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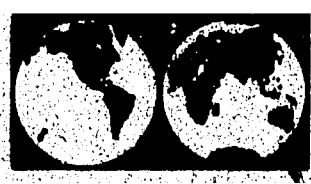
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Proceedings of the IPPF Eighth International Conference



PROCEEDINGS OF THE
EIGHTH INTERNATIONAL CONFERENCE
OF THE
INTERNATIONAL PLANNED
PARENTHOOD FEDERATION
SANTIAGO CHILE
9—15 APRIL 1967

‘Planned Parenthood - a duty and a human right.’

Editors

R. K. B. Hankinson, M.A. General Sessions

Dr. R. L. Kleinman. Medical Sessions

Dr. Peter Eckstein. Basic Science Sessions

Professor Hernán Romero. Spanish Edition

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Executive Secretary: Mrs. Joan Swingler, 18-20 Lower Regent Street, London, S.W.1 England.

Cable IPEPFE London S.W.1. Telephone 839-2911 to 2916.

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Member Organizations: Belgium, Denmark, Egypt, Finland, France, German Democratic Republic, German Federal Republic, Jordan, Luxembourg, Netherlands, Poland, Sweden, Switzerland (Canton de Vaud), Turkey, United Kingdom, Yugoslavia.

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Member Organizations: Ceylon, India, Nepal, Pakistan.

South-East Asia and Oceania Region

FPA Building, 26 Dunearn Road, Singapore 11.

Hon. Secretary: Dr. (Mrs.) Maggie Lim, M.R.C.S., L.R.C.P., D.P.H.

Medical Consultant: Dr. (Mrs.) Sushila Gore.

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Western Pacific Region

c/o Hoken Kaikan, No. 2, 1-chome, Ichigaya Sadohara-cho, Shinjuku-ku, Tokyo, Japan.

Secretary: Mr. Tameyoshi Katagiri.

Member Organizations: Hong Kong, Japan, Korea, Okinawa.

Africa

(a) Central Office, London.

Regional Liaison Secretary: Mrs. B. C. Hull.

(b) Regional Office, Nairobi.

IPPF Representative for East and Central Africa: Dr. J. W. McAllan, P.O. Box 30234, Nairobi, Kenya.

Member Organizations: Kenya, Liberia, Mauritius, Nigeria, South Africa, Uganda.

MEMBER ORGANIZATIONS

- AUSTRALIA**
Family Planning Association of Australia, 92 City Road, Chippendale, Sydney, N.S.W.
- BARBADOS**
Barbados Family Planning Association, Bay Street, St. Michael.
- BELGIUM**
Fédération National Belge des Mouvements pour le Planning Familial, 25 rue de Praetere, Brussels 5.
Belgische Nationale Federatie der Verenigingen voor Gezinsplanning, Sterstraat 20, Antwerp.
- BERMUDA**
Medical and Health Department, Hamilton.
- BRAZIL**
Sociedade de Bem Estar Familiar no Brazil (BEMFAM), Rua das Laranjeiras 180, Rio de Janeiro.
- CANADA**
Family Planning Federation of Canada, 36 Parkside Street, Montreal West 28, P.Q.
- CEYLON**
Family Planning Association of Ceylon, 23/5 Horton Place, Colombo 7.
- CHILE**
Asociación Chilena de Protección de la Familia, Valentín Letelier 1373, Oficina 804, Santiago.
- COSTA RICA**
Asociación Demográfica Costarricense, Apartado 2815, San José.
- DENMARK**
Foreningen for Familieplanlægning, Aurehøjvej 4, Hellerup, Copenhagen.
- ECUADOR**
Asociación Pro Bienestar de la Familia Ecuatoriana, P.O. Box 4407, Guayaquil.
- EGYPT (UAR)**
Egyptian Family Planning Association, 5 Talaat Harb Street, Cairo.
- FIJI**
Family Planning Association of Fiji, P.O. Box 149, Suva.
- FINLAND**
Väestöliitto, Bulevardi 28, Helsinki.
- FRANCE**
Mouvement Français pour le Planning Familial, 2 rue des Colonnnes, Paris 2e.
- GERMAN DEMOCRATIC REPUBLIC**
Ehe und Familie, Arbeitsgemeinschaft der Gesellschaft für Gesundheitsschutz, Leninallee 70, 25—Rostock.
- GERMAN FEDERAL REPUBLIC**
Pro Familia: Deutsche Gesellschaft für Familienplanung e.V., Auf der Körnerwiese 5, 6 Frankfurt/Main.
- HONDURAS**
Asociación Hondureña de Planificación de Familia, P.O. Box 625, (Hospital San Felipe), Tegucigalpa.
- HONG KONG**
Family Planning Association of Hong Kong, 152 Hennessy Road.
- INDIA**
Family Planning Association of India, 1 Metropolitan House, Dadabhai Naoroji Road, Bombay 1.
- JAMAICA**
Jamaica Family Planning Association Limited, 6 Bravo Street, St. Ann's Bay.
- JAPAN**
Family Planning Federation of Japan Inc., Hoken Kaikan 1-2, Ichigaya Sadohara-cho, Shinjuku-ku, Tokyo.
- JORDAN**
Jordan Family Planning & Protection Association, P.O. Box 999, Jerusalem.
- KENYA**
Family Planning Association of Kenya, P.O. Box 30581, Nairobi.
- KOREA**
Family Planning Federation of Korea, 97 Ulchiro 1, Chung-ku, Seoul.
- LIBERIA**
Family Planning Association of Liberia, P.O. Box 938, Monrovia.
- LUXEMBOURG**
Mouvement Luxembourgeois Pour le Planning Familial, 3 Avenue Pescatore, Luxembourg.
- MALAYA**
Federation of Family Planning Associations, 59 Jalan Templer, Petaling Jaya, Selangor.
- MAURITIUS**
The Mauritius Family Planning Association, Tulsidas Building, Corner, Desforges & Jumrah Mosque Street, Port Louis.
- MEXICO**
Fundación Para Estudios de la Población, Shakespeare No. 6-301, Mexico 5, D.F.
- NEPAL**
Family Planning Association of Nepal, 16/4 Putalisadak, Kathmandu.
- NETHERLANDS**
Nederlandse Vereniging voor Sexuele Hervorming, Bilderdijkstraat 39, The Hague.
- NEW ZEALAND**
New Zealand Family Planning Association, Inc., 80a Pitt Street, Auckland.
- NIGERIA**
Family Planning Council of Nigeria, 1 Tafawa Balewa Square, P.O. Box 3063, Lagos.
- OKINAWA**
Family Planning Association of Okinawa, c/o Radio Okinawa, 1-22, 3-chome, Izumi-cho, Naha.
- PAKISTAN**
Family Planning Association of Pakistan, 34 Lawrence Road, Lahore.
- PHILIPPINES**
Family Planning Association of the Philippines, Inc., Third Floor, Maternal & Child Health Institute Building, 11 Banawe Street, Quezon City.
- POLAND**
Towarzystwo Świadomego Macierzyństwa, U1 Karowa 31, Warsaw.
- PUERTO RICO**
Asociación Puertorriquena Pro Bienestar de la Familia, 166 Arzuaga Street, Rio Piedras.
- SINGAPORE**
Family Planning Association of Singapore, FPA Building, 26 Dunearn Road, Singapore 11.
- SOUTH AFRICA**
National Council for Maternal & Family Welfare, 104 Maynard House, Maynard Road, Wynberg, Cape.
- SWEDEN**
Riksförbundet för Sexuell Upplysning, Box 17006, Rosenlundsgatan 13, Stockholm 17.
- SWITZERLAND**
Service de la Santé Publique, Canton de Vaud, Immeuble Athenée, Lausanne.
- THAILAND**
Family Planning Association of Thailand, No. 1 Luang Road, Bangkok.
- TRINIDAD & TOBAGO**
Family Planning Association of Trinidad & Tobago, 143 Henry Street, Port-of-Spain.
- TURKEY**
Family Planning Association of Turkey, Venischir Mithapasa, Caddesi 31/8, Ankara.
- UGANDA**
Family Planning Association of Uganda, P.O. Box 30030, Kampala.
- UNITED KINGDOM**
Family Planning Association, 231 Tottenham Court Road, London, W.1.
- U.S.A.**
Planned Parenthood Federation of America Inc., 515 Madison Avenue, New York, N.Y. 10022.
- YUGOSLAVIA**
Federal Council for Family Planning, Bulevar Lenjina Br. 6, Belgrade.

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Dr. Luisa Pfau, President.
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Professor Hernán Romero, Medical Director.

Señor Manuel Fernández, Mayor of Santiago, most generously allowed the Conference to be held in the Municipal Theatre.

Dr. Eugenio González, Rector, University of Chile, kindly invited the Eighth International Conference to hold an Exhibition at the University of Chile and made the Salon de Honor available for the showing of films.

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Dr. Guillermo Adriasola	Professor of Maternal and Child Health, Director, School of Public Health, University of Chile.
Dr. Onofre Avendaño	Professor of Obstetrics, University of Chile; Chief, Obstetrical and Gynaecological Unit, Hospital Barros Luco—Trudeau, Santiago.
Dr. José Manuel Borgoño	Professor of Social and Preventive Medicine, University of Chile.
Dr. Manuel Moreno Geisse	Head of the Gynaecological Service, San Borja Hospital, Santiago.
Dr. Lucía López	Assistant Obstetrician, Division of Health Promotion, National Health Service.
Dr. Luisa Pfau	President, Chilean Association for Protection of the Family, and President, IPPF Western Hemisphere Region.
Dr. Silvia Plaza	Department of Maternal and Child Health, University of Chile.
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Dr. Hernán Romero	Professor and Chairman, Department of Social and Preventive Medicine, University of Chile (Executive Secretary to the Conference).
Dr. Jorge Rosselot	Head of Division of Health Promotion, National Health Service, Chile.
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Dr. Luis Tisné	Professor of Obstetrics, Head of the Maternity Service, El Salvador Hospital.
Dr. Benjamin Viel	Professor of Social and Preventive Medicine, University of Chile.
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Under the leadership and guidance of Snra. Elsa de Avendaño, seven sub-committees were responsible for: Accommodation, Hospitality, Meeting Arrangements, Public Relations, Publications, Reception and Information, and Transport.

CONFERENCE ORGANIZATION AND ACKNOWLEDGEMENTS

Officials of the IPPF Eighth International Conference

Co-Presidents: Dr. Luisa Pfau (Chile), President of the Chilean Association for Protection of the Family; Shrimati Dhanvanthi Rama Rau (India), President of the International Planned Parenthood Federation.

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IPPF EIGHTH INTERNATIONAL CONFERENCE

Santiago, Chile, 9-15 April, 1967

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Meteoric Growth of Population

Abnormal Expansion of Cities

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Discussion Chairman: MR. MILOS MACURA, *Chief, United Nations Population Division.*

Rapporteur: LIC. RAUL BENITEZ-ZENTENO, *Professor of Sociology and Demography, National University of Mexico.*

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Rapporteur: DR. MINORU MURAMATSU, *Institute of Public Health, Tokyo, Japan.*

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Discussion Chairman: DR. FRANCISCO MARDONES-RESTAT. <i>Director General, National Health Service, Chile.</i>	
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Session Chairman: DR. JOAQUIN NUNEZ. *Medical Director, Honduras F.P.A.*
 Discussion Chairman: PROFESSOR PIERRE HUBINONT. *Professor of Obstetrics and Gynaecology, University Hospital of St. Pierre, Brussels.*
 Rapporteur: DR. ANDRAC KLINGER. *Chief, Demographic and Social Statistics Section, United Nations Economic Commission for Latin America.*

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Programming for Family Planning Services

Session Chairman: MR. SAM KEENY. *Resident Representative of the Population Council for East Asia.*

Discussion Chairman: MR. R. L. MUNRO, C.B.E. *President, F.P.A. of Fiji.*

Rapporteur: DR. HERNAN MENDOZA-HOYOS. *Chief, Population Studies Division, Colombian Association of Medical Faculties.*

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Discussion Chairman: MR. A. M. A. KABIR. *President, East Pakistan F.P.A.*

Rapporteur: DR. AQUILES SOBRERO. *Director, Margaret Sanger Research Bureau, New York.*

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PART III MEDICAL

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Session Chairman: PROFESSOR F. T. SAI. *Department of Preventive Medicine, Ghana Medical School.*

Discussion Chairman: DR. M. K. KRISHNA MENON. *Director, Institute of Obstetrics and Gynaecology, Government Hospital for Women and Children, Madras.*

Rapporteurs: DR. MARGARET JACKSON. *Medical Officer, Devon Family Planning Clinics. UK Consultant to IPPF Medical Committee.*

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Session 1

INAUGURAL SESSION

1. OPENING ADDRESS

R. Valdivieso

Minister of Health, Chile

INTRODUCTION

One of the most characteristic features of the history of the last decades has been the accelerated and progressive increase of world population. Although this manifestation is to be found in all countries, the highest indices of demographic increase correspond to the under-developed areas, in particular to Latin America.

In fact, the rate of growth of the Latin American population has in the last 30 years increased to the point of being the highest among the continents. Fundamentally, this increase parallels the rapid drop in mortality figures with high and sustained birth rates and, proportionally, a barely significant international immigration. Its main effect has been a considerable lowering of the average age of the population and, as a result, an increase in the proportion of economic dependents.

Together with the accelerated demographic increase, a rural-urban migration has taken place to an extent which outstrips the possibilities of the trends and opportunities of employment that the rhythm of industrialization of the continent can bring. This has been an important contributing factor in the creation of fringe problems and under-employment.

Moreover, given the characteristics of the distribution of income, such as the conditions of social organization and structure, there does not appear to have been a substantial improvement of the living standards and social conditions of the majority of the population. Neither, one must add, is there sufficiently rapid progress in the essential structural reforms for an acceleration of the economic and social development of the area.

The latter factor only aggravates the characteristics and extent of the population problems, for it is precisely the fringe groups, in relation to the benefits of development, who are most directly affected by these problems. Such sectors are merely passive beneficiaries of the general health effects in the reduction of mortality, the high rates of reproduction, meanwhile, being maintained. It is difficult for the members of these groups to assimilate precepts of rationality in their reproductive conduct if the whole social context tends to keep them on the fringe of the overall process of advance. Nevertheless, whatever its tempo, the process of development, associated with the growing influence of the social means of communication, necessarily makes a bigger and bigger population more and more clearly aware of the possibilities of social improvement and of a wider participation in the national life. This multiplies the pressure of demands which the present tempo of development cannot satisfy.

Today, it is clear that the multiple and complex characteristics of the population problem call for special attention, for a harmonizing of all the activities which have so far been brought to bear on this aspect of development. In other words, in order to accelerate the process of modernization and planning of development, with a view to obtaining a substantial and rapid improvement of living standards, it is essential for adequate consideration to be given, not only to the political, but to the different demographic aspects.

ECONOMIC REPERCUSSIONS

It is held that the accelerated growth of population is the greatest obstacle to the economic development of the backward nations. Well then, in order to brake this growth, a policy directed towards a reduction of the birthrate appears to be indicated; for insofar as this remains as it is, the problem will find no solution, so this remedy must be analysed.

A reduction of the birth-rate would imply a favourable modification of the ratio "non-earning population/labour force" and consequently an increase of the *per capita* income and

a rise in the living standard of the people. The countries of rapid demographic increase are obliged to subtract a relatively greater proportion of the Gross National Product (GNP) for investment purposes, to cope with the new population contingents, faced with their need for capital.

Furthermore, the population problem must be seen from the point of view of a situation of imbalance between the number of persons and the available resources for providing them with an adequate standard of life. If the planning, however, is carried out only on the economic level, which is incorrect, it appears that the problem is not simply one of imbalance between growth of population and growth of production. A reduction of the birth-rate effectively changes the structure of the population in its age-group components, at the outset easing the burden of non-productive youth on the wage-earning elements, though in a later phase the labour force will be depleted and subsequently this might be a hindrance to development. Finally, a relative increase in the non-earning population of advanced age must be expected.

Even those who accept without reserve that the excessive growth of the population is the greatest obstacle to securing improved living standards, have had to concede that the seemingly specific remedy of restriction of the birth-rate would have little importance as an instrument of development.

THE HEALTH SECTOR

Hygienic deficiencies and general economic underdevelopment are projected in the health indices which show a high rate of maternal mortality (2.7 per thousand) and of infant mortality (99.8 per thousand), which in Chile have remained practically stationary in the last decade, evidencing the significant role of abortion. In our country we have one abortion for every two births, and 20% of maternity beds are occupied by patients with complications from abortions. In 1964, from the hospitals of the National Health Service there were 56,391 discharges coming under this head, representing 8% of the total discharges. Their seriousness may be appreciated when it is realized that they cause two-fifths of all the maternal mortality, occupy 184,000 bed/days and cost the Treasury the equivalent of one million dollars.

The epidemiological study of abortion reveals a fact which should not be forgotten: its inter-relationship with economic under-development.

Abortion is the inhuman method of birth control adopted as a solution in certain conditions and at certain low cultural levels, in the face of a social and economic reality.

The grave incidence of abortion this year, which affects the structure of the family and of the community and an awareness of the problem on a world scale, explain the priority of attention on the part of the health sector and of national and international organizations.

BIRTH CONTROL ACTIVITIES IN THE HEALTH SECTOR

Confronted with the gravity of the situation that has been indicated, the health authorities in Chile could not remain indifferent.

As, since 1962, means from various sources have been employed in the field of birth control, without institutional instruction, and as, on the other hand, there has been a growing demand for information on contraceptive procedures on the part of people benefiting from the Health Service, it was decided to channel these activities within clearly defined principles.

The Minister of Public Health, advised by the Committee on Population and Family set up for this purpose, ordered that birth-control activities be directed primarily at the prevention of abortion and to this end that they be incorporated in the regular programmes of maternal and child care for the purpose of reducing the risks of undesired maternity. These activities are subject to the following norms:

(a) respect of the freedom and dignity of the human person, inasmuch as it will be the couple themselves who, freely and responsibly, take the final decision on limitation or spacing of children;

(b) furnishing both partners with adequate information on all existing and legitimate methods, including the use of drugs for modifying fertility, and

(c) as the prime object of the programme is to combat abortion, it is addressed to those groups of the population which are exposed to the risk, priority therefore being accorded to women attending for abortions, to women who already have several children and to those who, having serious socio-economic problems, constitute a group potentially inclined to abortion.

Thus, the Ministry of Health has established birth-control action as one of the features of its mother and child health programme, oriented solely to the purpose of preventing and combating criminal abortion. Its final purpose therefore is the protection of mothers, children and the family health.

It is for this reason that the programmes of family planning, which since 1962 have been carried out without the due control of the authorities, and on the responsibility of private organizations, have been made subject to the new norms.

I think it opportune to mention here, in connection with the WHO, that the latter, at the XIX Assembly, May, 1966, discussed the health aspects of the world demographic situation. The discussion arose in connection with a draft resolution presented by the delegations from India, Pakistan, the USA and the countries of northern Europe, in which the Director General of the WHO was authorized to give technical approval to programmes of birth control and family planning, outside the National Health Services and excluded from their programmes. Although the draft resolution did not explicitly express this position, it implied it, inasmuch as in one of its final provisions it asked the Director General "to investigate the means by which birth-control programmes in the future could be incorporated in the National Health Services".

Our representative in the Assembly opposed the project and defined the position of Chile by submitting to the consideration of the Committee a new project, which in principle authorized the Director General to give technical advice to countries which asked for it for programmes of family planning integrated in the Health Services, without prejudice to the prophylactic and curative activities of the latter. This project was approved by a large majority with the support of practically all the Latin American and African countries.

The consequence of this resolution of the World Health Assembly was that the Executive Council of UNICEF postponed any statement on such an important project because of its magnitude, and because of the major financial implications of implementing population control programmes.

POPULATION POLICY

Having outlined the evidence in support of birth-control activities, defined them and the sphere of their application in the health domain, I will now explain our position on population policy in relation to social and economic planning and the development of the country.

By population policy we understand, transcribing the terms used in the seminar on "Population Policy in relation to the Development of Latin America", which was conducted last February under the auspices of the Organization of American States (OAS), "the coherent totality of decisions which are part of a rational plan of behaviour adopted by the public at large in accordance with the needs and desires of family units and the collectivity, for the purpose of directly influencing the probable magnitude of the population, its composition in age-groups, size of the family and the regional or rural-urban distribution of the inhabitants, with a view to facilitating the attainment of the aims of the national development". We emphasize that this policy must consider and evaluate the influence exerted on these variables by changes in social processes, particularly in education, housing, health and employment.

What has been said excludes from our consideration any kind of unformulated means or partial actions which can only distract our attention from the broad framework of development and of the general problems inherent in the latter. On the other hand, this assumes the working out of a population policy which includes all aspects of the problem and which fits into the wider framework of the general policy of development. These are tasks which must be defined and carried out by each country according to its own conditions, its historical processes, its possibilities and its cultural framework.

At the present time, and in the particular case of Chile, the establishment of a policy of population is a complex procedure and one which calls for prudence. For one thing, it is clear that means and initiatives have been set in motion to achieve an acceleration in the tempo of our development.

The GNP has, of course, increased fantastically in recent years and there is no sufficient evidence to justify the assumption that this is only a sporadic phenomenon. On the contrary, all efforts are being directed towards maintaining this rhythm of growth. In the second place, the annual increase of the population indicates a tendency to decline and is not at a level which would justify any great urgency in respect of demographic growth, especially as the economic growth shows a tendency to increase.

In view of this it seems more reasonable to proceed prudently and to analyse the overall effects of the interdependence of the two processes of socio-economic development and of demographic development. In this connection, it should be mentioned again that the demographic solution is not the only one for resolving the problem of under-development, without thereby denying its importance, or that there is diversity of opinion on the relations and the degree and form in which a policy of demographic braking exerts its influence on the economic process.

To this must be added the local or national implications of the differences between the various countries in their economic, social, geographic, ethical and other characteristics, which restrict or prevent the adoption of patterns or models of population policies of other countries.

But further, the accelerated tempo of the process of economic and technological change and development which world population is experiencing at present, is creating new conditions and factors already operative in this century. Possible solutions, therefore, particularly the demographic solutions, must be sought in a new context, adjusted to present and future realities. These facts take on especial importance in the problem of population growth, which must be seen in a new perspective that takes into account the factors of time, place and tempo of development.

Even in the exclusively economic field, the problem is not a simple imbalance between population growth and resources; for those who think otherwise, for those who formulate its solution in terms of the dilemma "either economic development or demographic growth", as means for the achievement of a higher standard of life, we must again take into consideration some facts to which we have already referred and which we would now like to establish more specifically as applied to the case of Chile.

As a pragmatic proposal, we asked the Office of National Planning how the economic growth of the country would affect the future demographic growth and what the effect would be of a decision in the sense of containing this growth.

In the reply, two alternatives are analysed. The first considers a fall in the overall rate of reproduction from 2.41 in 1960 to 1.88 in 1985, and subsequent maintenance at this level up to the year 2000. This alternative would very roughly correspond to the evolution of the variables as experienced in our country today. Remember that for this year the rate shows a tendency to fall. In this case, by 1985 Chile would have an overall rate of reproduction equivalent to the highest found in the developed countries today. The other hypothesis, which is assumed to result from a policy of rigorous braking of the birth-rate, would lower the above-mentioned rate of 2.41 in 1960 to 1.205 in 1985. That is to say, a reduction by half in 25 years. This level is that of many European countries at present and its attainment "would be" possible. This would result in Chile's population reaching in 1985, 14 millions (58% of population aged 15 to 64) in the first case and 12.5 millions (63% of population aged 15 to 64) in the second case. Then, taking into account the number of consumers per wage-earner, the cost of the demographic investment and the possibilities in terms of natural resources, and assuming an equal effort of investment, it is found that it would take 23 years to double the *per capita* income in the case of the first alternative and 20 years in that of the second.

It would thus clearly be a question of a very slight advantage. Three years of difference to reach the same economic level in Chile with and without a policy of family planning.

But if planning of a purely economic order appears doubtful, at least for our own conditions, we are assailed by the same or greater doubts about the effect of a policy tending to a

reduction of our population on economic growth if we consider what effectiveness in influencing our birth-rates there may be in a programme of family planning based on the sole acceptable moral sanction, the free-will of the couple concerned.

As I mentioned at the outset, an epidemiological study of abortion in Chile revealed its close interconnection with a low cultural level and low standards of life. I will now add that it is the undeveloped countries which have the highest birth-rates, while in the countries which have attained to high living standards it is a matter of commonplace observation that the birth-rates and the incidence of abortion are higher in the lower classes than in the rest of the population.

The fact is that, basically, it is in poverty that are to be found the conditions, whether shortage of housing, alcoholism, ignorance, which lead to irresponsible procreation. And this is one of the real causes of the so-called demographic explosion.

In these social strata, programmes of family planning reveal enormous weakness. It transpires that it is the poorest who most need them and who, at the same time, are least willing to accept these programmes. It is this that has made some say despairingly that the efforts to reduce the birth-rates among the great populations of the globe, characterized by illiteracy and poverty, have so far had little success.

In a report by Lauchlin Currie, it is stated that "a reliable survey in a developed country showed that between 1890 and 1940 there was a high inverse relation between educated economic levels (up to the fourth year of secondary education) and birth-rates. It seems that this correlation is not affected by other factors, such as religion".

We thus find ourselves in a vicious circle, which must be broken: poverty-ignorance-demographic explosion-poverty. And with regard to the current solutions, I have plainly expressed our doubts. Doubts as to the advantage, at least in our case in Chile, of a policy of reduction of the growth of our population in connection with the raising of the *per capita* income; doubts as to the efficacy of the instrument of family planning to secure a reduction of the birth-rate.

These are question-marks that we ardently hope will be considered in the debates of this conference.

* * *

In 1966, Chile attained an increase in the GNP of 7%, and the *per capita* income was raised by 4.6%. These indices give us a high place in economic growth in the continent. The basis is thus given for development. If now this higher income is distributed equally and an accelerated impulse given to social development, then the conditions for success in a policy of family planning are present.

Actually, speaking about the vicious circle in which we find ourselves, about the doubts to which the procedures proposed give rise, we would like to add that, in the doctrine which the government take as their point of departure, we consider that this vicious circle can only be successfully broken by making a massive investment in the educational sector for the benefit of the poorest part of the population, and correspondingly, as great an effort as possible to raise their standard of life. That is what Chile is doing at the moment. In education alone, public expenditure increased 55% between 1964 and 1966. In the five years 1960-1964, the promised increase of matriculation attained to 60,000 pupils yearly. In 1965 the increase was of 220,000 and in 1966 it reached 310,000.

RESPONSIBLE PROCREATION AND THE DUTY OF THE STATE

One often hears the necessity proclaimed of inculcating a sense of responsible procreation to render programmes of family planning effective. But it is not so frequently observed that, among the elements which dictate his conduct man has no special pigeon-hole for sexual responsibility. This, in fact, is nothing other than the concretion, within the ambit of conjugal intimacy, of a general sense of responsibility in the most authentic form of its meaning. That is, assuming consciousness of his finality as a human person, as the integrating factor of the family nucleus, as a member of the social group in its historical and geographical reality.

Nevertheless, responsibility is not limited to the plane of the couple concerned. It extends to the wider whole of social groups and institutions and, in a very particular way, to the state. The responsibility of the latter finds its specific expression in the creation of conditions which

will qualify and enable the couple to exercise responsibly their procreative function. This task of the state goes beyond the limits of mere information on methods of control, entering into the wider task of procuring the common weal of the whole of society.

In order to procreate responsibly, the couple require: on the physical plane an adequate development of the body; on the psychic plane, maturity and psychological balance; on the cultural plane, the spiritual enrichment that is the fruit of a minimum education; on the ethical plane, an assimilation of guiding principles to inform their conduct.

These benefits and values are furnished by society as part of its mission to promote the common weal. The personal fulfilment of the members of a community is not a task that does not concern the authorities or the state as entities bearing most responsibility for the well-being of this human group.

Thus a responsible authority must, for example, maintain a policy of public health which aims at achieving a full physical development of its members, eradicating maladies and vices specifically incident to fecundity and birth.

On the psychological and cultural plane, authorities must methodically guide the younger generation towards a responsible fecundity, giving, among other things, an adequate sexual instruction.

On the ethical plane, the responsible authority must respect and provide a system of minimum normative values, through, for example, a protection of matrimony and the family.

However, the creation of these conditions is not enough. It is necessary to go a step further and to promote a responsible *conduct*. In this advance, society is likewise involved through the state, furnishing the elements that will make this conduct possible. Here the full magnitude of the economic investment devolving on the community before this purpose of the couple can become reality, emerges clearly.

To indicate some of these enabling conditions is a difficult task, subject to the characteristics of the different human groups. We can, however, by way of illustration, indicate some of them which we consider urgent: suitably remunerated work, covering the vital needs of the worker and his family; appropriate housing, enabling conjugal intimacy and the full development of the family nucleus; basic education, giving the couple an awareness of the needs, obligations and possibilities of the society in which they live.

The Eighth World Conference of the IPPF is at the present time an event of the highest importance. Because of its world-wide scope, because of the presence of so many highly qualified participants, assembled for the discussion of a subject of incontestable urgency, the Chilean Government will watch its progress with the greatest interest and will be open to consider suggestions emanating from it, expressing at the same time its satisfaction at the fact of this city having been chosen as the place of the conference.

I ask all the participants and members of the Federation who are present, and very particularly its emeritus President Dr. Elise Ottesen-Jensen, Mr. Cass Canfield, President of the Governing Body, the organizers and other executive members of the Federation and of the Chilean Association for Protection of the Family, to accept the welcome which, in the name of the President of the Republic, Sr. Eduardo Frei and his Government, I have the honour to extend to you at the opening of your Congress.

2. OPENING ADDRESS

M. Fernández
Mayor of Santiago

As representative of the Municipality of Santiago and Mayor of the City, I should like to welcome most cordially all the delegates to this Eighth Conference of the IPPF.

I feel it is right to begin, rather than with the theme of this event, by thanking you in the name of Santiago for having chosen our city as the meeting-place for this Eighth Conference, which confirms our pride that Chile is seen among the nations of the world as one loving peace, liberty and democracy.

It has been our great pleasure to offer the delegates the Municipal Theatre and we have taken good care that it should be in the best of condition. Perhaps such a detail is not important, but it reflects a higher motive. Before this select gathering—statesmen, scientists, technicians, doctors and learned men from distant countries—we want to show with this gesture our yearnings after progress and culture, since it is in this auditorium that the people of Santiago express their artistic concern, and it is this background against which our youth daily gain inspiration from the latest movements in philosophy, science and the arts.

We look forward impatiently to the results of this conference. Before the magnificent setting of a world in development, and under the formidable impact of technology and the conquest of space, it is essential to affirm that the family is humanity's primary cell.

How strange it is that this event should follow within a few days of Pope Paul's Encyclical "Populorum Progressio" which is a solemn call for joint action for the development of the whole man and for the united development of humanity.

Man, who is achieving mastery of nature, must not forget those who live in poverty. Each act, each programme and plan of assistance must begin with its true author, the man himself, in the family, which is the synthesis, both intimate and collective, of all humanity.

From this it follows that the couple act upon the world around them and influence it with the secret of their intimacy.

It is calculated that the world's population will double before 35 years and as is already happening there will be even more acute problems of sanitation, housing, education and employment, and the progress and development plans of governments will be jeopardized.

All this can be foreseen, and the great enterprise of planning which takes account of it all, must begin with the planning of the family. This realization must be shared by all governments, and to guide them in this delicate matter, the most distinguished experts have gathered here from every country.

Gentlemen, Santiago welcomes you warmly. We Chileans are not great talkers; we prefer the facts to speak for themselves. We shall try to make your stay in our capital pleasant and comfortable for each of you so that when you return to your homes, you will remember this distant people in South America for the esteem and friendship which is felt particularly towards each delegate, and will keep as a vision of our tenacious and progressive spirit, our countryside, beautiful but difficult.

3. RESPONSE

Elise Ottesen-Jensen

President Emeritus, IPPF

President, Excellencies, Ladies and Gentlemen—I am very sorry to tell you that our President, Lady Rama Rau, is unable to be with us today, a sorrow I am sure she feels as deeply as we do. And so I welcome you all to this conference. I am especially honoured, and have much pleasure, in thanking President Frei for being with us and speaking, and in that way giving our important conference a real start. And then in the name of the IPPF I have to welcome everyone here. It is our hope that you will gain much from the proceedings; that you will have the knowledge and inspiration to work for the ideals that are ours so that no child should be born unwelcomed, and that this will create family happiness, and thus national joy and well-being. Surely happiness within each country points the way to peace in a suffering world. We also hope that when you leave here you will transmit this knowledge and inspiration to your own countries, helping the people there to learn about family planning, and giving them help. It is our hope that you will never forget to carry the light to the darkest corners of the world, where help is most needed. Welcome.

4. CALL TO ORDER AND WELCOME

Luisa Pfau

Chilean Association for Protection of the Family

After a lifetime dedicated to working for the well-being of the mothers and children of my country, the IPPF has given me the privilege of adding a new service which will have enormous significance for public health, and for cultural, political, social and economic development. For a long time many doctors have been saddened at the unfortunate effects of excessive fertility, seen in high mortality rates of both mothers and children, malnutrition among large sections of the poorer classes, and most dramatic and immediate, by the terrible plague of induced abortions.

It was this concern that influenced a group of us to form the CCPP, the Chilean Committee for the Protection of the Family. Our intention was to offer advice and help to the family, the living cell of the community, whose fortunes and stability are damaged by too-rapid growth in size. So great was the need and desire of Chilean couples to avoid unwanted pregnancy that our original work, unexpectedly successful as it was, had to be redoubled.

The Committee became an Association, we obtained legal recognition and gave ourselves a stable structure. To the original nucleus we added social workers, midwives, nurses, and others imbued with love of their neighbour and desire for human solidarity.

None of our work would have been possible had it not been for the good will and understanding of the Minister of Health, the National Health Service, the universities, and many public and private organizations working on behalf of the community. Even less would have been possible had we not received from the outset the technical and financial help of various international agencies, especially the IPPF.

Although the various projects have been prepared and operated by our fellow Chileans, we have all benefited from the timely, considerate and experienced advice of foreign experts. We have received money, equipment and drugs in such generous amounts that it is not too much to say that in material terms we have had everything we needed to carry out our task. What has held us back has been the relative shortage of trained personnel and doctors, and other factors in this country.

For the group that has worked stubbornly in our Association, which so kindly and inexplicably has made me President and kept me thus, and whose numbers increase every day, this is a proud and happy, even a glorious day. For the Federation, which only now is meeting in this part of the world, has stated that it chose Chile because, in all of Latin America, we have the best birth control programme and because this is one of the few countries in which the Minister of Health and the National Health Service have framed clearly defined population policies that are models of prudence and wisdom. The Federation has honoured us by bringing to our small republic, hundreds of distinguished persons in the fields of science and medicine, sociology and demography, economics and agriculture, and many other spheres of modern knowledge. It has also given us the opportunity to show that we are a people with civic maturity, desire for progress, and with a spirit of warmth and hospitality. Lastly they have trusted in our capacity for efficient cooperation in the preparation and staging of an event of such size and importance.

Because this is the first occasion on which the Federation—an international body in its objectives and operation—meets in Latin America, the organizers have agreed to give special attention on the agenda to the most serious problems of the region. It would seem fitting then, in welcoming the participants, to mention especially those coming from our sister

nations. Almost all of them are carrying out birth control-programmes which are the more important because of the great vistas of progress the region can offer. I should like to add that we base our deepest hopes on these lands and most of all on their youth. For their sake, above all, we should like to make a reality of the theme of this conference—Planned parenthood, a duty and a human right.

5. KEYNOTE ADDRESS

PLANNED PARENTHOOD—A DUTY AND A HUMAN RIGHT

Lord Caradon

Minister of State and Permanent United Kingdom Representative to the United Nations

I come today first to express gratitude and admiration to a President and to a government and to a city and to a people. I know that in that purpose I speak for you all. We have gathered from the four corners of the world, from every continent and from every race, and some of us come from representing different nationalities in the central organization of the international community. We come from many diverse countries with many various problems and pressing preoccupations. But whatever our differences we are all of us bound together by one common concern and one common cause and one common conviction. We are brought together by a sense of danger—indeed a sense of potential disaster—on a scale never before imagined. We are united in our concern for the individual—for man and woman and specially for the child. Our cause is no less than to make the revolution of rising expectations not a betrayal but a reality and a fulfilment.

We come together with a common concern and a common cause and also with a common conviction—the conviction that what we want is action—urgent administrative action. It was John Kenneth Galbraith who said that population control is still in the hands of the philosophers and the prophets. He urged us that it should now go to those who act, and that is the determination, I am sure, of those who have assembled for this conference.

We embark on our task first and foremost with a sense of deep gratitude for the leadership of the President, whom we all greatly respect as a philosopher-statesman who has won world-wide reputation as a practical reformer. To him and to the people of Chile we wish to express our respectful tribute, and we pray that our deliberations and our decisions will justify their kindness and their boldness in inviting us to come to this beautiful capital city of this courageous country.

Before I go further I beg you to be tolerant with me as I admit the limitation of my qualifications to address you this morning. We have here assembled many of the leading experts of the world on one of the main problems of the world. I myself always live in awe of experts, and we have here indeed an awe-inspiring gathering of experts on every aspect of this vast problem. Seldom if ever before have so many experts on the whole problem of world population met in one place. But, Mr. President and distinguished delegates, I am not an expert. Far from it. I am by training an administrator, and I am by inclination a politician. I flatter myself that it was by design, and in recognition of the need for administrative and political action, that I, a humble administrator and politician, was invited to speak to so many experts. And let me say that I have one other qualification to speak amongst what I might call an escalation of experts.

I speak to you, Ladies and Gentlemen, not as an expert but rather as a convert. It is as a convert that I come respectfully before you. I come as a convert to the conviction that of all the problems of the human race there is no more important and no more urgent problem than the problem of population. I come to speak to you with the enthusiasm, indeed with the faith, of a convert—a convert to the conviction that if we endeavour to deal with the great world problems of poverty and hunger and ignorance and disease—and hatred and fear and violence too—without at the same time dealing with the problem of population we shall utterly fail. We shall fail because we shall have failed to put first—first of all—the aim, the overriding aim, to give to every child born into the world some reasonable expectation of survival and some hope of living in human dignity. To put it at its lowest, if we bring children into this

world without such an expectation and such a hope it will be a waste, a criminal waste, an utterly unforgivable waste, of the most precious thing in the world, the potentiality of the human personality.

Bear with me, I beg you, if I tell you the circumstances of my conversion. Nearly a third of my long working life was spent in the beautiful and fertile and prolific island of Jamaica. I was fortunate to go there first at a time when there was a new restlessness, an awakening to the need to shake off the fatalistic acceptance of poverty and privilege. There was a new desire to escape from the lethargy of political and economic stagnation. In the subsequent decade there was unprecedented progress. Politically the people took hold of their own destiny. By the end of the decade Jamaica had advanced to self-government in preparation for independence. Political progress was matched by economic advance. Massive investment was attracted from overseas. There was a cultural renaissance too. A West Indian University was founded, and flourished. Jamaica embarked on an ambitious development programme—new industries, new schools, new hospitals, new housing schemes and new agricultural experiments. Even the worst hurricane ever known in Jamaica did not hold the people back. They united as never before to build and plant again. The disaster was turned to a blessing. Within little more than a year of the devastation of the hurricane Jamaica was growing and exporting more than ever before. It was a period of political stability and growing material prosperity and social advance unequalled in the history of the island. All of us who were engaged on the exciting task of new development were of course aware that we had a population problem. In an island no-one can easily forget it—especially in an island like Jamaica which has such a high rate of illegitimacy. The population of Jamaica a century ago was half a million. It is approaching two million now, and at the end of this century at the present rate it may be nearly four million. Yes, we were aware of the population danger. But many of us who were engaged on the hectic, happy, absorbing work of new development were impatient of the few who reminded us of the futility of our efforts if the monster of over-population continued to gain on us. We pushed their protests aside. We took refuge in working harder to further our development plans and our political aims.

Why were we so blind? It wasn't only a matter of stupidity. It was also cowardice. We knew that population control was an awkward subject. It was controversial. Worst of all, from a politician's point of view, it was unpopular. Partly our inactivity was due to ignorance. Most of us were at a loss to know what to do about it. Partly it was weakness. We took the line of least resistance. We shut our ears and our eyes to the danger. To invest, elect, build and plant, those were our obsessions. We went faster, faster, thinking we were going ahead,—but we were in fact running away. A former Chief Minister of Jamaica tried to laugh it off. He said "I have been a socialist all my life but I think birth control is best left to private enterprise." Though that was said half in jest, I am sorry to say that many of us for a while took it seriously. But we could not escape. The monster was not only gaining on us. It caught up. No sooner had we built a new school than it was too small. It was not mainly a matter of how many children could be crowded in, but how many had to be shut out. No sooner had we built a new hospital than there were two, three, four people waiting for every bed. Every agricultural project we started increased the clamour for more land settlement. New industries paying higher wages showed up the gulf between the favoured few and the discontented rest. Then the dreadful drift to the slums of Western Kingston gained momentum. Before long a quarter of the population of the island was crowded into the capital city with thousands of men, women and children living in conditions unfit for animals. The gaiety and beauty of the Jamaican countryside were abandoned for urban squalor. The rising tide of population flowed into the stagnant swamp of urban disillusion. So slowly, much too slowly, it dawned on us in Jamaica that production alone was not enough. Indeed production alone was a delusion. The twin problems of production and reproduction, so we realized, must be tackled together. It finally dawned on us that if dealing with the problem of population was left too late then all our economic and political achievements would be swept away like sand castles before the advancing tide.

I make no excuse for telling you of our awakening, our conversion, in Jamaica, which has led to increasingly effective action in recent years. We were not slower in our realization of the danger than most of the rest of the world. It is only in the past few years that the terrifying

statistics of world population have begun to make impact on world public opinion—and then only to a sophisticated super-structure of society. But what we now hear in terms of statistics has long been known in terms of human degradation and human suffering and human frustration and human bitterness. The price of the blindness and the sloth and the prejudice of the affluent and the educated has been paid by those least able to understand and least able to protest, by the poor and by the illiterate—and specially by bewildered women and unwanted children. I remember Ambassador Plimpton saying a year or two ago that:

“Two generations ago the unwanted child was a tragedy for the health of the mother. A generation ago it was realized that the unwanted child was a tragedy for the economic health of the family. We now realize that the unwanted child may well be a tragedy for the economic health of an entire people. Perhaps we shall soon realize that the unwanted child may be a threat to the economic health of the whole world.”

The dangers of the world are surely greater than ever before. I shall not attempt any full catalogue of world dangers. We are all too familiar with them.

There is first the danger of poverty with a thousand million people living near or below the starvation level. And the level of world food production last year stopped and even dropped. And the gap between the affluent nations and the impoverished nations grows rapidly greater. And the assistance from the rich nations to the poor nations falters far short of the desperate need. Meanwhile attacks on the death rate were outstandingly successful. In Ceylon the anti-malarial campaign reduced the death rate by 40% in a single year. As the expectation of life grows so fast—it has risen from 27 years to 48 years in India in two decades—the expectation of starvation is even more spectacular.

There is the danger of youth—the danger that our failure to act in time will lead to furious frustration. When I went down through Africa a year or two ago they told me in one country after another that more than half the population was under 18 years of age. And now more of the younger African generation are going to school. As they grow up they are not going to be content to scrape a miserable livelihood from eroded land by antiquated methods as their fathers did before them.

Then there is the danger of race—the danger that racial tension and racial injustice will lead to racial conflict. There is the danger that the confrontation between African nationalism north of the river Zambesi and white supremacy and white suppression south of the river will cause an explosion and a conflict which would at once inflame all Africa and involve the whole world.

We have to add to the other dangers the danger of population, with more than a thousand million new mouths to be fed by 1980. As Lord Ritchie Calder said the other day in the House of Lords, if 20 divisions of men from Mars landed in this planet every 24 hours—arrived without their rations—we should feel bound to do something drastic and urgent about it.

The most important thing about the revolutions of poverty and youth and race and population is that they are not four problems but all one. The greatest danger of all—of this I have long been convinced—is that there is a growing division in the world—a division, a growing gulf, between the affluent, comfortable, complacent people of the older nations on one side and the hungry over-crowded, discontented people of the new nations on the other.

The realization of that overriding danger leads me to put this main proposition to you. We cannot deal effectively with the danger of starvation or the danger of a revolt of youth or the danger of a conflict of race or the danger of over-population separately. One will not wait on the other. The necessity is to tackle them together. It is a vast task but it is unavoidable—and indivisible. I have said that the population problem is the number one problem of the world. But I do not think that I need to emphasize to this audience that it would be wrong to concentrate on one of the four dangers alone. To control, to limit, population is essential. But to do that alone would be negative. Development, education, opportunity, freedom and fairness of trade, racial understanding and cooperation, maternity and child welfare and control of population must march together. They all have the same purpose—a fuller richer life. The challenge we face is not for negative action but for the most positive object of all—the positive object of human freedom and human dignity.

Let me go on to put another proposition to you. I suggest to you that the dangers of which I speak are now far too great to be dealt with by the action of private individuals and

voluntary organizations alone. They are too great to be dealt with by national action alone. They can be effectively dealt with only by a combination of individual action and national action and international action together. I pay my sincere tribute to all those individual pioneers who have led the way in the voluntary crusade in which we now join. They are well represented here today. And specially I pay my tribute to the great Federation under which we meet today which has given us all such a fine lead. The need for individual and voluntary leadership is not less but greater than ever, for in this cause as much or more than any other in the world it is not a matter of imposing anything on the people: it is a matter of setting people free—free from the prison of ignorance and poverty, and free to choose. The cause of popular emancipation derives, and should derive, primarily from voluntary action.

I well recognize moreover that each nation, each people, must reach its own conclusion and must set its own aims. Nothing can be imposed from outside. Without national choice, national will and national action very little can be accomplished.

Let me turn for a minute to say that in my own country we have sought to deal with our population problem mainly by supporting the Family Planning Association of Great Britain, which has more than 600 clinics throughout the country. But we have also declared that when a request is received from a developing country for technical assistance in promoting family planning we shall be ready and anxious to help. We have already made a start by responding to requests for British experts from India, Jamaica, Mauritius and Singapore, and we welcome many doctors and nurses who have come from overseas for training in family planning. The British Government at present make a small grant to the IPPF. Now in order to enable the Federation to carry out additional work in developing countries my government propose to increase this grant to £50,000 a year for five years. We are also thinking of going further by setting up a Population Bureau to offer postgraduate training for senior staff from developing countries, to act as a host institution for research workers and to coordinate the work at present being carried out independently in many different centres in Great Britain.

But while we recognize that individuals must make up their own minds, and voluntary organizations must continue to preach and stimulate and organize, and while nations, rich and poor, must determine their own positive policies, there is also an overriding need for international action. It is of international action that I wish to say a further word to you today as you start your conference. We must start with the blunt statement that in its first 20 years the UN with all its battery of specialized agencies had done practically nothing in terms of practical action to deal with this world problem. That is not to decry the research and preparatory work done in those years. That preparatory work had been valuable. There had been the first World Population Conference organized by the United Nations in Rome in 1954. The Population Commission and a Branch of the UN Secretariat had done useful work mainly in research. Demographic training and research centres were established in Bombay and Cairo and here in Santiago. In 1962 the General Assembly had adopted a resolution asking the Secretary-General to conduct an inquiry on the relationship between economic development and population change and recommending that studies and research should be intensified. Discussion and research and inquiry, but precious little action.

It was not till 1965 that the UN and its agencies began to act. 1965 was indeed a year of intense activity. It was the year when the UN put population for the first time high on its agenda. Early in the year the Secretary-General at the request of the Government of India appointed a team of experts to give advice on immediate steps to accelerate the impact of family planning programmes in India. In May the World Health Assembly unanimously adopted a resolution calling for the development of programmes of advisory services on the health aspects of world population. In July the Economic and Social Council endorsed a long-range programme of work drawn up by the Population Commission. In September the second World Population Conference was held in Belgrade.

Let me also give a practical example of the break-through in 1965 to international action, an example nearer to you here in Santiago. In 1957 the Latin American Demographic Centre had been established in Santiago as a joint venture between the United Nations and the Government of Chile. It was engaged mainly on demographic research. But in 1965 in cooperation with the Economic Commission for Latin America a scheme was worked out to expand the centre under a United Nations Development Programme project—a project to

cost two and a half million dollars. In addition to Chile, the Argentine, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru and Venezuela now participate. Other Latin American states are expected to join soon. And the emphasis is shifting from research to action. There could scarcely be a better example of the new awakening in the year 1965 to the need for action, action not only on the national level but also in international cooperation.

The new initiatives of 1965 were vigorously pursued last year. The former Population Branch of the UN was reorganized as the Population Division early in 1966. The World Health Assembly, the General Conference of UNESCO and the Board of Directors of UNICEF all authorized new advances, and in October last year the various agencies concerned met together to achieve better inter-agency cooperation and coordination. And last December the General Assembly unanimously adopted a resolution on population growth and economic development. It endorsed the World Health Assembly's decision to provide advisory services. It authorized the Secretary-General to pursue the work programme already prepared. It called for a development and strengthening of the population activities of the Regional Economic Commissions and the specialized agencies. In fact it gave the signal for the UN itself and all its agencies to move from discussion and preparation to action. Moreover, 21 UN technical assistance projects to deal with population problems, both national and regional, are already planned in Africa, Asia, the Americas and the Middle East.

In December last year something else happened. It was an event of far-reaching consequence and of greater importance than all the timorous and tentative earlier steps. On Human Rights Day, on 10th December 1966, a Declaration was made by twelve Heads of State. I believe that this Declaration, coming as it did at a time when the international community was just awakening to its responsibilities, will be regarded in future years as a decisive document in history. I beg you not to miss the significance of the fact that the Secretary-General of the UN announced and endorsed the Declaration on Human Rights Day. It is under the banner of the defence of human rights that we shall gather our crusade. Who signed the December Declaration? Twelve Heads of State. They were not the most powerful nor the most affluent of the states of the world. But they represent some of the peoples who care most, those who future prosperity and future salvation are dependent on early action. They were of very different race and history and political belief—from Sweden to Singapore, from Colombia to Finland, and from India to Yugoslavia—Scandinavians and Arabs and Africans and Asians and Latin Americans, all coming together to state a new purpose, to express a new will. These 12 states, so diverse and so widely representative, through their Kings and Presidents and Prime Ministers came forward to condemn the delays and hesitations of the past, and make a clear call for action, a call in language of unmistakable emphasis. No words of mine could add to the December Declaration itself. Many of you already know its terms. To all of you I say that this Declaration should be widely distributed and known in every country in the world. The Declaration was signed by the President of Colombia, the President of Finland, the Prime Minister of India, the President of the Republic of Korea, the Prime Minister of Malaysia, the Kings of Morocco and Nepal, the Prime Minister of Singapore, the Prime Minister of Sweden, the President of Tunisia, the President of the UAR and the President of Yugoslavia. This, the December Declaration, announces and inaugurates a new international effort and initiative.

I have said that we are united in the common conviction that what we want is action—urgent administrative action. How can that need be best pursued? How can momentum be maintained and increased? How should we answer the appeal of the December Declaration?

Next year, 1968, is Human Rights Year. Should it not be the year in which the new initiatives of which I have spoken are carried forward with increasing impetus? Should it not be the year in which the rights of the family are specially remembered? Should it not be the year in which the right of the parents to rear and educate their children in decent conditions is a primary concern? Should it not be the year in which the human rights of the child to have some hope of growing up in human dignity are put first? These are surely human rights which should be given pride of place. As the Secretary-General of the UN said when he announced the December Declaration on Human Rights Day, "Freedom from hunger, the right to medical services and the right to education are already considered to be basic human

rights." He said that he was concerned not only with the number of human beings on earth but with "the quality of human life". When next year the International Conference on Human Rights meets in Teheran I trust that these human rights will not be overlooked.

Moreover, I have this practical suggestion to make. Every year in the summer representatives of the whole family of the UN gather in Geneva. The Secretary-General goes; the President and members of the Economic and Social Council, the leaders of all the UN specialized agencies. They go to undertake a review of the whole range of economic and social policy in the international field. That should be the occasion, I suggest to you, in Human Rights Year, for a review of past and future action in the problem of world population. I suggest that from this conference here in Santiago a recommendation should go this week to the United Nations that in the summer of Human Rights Year, in Geneva in 1968, when the Economic and Social Council of the UN meets, there should be a concentration on action in the world problem of population. All the international agencies concerned should take part--including WHO and UNICEF and FAO and UNESCO and ILO. The main purpose would not be to make speeches. The purpose would be to review what has been done, to accelerate the pace of action and to chart a new course for the future. I can imagine no better ways of making Human Rights Year a blessing to mankind.

Now let me conclude by reading to you the convictions stated in the December Declaration of the 12 States. This is what the 12 Heads of State said in their Declaration.

"We believe that the population problem must be recognized as a principal element in long-range national planning if governments are to achieve their economic goals and fulfil the aspirations of their people.

"We believe that the great majority of parents desire to have the knowledge and the means to plan their families; that the opportunity to decide the number and spacing of children is a basic human right.

"We believe that lasting and meaningful peace will depend to a considerable measure upon how the challenge of population growth is met.

"We believe the objective of family planning is the enrichment of human life, not its restriction; that family planning, by assuring greater opportunity to each person, frees man to attain his individual dignity and reach his full potential.

"Recognizing that family planning is in the vital interest of both the nation and the family, we, the undersigned, earnestly hope that leaders around the world will share our views and join with us in this great challenge for the well being and happiness of people everywhere."

Mr. President, it is with the guidance of those words and with the inspiration of the leadership they represent that we embark on this conference.

6. ADDRESS

His Excellency Señor Eduardo Frei
President of Chile

I have been asked to inaugurate, in the name of the Government of Chile, this important conference. The viewpoints of the government and the problems Chile faces have been described by the Minister of Health. It is for me, first of all, to welcome most cordially all of the delegates and to express to them the pride that our country feels at having been chosen as the seat of such an important conference; and to express our desire to receive them and be their hosts, that they may carry away a pleasant memory of this country.

More than this, and this is not just courtesy, but reflects the way we Chileans feel, I would like to tell you that the government will follow your proceedings with profound interest. We realize that people of great distinction and knowledge in these matters have come here. Our minds are open to look at the problem. We put no prejudice in the way, and our only desire is to act in the greatest seriousness. Although it is true that politics is generally a matter of judgement, I cannot forget that Aristotle ranked it as the first of the sciences, because in the long run, it is men who work out the answers but governments which often have to take the decision and the responsibility of applying them, with the consent of their peoples. For this reason, Lord Caradon's words were of great interest to me. He has said that not only must human rights be taken into account and respected, but that this is a problem which must be resolved by each family and by each nation, because of the particular conditions and problems each encounters. We are aware that at this time the population explosion is a problem that cannot be evaded and that it is necessary not only to study it but to work out solutions to it and face it with courage; that this is a problem affecting not just each family and each country, but humanity as a whole. It is this that brings men and women from all over the world to seek out the path which we must find and follow. For the Government of Chile, it is a problem of the greatest interest and for this I am grateful to all of you.

Thank you.

7. THE INFLUENCE OF POPULATION CHANGES

Carmen A. Miró*

UN Latin American Demographic Centre. (CELADE)

1. THE POPULATION "PROBLEM"

Latin America is a relatively underpopulated continent; in fact, large parts of its territory which are habitable have at present few inhabitants or none. The average density for the region in 1966 was barely 12 persons per square kilometre, or approximately half the world average; a fifth that of Asia and a seventh that of Europe. Only two Latin American countries (El Salvador and Haiti), as small in population as they are in area, have densities comparable to those of Central Europe, and more than 10 times greater than the average for Latin America. On the other hand, eight countries making up 60% of the population of Latin America, have densities equal to or below the region's average. When one considers that this is an average of data for densely populated areas, such as the large cities, taken together with highly dispersed towns and villages, one must conclude that Latin America has, in fact, large areas potentially habitable.

This leads us to ask why, if the land-population relation is not a cause for concern, is the population of Latin America so often mentioned in association with the word "problem"? Essentially because two phenomena are occurring simultaneously which, without showing a clear cause and effect relation, suggest the existence of a reciprocal effect—high demographic growth rate accompanied by social and economic underdevelopment.

While the first is accelerating, the second is becoming more acute. While there may not be sufficient evidence to say that the first gives rise to the second or vice-versa, what is important is that their behaviour seems to be associated. This was recognized by the Economic Commission for Latin America (ECLA) in a study of the economic underdevelopment of the region since the Second World War, when in showing how the rate of development fell towards the end of the 1950's it stated that "at the same time as economic growth slowed, there was an increase in population growth such that the *per capita* product for Latin America as a whole rose in recent years at an annual rate of only 1.4%, the growth of real income being still less".¹

Further on in the same report, new reference was made to the connexion between demographic behaviour and economic growth as follows: "Increase in population growth and the labour force are other factors characterizing post-war economic growth. This demographic phenomenon raises two basic problems: (a) the economy's capacity to absorb the work force at adequate production levels, and (b) the *per capita* income level and its eventual distribution among the different social sectors".²

Naturally, the "problem" is one of population for those who think that it is accelerated demographic growth which hinders the achievement of sustained economic growth, and one of development for those who think that because economic growth is insufficient it cannot properly take care of the growing number of inhabitants. For the former the solution is demographic, for the latter, economic. Perhaps in this dilemma there is no single answer, but it seems likely that in either situation it would be necessary to work with both variables. This paper summarizes the behaviour shown in Latin America in recent years by the demographic variable, together with some of the associated economic tendencies. Short-term

* The views expressed here are those of the author, and do not necessarily reflect those of the United Nations.

perspectives of demographic evolution will also be considered. Finally, certain recent events will be described which suggest that some Latin American governments are complementing economic solutions to the problem of development with demographic solutions. Concentration here on the latter does not imply that the economic picture matters less, but merely that the author prefers to consider the demographic aspect.

2. THE DEMOGRAPHIC SITUATION IN LATIN AMERICA

THE ELEMENTS AFFECTING CHANGE

The demographic evolution of Latin America in recent years has been described by various authors,³ and is well enough known that it need not be discussed here in detail. Its main features are as follows:

(i) *Fertility*

High, almost stabilized. For the whole region the gross birth rate for about the year 1955 was more than 40 per thousand per year, in some cases reaching 50 per thousand. The areas of greatest fertility are in Continental Central America and Tropical South America, where it is possible that small increases in fertility have resulted from a fall in the death rate.⁴ Only two countries (Argentina and Uruguay) show birth rates below 24 per thousand, similar to those in the world's more developed regions. In another two countries (Cuba and Chile) the rate is about 35 per thousand. There are, of course, large differences in fertility rates in rural areas, which are often twice as high as urban. An undeniable correlation between fertility and the degree of education of women has also been shown. In some Latin American cities the fertility of uneducated women is three times that of those with university education. Similar differences, although of different magnitude, are found between women in rural areas with different levels of education.⁵

(ii) *Mortality*

Moderately low. The fall in mortality must have begun at the end of the 1930's when the gross annual mortality rate was estimated at 25 per thousand for most of the countries in the region. The drop seems to have gained impetus after 1945 when the rate fell in almost all countries to around 15 per thousand. In certain countries (Bolivia and Haiti), relatively high mortality rates continue, similar to those in the advanced countries at the turn of the century. Even in cases such as Argentina, where life expectancy at birth is about 66 years, the index is still significantly below that found in the developed regions of the world. The latest estimates for the USA, for example, set this figure at more than 70 years.

The average figures given by national mortality rates hide important differences between different areas in the same country. Unfortunately, studies undertaken so far are insufficient to make this phenomenon clear. Isolated cases however, serve to illustrate the great disparities which can be inferred to exist between health levels in different areas of a country when their life expectancies at birth (e^0) are compared:

Table 1

	(e^0) about 1960*
<i>Argentina</i>	
Total	66
Pampas Region	67
Córdoba	60
<i>Chile</i>	
Total	57
Magallanes	63
Ñuble, Concepción, Bio-Bío, Malleco	53

* Estimates by CELADE.

Infant mortality, which like that of other age groups in the population had been falling in Latin America, seems to have slowed its rate of decline in recent years. This phenomenon

is taking place at a time when the infant mortality rate for the region fluctuates at values between four and seven times greater than those of Sweden, and is one of the highest in the world. This levelling-off in the infant mortality rate, in fact, continually increases the difference between the developed countries and Latin America and seems to be mainly the result of socio-economic factors since, states Behm⁶ "illness and death of the child in its first year of life is closely linked with the living-conditions of the family into which it is born".

(iii) *Immigration*

Neglecting migration between Latin American countries, which sometimes can influence the growth of their populations, the region as a whole does not receive significant immigration from other parts of the world. Generally speaking, given the high domestic increase, immigration from abroad has in the past been insignificant.

Internal migration, on the other hand, has strongly affected the population distribution, having contributed greatly to the high and growing concentration of the Latin American population in cities, a recent phenomenon in most of these countries.

In 1960 more than 31 million people, about 15% of the total population, lived in 20 cities of more than half a million inhabitants, whereas in 1940, there were only eight cities of this size, containing 12 million people.

OTHER CHARACTERISTICS

It is the variation of the elements described which determines the other characteristics of the present demographic situation of Latin America. Those most obviously associated with economic and social development will now be considered.

(i) *The rate of growth*

A high and increasing rate of total population growth—estimated at about 2.8% per year for 1960. The increase in growth is obvious when this rate is compared with that of former decades.

Table II

<i>Decade</i>	<i>Annual rate %</i>
1920-30	1.8
1930-40	1.9
1940-50	2.2
1950-60	2.7

At the national level, the growth-rate depends on fertility and mortality, it varies between 1.7% for Argentina and Uruguay, to about 4% for Costa Rica and Venezuela.

Internal migration, which consists mainly in the movement of people from country areas to the cities, also produces differential rates of urban and rural growth. In most countries of the region, the latter rate was at least 2% annually between the two most recent censuses. On the other hand, except for Argentina (and probably Uruguay) where urbanization has already reached quite a high level, the urban population grew in almost every country at more than 5% a year, in one case (Venezuela) at more than 8%.

(ii) *The Age Structure*

Falling mortality combined with stable fertility gives rise to a population in which the resulting predominance of children and adolescents increases further the tendency towards rejuvenation—excepting Argentina, Uruguay, Cuba and Chile, 53% of the population was under 20, according to the most recent census.

Since domestic migration is selective in regard to age, the migrants being mainly young adults, the proportion of those below 20 years of age is still generally greater in the rural areas of Latin America. The following examples illustrate this:

Table III

	Urban	Rural
Costa Rica, 1963	52.5	59.9
Panamá, 1960	48.8	56.7
Chile, 1960	47.6	53.5

3. INFLUENCE OF DEMOGRAPHIC CHANGES

Nobody questions the fact that Latin America is in a stage of economic and social underdevelopment. ECLA has characterized⁷ some of the conditions as: (a) low average *per capita* income, estimated in 1961 at 420 dollars, or two-fifths of the West European countries, a sixth of the United States and Canada, and a half of the East European countries. This is less than the world average which is about 600 dollars; (b) an extremely unequal distribution of income with the sectors where this is more acute remaining important in the region; (c) agricultural production unequal to effective demand; (d) production of non-agricultural goods also unable to absorb available manpower; (e) stagnant productivity in trade, finance, government and other services; (f) a precarious food situation in which mortality due to malnutrition is high; (g) housing shortage with a predominance of improvised dwellings lacking hygienic services and excessively crowded; (h) a low educational level with a continuing high percentage of illiteracy. In some countries more than 50% of persons above 15 years of age have no education, and (i) inadequate medical and hospital facilities.

Associated as they are, underdevelopment and the high demographic growth rate must influence one another mutually. The most obvious influences are:—

(i) *The investment rate*

The first such influence arises from the rate of investment needed to meet the requirements of a growing population. To quote ECLA: "the economic and social consequences common to most Latin American countries are evident. If we assume that the product-capital ratio is 0.40, Latin America as a whole would require a net annual investment of 7.5% of the gross product to grow at a rate of 3% a year, which would only succeed in maintaining unchanged the *per capita* income level. To reach a *per capita* growth of 3%, which is considered a minimum goal although higher than that set in the Charter of Punta del Este (2.5%), net investment would need to rise at 15%, which would require extraordinary effort compared to the present bare 10%".⁸

To this must be added that the growing proportion of persons below 20 years of age, which makes real productive investment resources continually less for the maintenance of the investment rate suggested.

(ii) *Absorption of potential manpower in productive labour*

The inability of non-agricultural production to absorb the continued increase in the labour force has been described under conditions of underdevelopment. The main reason is an urban population increasing often at more than 5% annually. This has given rise to a characteristic Latin American phenomenon: the movement of large sections of the economically active population into services and other activities of very low productivity. The same ECLA study describes the picture as follows: "rates of economic growth of 4% or 5% in countries whose population is increasing at 7% are clearly insufficient to absorb the labour force".⁹

(iii) *Unorganized urbanization*

The massive movement of people from rural areas and small towns to large cities, combined with insufficient economic and social development, has brought with it an urbanization characterized by every kind of lack: employment, housing, education, health, transportation and other public services, recreation and even social integration.

4. PROSPECTS

The possibility of Latin America achieving sustained economic development depends on the combination of a number of factors, among which it is worth mentioning the taking of

effective measures to eliminate unequal distribution in the ownership of capital and natural resources, and no less important, of measures leading to a reduction in population growth.

The demographic forecasts made by the United Nations for Latin America are well known. The population of the region, which in the year 1966 was estimated at 244 millions, is expected to reach in 14 years (by 1980) more than 363 millions, that is to say an increase of 50% in this short time. Should the mortality and fertility trends described in section 2 above, continue to the end of the century, the population would exceed 740 million. This projection however, is not considered very likely, and a more probable figure would be about 612 millions. Naturally growth would be different in each country, the largest increase being in Continental Central America and Tropical South America.

Even in the case of an effective and continuous fall in fertility, the proportion of young people will still continue for some years to be a high proportion of the total population.

In 1966, the number of persons annually entering economic activity was estimated as 3.3 million,¹⁰ which figure will have risen by 1980 to more than 5 million annually, the economically active population by then having risen to almost double that of 1960. Indications are that urbanization will continue at the present high rate. The United Nations has estimated¹¹ that by 1980 Latin America will have about 100 million people living in cities of half a million or more.

5. ACTION TO MEET THE POPULATION "PROBLEM"

In the face of the prospects that have been described, a concern for the influence of demographic changes on the possibilities of development has brought many responsible groups in Latin America to face the population "problem" more rationally. Available demographic data are being studied with the intention of including the population factor as a variable in economic and social planning. The number of personnel qualified in demographic analysis is being increased and the study of demography has been introduced into the universities. Two regional centres are encouraging these activities, the Latin American Demographic Centre (Centro Latinoamericano de Demografía—CELADE), its branch in Central America, and one national branch (The Colegio de México). Three countries, Chile, Costa Rica and Honduras, have incorporated family planning assistance in their health services. The Colombian Ministry of Health in cooperation with the Colombian Association of Medical Faculties has begun a broad programme for training doctors, nurses and other health workers in family planning methods. Various countries including Mexico, having incorporated family planning assistance into their social security services. In practically all Latin American countries, activities are under way to encourage the use of family planning methods, whether through private groups or state institutions. In many of the countries experimental programmes are going forward with the help of state universities. Generally speaking there is a more favourable climate in the different spheres for consideration of the population "problem"—proof of which is that for the first time, an international conference of the International Planned Parenthood Federation is being held in a Latin American country, with official sponsorship and with the full participation of Latin American professionals. There is no doubt that all these activities find effective support in large section of public opinion in Latin America, especially among women. The Latin American Demographic Centre interviewed, with the help of various national institutions, a sample of some 16,000 women in seven cities of the region.¹² The attitude of these women towards family planning was generally favourable. Among married women a high proportion (from 38% in Mexico City to 78% in Buenos Aires) stated that they had at some time used contraceptives, and this was found to correlate with the level of education.

It is noteworthy that up to the present, the measures adopted have been based on the need to protect the family, avoid abortion, and in general secure a fuller life for children and parents. This means that the problem is focused at the micro-social level, that of the family. Up till now there have been in Latin America no programmes which seek essentially demographic objectives in association with economic and social development plans. There is no country in the region which has adopted a demographic policy as this was defined by a recent seminar "A coherent set of decisions following a rational strategy adopted by the public sector in accordance with the needs and wishes of families and of society, with the purpose of

directly influencing the probable size of the population, its composition by age, the size of the family, and the regional or rural-urban distribution, in order to achieve development objectives. Such a policy will have to consider and evaluate the influences of social processes—especially education, housing, health and employment, on these objectives”.¹³

If, as has been repeatedly pointed out in this paper, there is a clear association between the demographic situation in Latin America and its underdeveloped condition, it would seem unwise to further postpone the integration into the general context of economic and social planning, of a demographic policy such as has been described.

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8. THE IMPACT OF POPULATION GROWTH ON AGRICULTURE AND INDUSTRY

G. A. Bridger

Ministry of Overseas Development, United Kingdom

GENERAL

The traditional pattern of economic development has always depended upon a move of resources from agriculture into industry and then into services. This reflects itself in the movement of labour from the rural sector into manufacturing industry and at an ever increasing rate into the service sector.

Thus, service industries assume a role of ever increasing importance as the production process becomes more complex and income increase creates new demands.

As a result, the pattern of effective demand and the productivity of labour adjusts itself with agricultural labour becoming more productive, both to fill the gaps left by emigrating manpower and to meet the increased demand brought about by higher productivity and incomes in urban centres.

This process has been taking place in Latin America, but the rate of expansion of the population has been such as to lead one to suspect that distortions may well have been occurring and that the burden placed on the various sectors as a result of this may well be a deterrent rather than a help to economic growth. Between 1925 and 1960 for instance, 36 million¹ additional people were absorbed into employment in Latin America—in the generally dynamic USA economy the actively employed population increased by a similar number over a period of 60 years (1900–1960).

It is the object of this paper therefore to examine the flow of manpower into agriculture and industry and to try and compare what has happened in Latin America with other regions, as well as to hazard some opinions as to the present and future effects of the increase in population on employment in these sectors.

STATISTICAL DEFICIENCIES

It would not be out of place to utter a word of warning about the statistical material used in this paper. Although it is all gleaned from reputable sources, the problem of ensuring that data collection is efficient and consistent, and that the basic assumptions are correct is a difficult one, and as a result it should be treated with the greatest caution. Even such basic information as the population of Latin America is partly calculated on assumptions, while much of the other data used is often based on estimates rather than on fact. As a result, a blind acceptance of statistical evidence is liable to do more harm than good.

Nevertheless, while recognizing the inadequacy of statistical evidence, it is the best that one has to work with, and if used to support a theory rather than to prove one, it is an important tool of analysis.

CHANGES IN EMPLOYMENT

For the period for which adequate data are available, that from 1945 to 1962, the working population of Latin America increased by some 22.5 million (see Table I), increasing the total in employment to some 70 million.

Table 1.^{2,3} Latin America—Absorption of the net increase in the active population—by main economic sectors (in millions)

Sector	Total change						Percentage change (yearly rate of increase)			
	1945	1950	1955	1960	1962	1962 as % of 1945	1962 1945	1950 1945	1955 1950	1960 1955
Total*	47.2	51.3	58.1	66.0	69.7	147.7	2.3	1.7	2.5	2.6
A. Agricultural Sector	26.4	27.4	29.3	31.5	32.4	122.7	1.2	0.8	1.4	1.5
B. Non-agricultural Sectors	20.8	23.9	28.8	34.5	37.3	179.3	3.5	2.8	3.8	3.7
1. Goods and Basic Services	10.3	12.0	14.2	16.6	17.2	167.0	3.0	3.1	3.4	3.2
Mining	0.6	0.6	0.6	0.7	0.7	116.7	0.9	0.0	0.0	3.1
Manufacturing	6.6	7.4	8.3	9.4	9.6	145.5	2.2	2.3	2.3	2.5
Construction	1.4	1.9	2.6	3.0	3.2	288.6	5.0	6.3	6.5	2.9
Basic Services†	1.8	2.5	2.7	3.4	3.7	205.6	4.3	6.8	1.6	4.7
2. Services	10.5	11.9	14.6	17.8	20.0	190.5	3.9	2.5	4.2	4.1
Trade & Finance	3.6	4.0	5.0	6.0	6.5	180.6	3.5	2.1	4.6	3.7
Government	1.4	1.7	2.0	2.4	2.6	185.7	3.7	4.0	3.3	3.7
Miscellaneous Services	4.4	5.0	6.3	7.9	8.7	197.7	4.1	2.6	5.0	4.6
Unspecified Activities	1.2	1.2	1.3	1.5	2.3	191.7	3.9	0.0	1.6	2.9

* Excluding Cuba.

† Includes energy, water supply, sewerage, transport and other similar services.

This immense increase is broken down between the three main employment sectors approximately as follows:

	Million	%
(1) Agriculture	6	27
(2) Goods and Basic Services	7	32
(3) Services	9	41

Manufacturing industry, which is incorporated in "Goods and Basic Services", absorbed 3 million people during this period.

As a result of these changes, agriculture no longer remained the predominant employment sector, but declined from providing work for some 57% of the population to some 46%, while industry's share remained at 14%—services increasing their share.

AGRICULTURAL DEVELOPMENT

While no longer being the most important employer of labour the agricultural sector succeeded in expanding its labour force by some 23% during this period, but the average cumulative rate of increase per annum was only 1.2%—a rate of increase well below the current increase in the population of nearly 3%, and one below the annual increase of employed population of 2.3%.

However, the absorptive capacity of manpower varied considerably from country to country, and in the early fifties the percentage of the labour force absorbed by Chilean and Uruguayan agriculture was 6%, by Venezuelan agriculture 11%, by Colombia 17%, Brazil 35%, Peru 37% and Central America 53%.² To a large extent this phenomenon must be explained by the opportunities provided by urban expansion in the first mentioned countries rather than by the attractions of the agricultural sector in the latter.

This absolute increase is completely contrary to the trend to be found in most rapidly developing countries, and although it is possible that part of it may be explained by an

increase in the number of children in agriculture registered as economically active, this cannot account for the major part of the increase.

Of the European countries only Greece increased its rural population in the 1950's—all the others reduced it by between 1% and 4% per annum.*

It is of interest to note, however, that in Latin America the reverse appears to have occurred and that the *rate of increase* of manpower absorption in agriculture actually seems to have increased.

Average Annual Rate of Change (see Table I)

Percentages			
1962	1950	1955	1960
1945	1945	1950	1955
1.2	0.8	1.4	1.5

The precarious nature of the statistics available makes one hesitate to draw the conclusion that agriculture is actually increasing its rate of manpower absorption; the definition of "economically active labour" varies from one country to another—and sometimes includes anyone not at school who is over 10 years of age.

However, it should at least be possible to conclude that unlike other regions of the world with healthy rates of economic expansion, rural employment in agriculture in Latin America is growing—and possibly, and this must be treated with caution, might be growing at an ever increasing rate.

The failure of the urban sector to be able to offer alternative employment is no doubt the major cause, for few who are aware of rural conditions in Latin America would doubt that an urban life, however humble, would not be preferable to rural living.

What are the prospects of agriculture employing more labour without reducing income levels?

It is argued sometimes that a considerable increase in agricultural production is possible as its performance so far has been extremely poor, and thus the rural sectors could support a larger population. In fact, the growth of agriculture in Latin America has been no worse than the world average; it has been expanding at around 3% per annum,† and has been doing slightly better than it has in Europe (see Table II).

Table II. Total agricultural production[‡]
(1952-53 to 1956-57 = 100)

	Pre-War	1948-49 to 1952-53 (average)	1963-65	Percentage pre-War to 1963-65	Change 1948 to 1952-53
Latin America	73	88	129	60	45
Western Europe	82	86	127	56	45
North America	68	93	117	70	26
Eastern Europe and USSR	81	86	139	77	62
All Regions‡	76	88	128	70	44

‡ Includes Oceania, Far East, Near East, Africa.

While this does not mean to say that a better performance cannot be expected, it certainly makes faster expansion of agriculture that much more difficult.

However, the 3% performance of agriculture is too general a figure to be meaningful and a closer look at country performances shows that Mexico and Brazil have been expanding

* The German F.R. decreased its rural population by more than this figure—4.4% (1950-52). Other examples of interest are Portugal—0.9% (1950-60), Spain—0.9% (1950-60), Italy—1.5% (1950-60).

† Different sources give differing rates of growth but M. Yudelman, who studies this matter carefully in *Agricultural Development in Latin America—Current Status and Prospects for the I.D.B.*, suggests this figure as a reasonable one.

their agricultural production at well above average rates (6·8% and 4% respectively)* and in fact, if one excludes Argentina, Uruguay and Cuba, the growth rate for the remaining countries was, between 1954 and 1965, a quite commendable 4·1%.¹

Since the three mentioned exceptions have a slow population growth, the prospects of expanding agriculture to absorb extra labour are precisely in those countries where agricultural expansion has been rapid.†

The situation is made more depressing by the fact that the overall growth rate of 3% is weighted very heavily (about 50%) by the slow growing livestock sectors—the sector least able, since it is mainly concerned with cattle production, to absorb manpower.

Although livestock production for the area only increased at 1·6% per annum, cereal production increased at 4·3% per annum. While of the other major cereal producers, only Australia and New Zealand surpassed the Latin American average, in livestock production every other major producer achieved growth rates at least double that of the region.‡

The above factors obviously impose considerable constraints on the ability of agriculture to absorb more labour by expanding output. What are the prospects, however, of making more intensive use of land by breaking up the many large estates which characterize the pattern of farm ownership in the region?

Subject to the obvious qualification that many of the large estates are on poor quality soils, there is obviously scope for doing this and no doubt in absolute terms more employment could be found for labour. Nevertheless, it is a once and for all solution, for subdivision of holdings cannot be expected to continue without damaging, as it has done in Europe, the prospects of developing a dynamic agricultural system, and eventually the rural sector will have to reduce its population if living standards in it are to rise. Furthermore, it can be seriously doubted whether subdivision into small family holdings is an economically justifiable measure, for it sets up ownership structures which are often inimical to the use of modern techniques of production.

It would appear therefore that the rural sector has made a substantial contribution to employment by absorbing more manpower. Furthermore, while agriculture may well have to increase its labour force in future, and land reform may well provide opportunities for this, a big expansion in employment could have a retarding effect on rural economic growth by introducing uneconomic units of production and would certainly make increases in *per capita* income difficult if not impossible.

INDUSTRIAL DEVELOPMENT

The role that industry has played in the development of Latin America has become increasingly important, and was given a major impetus as a result of the restriction of imports brought about by the Second World War. As a result, industry's contribution to the Gross National Product (GNP) has increased from 15·2% in the pre-war period to just over 20% between 1965 and 1960.

Industrial expansion has depended primarily upon import substitution, and so great has been the success of some of the larger countries in the area that, despite a very much larger GNP, consumer goods imports have fallen, and imports constitute as little as 5% in some instances, of total GNP.

The actual rate of industrial expansion has varied considerably since the Second World War and has fluctuated between 7·5% and 9% per annum. Although indices are not in themselves a sufficient indicator of performance, as they depend very much on the base period and the level of development, the general performance of industry in Latin America has been impressive.

The role, however, which industry plays as an employer of labour, is not as important as agriculture and, as was mentioned above, manufacturing industry accounts for some 14% of labour in employment. Despite the fact that the industrial labour force rose from 6·6 million in 1945 to 9·6 million in 1960, its average cumulative rates of increase has been just

* Periods referred to are 1952–55 to 1962–65. Australia achieved 3·7% per annum, UK 3·1%, New Zealand 3%, France 2·5%, USA 1·6% growth.²

† Brazil and Mexico account for some 50% of the population of the region.

‡ F.A.O. *Production Yearbook 1965*—refers to 1948–49, 1963–64.

under 2.2% per annum—a growth rate which has barely kept pace with the increase in the economically active population.

As Table III shows, these rates of growth varied considerably from one country to another. Although the above data are not comparable on an inter-country basis, as industries covered are not always the same in each case, they do bring out well enough the fact that industrial employment is not expanding nearly as rapidly as industrial production. This reflection is not surprising as industrial output *per capita* has risen rapidly with an increase in investment per worker. When taken, however, with a stable contribution to employment, of 14%, the situation becomes more serious; it might well have been assumed that the possibilities of expansion of industry were such that employment opportunities would have been greater. The situation is, however, somewhat more serious than this, for the drive towards capital-intensive industry is, in certain instances, actually reducing the amount of labour in employment.

Table III.^a Growth of manufacturing production and employment in selected countries
(Yearly growth-rate)

		Production	Employment
Argentina	(1950–1960)	4.4	–2.0
Brazil	(1949–1959)	9.8	2.6
Chile	(1950–1960)	5.4	1.7
Peru	(1950–1960)	6.6	4.4
Colombia	(1950–1960)	7.6	2.5
Venezuela	(1950–1960)	13.0	2.1
Mexico	(1950–1961)	6.5	0.4

Baer and Herve⁶ show that in Argentina despite industrial expansion, the absolute level of employment has fallen and that a similar tendency is also found in certain of the industries in some of the other countries. The industries which seem to be particularly affected are the textile and clothing industries, and in some cases those engaged in non-metallic mineral production. These are important,* both at present and in the future as sources of employment in developing countries.

Baer and Herve state: “Concern about the employment effects of industrialization in underdeveloped countries has been expressed—ever since the early post-war years”, and “it was thought that new industries should, as much as possible, absorb the surplus labour which was streaming into urban centres—strategy was to develop labour-intensive industries, but as can be seen, investment in manufacturing has not followed this pattern—it has even, in certain cases, reduced its labour force.”

This tendency has also been noted by other research workers. Arthur Lewis points out that in Puerto Rico,⁷ despite enormous industrial investment, employment was no greater in 1960 than it was in 1950, while in Jamaica, despite net investment of 18% per annum, overt unemployment was as great in 1950 as it was 10 years later. A recent study in Kenya⁸ indicates that industrial employment declined between 1954 and 1964 by 1% per annum despite the fact that private real output increased by 4% per annum.⁹

The reason for this is suggested by H. W. Singer¹⁰ who states: “In many respects the technology of a hundred years ago would be desirable for them [the developing countries] and would make their economic development easier. But that technology no longer exists. It has been scrapped, and rightly scrapped in the industrialized countries—and the technology of the industrialized countries is the only technology”.

While it is probably true that the average investment per worker in industry in Latin America is still low in comparison with that in developed countries, the situation tends to be very similar when new investment is being considered. Investors are obviously reluctant to introduce machinery which is no longer in use in the developed countries, as the spares for it are more difficult to obtain and the engineers and technicians required to operate it more difficult to find, while it is easier to copy engineering blueprints prepared for other regions.

* The textile and clothing industries account for some 17% of gross industrial output.

Furthermore, trade union pressures are such that any labour cost advantage which might be obtained through the use of labour-intensive capital equipment may be eroded away by the unions' pressure for higher wages.

Although it is true that there are certain industries which have been set up using equipment which is technically obsolete these tend to be the exception rather than the rule.

This trend towards capital-intensive industry is well illustrated by the textile industry, as the following figures show:

Investment per worker in the textile industry in Latin America ¹¹

	US \$	
1950	1960	1965
6,660	12,687	20,659*

It is obvious that an increasing amount of capital is going to be required per worker in the future, not only in the factory but also outside so as to ensure that his education and training enable him to cope with modern machinery.

While no estimate is available of what these future direct and indirect capital requirements are likely to be, they are obviously going to be very high indeed.

It may well be argued that, while the ratio of labour to capital is bound to fall, it should be possible in absolute terms to expand industrial output to such an extent that total labour employment could rise much faster than it has done in the past.

The indications are, however, that in the three countries which account for over 60% of the population,† the level of industrial activity will be very difficult to increase substantially, except through the opening of new markets, either in Latin America or outside of it.

However, the industries most likely to benefit from this step are the heavier capital-intensive industries whose costs of production are already well above those of industries competing in world markets, and therefore the possibilities which they will provide for absorbing manpower will be very limited. Certainly in the next generation their contribution in this respect is hardly likely to make a significant contribution to employment.

The prospects, therefore, of industry absorbing significant increases in manpower are poor especially as in some cases the numbers in employment are actually falling.

THE SERVICE SECTOR

It has been the service sector which has borne the brunt of the manpower increase, absorbing as it has some 40% of the total, and expanding at a rate of nearly 4% per annum, a rate showing signs of increase rather than the opposite. (See Table 1.)

The expansion of this sector has been such that it now accounts for some 30% of all those in employment, and while this is a good deal less than the figure of 58% for the USA¹² and 52% for Canada,‡ the breakdown on a country basis shows some disquieting similarities between North and South America.

Percentage in services and ill-defined activities §¹²

Argentina	(1960)	48.3
Chile	(1960)	44.2
Colombia	(1962)	36.4
Costa Rica	(1963)	33.1
Mexico	(1960)	26.9
Peru	(1961)	31.0
Venezuela	(1961)	47.2

Since *per capita* income in the USA was \$3020 in 1964 and \$1940 in Canada while the highest *per capita* figure for any Latin American country was that of Venezuela of \$728||

* These figures refer only to direct investment and exclude infrastructure.

† Argentina, Brazil, Mexico.

‡ Refers to 1960 for USA and 1965 for Canada.

§ Abstracted from Labour Developments Abroad, March 1965. Data for Brazil is not available from the same source but other sources (America en cifras—1963—Union Pan Americana) suggest that the figure is about 27%.

|| Refers to GNP at factor cost. In Argentina it was \$614, Uruguay \$478, Chile \$483.

and the others were a good deal less, the importance which the service sector has in some Latin American countries appears to be out of all proportion to their income.

The rate of expansion of these sectors has also been greater than it has been in the USA, and while in Latin America the sector expanded at some 4.1% per annum between 1955 and 1960 and 4.6% between 1950 and 1962, in the USA it expanded at 3.6% per annum, while in Canada it was 4.5%.

In comparison with other economies similar to those in Latin America an ECLA report states:

"This distribution (of services absorbing 56% to 64% of additional workers)* contrasts unfavourably with that for Europe, both in the industrial countries and in the developing countries. For example, if Latin America is compared with the countries of southern Europe (Greece, Italy, Portugal, Spain and Yugoslavia), in most cases the sectors covering the production of goods and basic services will be found to absorb a higher proportion of the additional labour force in those countries than they do in Latin America".†

Naturally the pace at which services have absorbed manpower has varied considerably from one country to another within the region, and those with higher incomes have been able to absorb more labour than those with lower incomes.

In Argentina, Chile and Uruguay, the countries with the slowest rates of economic expansion, the service sector absorbed no less than 71% of all new workers, while in Venezuela where the economy has been expanding rapidly the proportion was 57%, in Colombia 49%, in Brazil 38% and Peru 37%. In Central America and Mexico, where economic development has been well nigh spectacular, only 30% and 29% respectively of the increased labour force went into services.‡

While it is possible to argue that if agricultural expansion, which was slow in the three southern countries, had been more rapid, expansion or employment in the services would not have been as great, it is difficult to believe that their agricultural sectors, largely dependent on cereal and livestock production, could have absorbed much more labour, even if their growth had been quicker.

While the reverse argument, that those countries with the most rapid rate of economic growth (Mexico, Venezuela and Central America) were able to do so because their service sectors expanded more slowly and were thus no burden, is almost as difficult to prove, it is not too difficult to believe that very often a large service sector has been built up at the expense of agriculture and industry.

The rapid increase in the service sector would not be subject for concern if it were obvious that its contribution to growth were satisfactory, but every indication is that it has been the reverse.

Data of increases in *per capita* production by sector given in Table IV shows that while gross agricultural productivity per head has been increasing at some 2% per annum, and in

Table IV.² Latin America—Growth of productivity *per capita* economically active population

(Annual average rates in percentages)

Sector	1936-40 to	1945-49 to	1936-40 to
	1945-49	1955-60	1955-60
Total	2.0	2.1	2.1
A. Agricultural production	0.8	2.0	1.5
B. Non-agricultural production and Services	1.5	1.1	1.3
1. Basic industry and Services	2.6	2.8	2.7
2. Commerce, finance, government and other services	0.7	-0.3	0.1

* In this definition there is included "basic services". The period is 1950-1962.

† Italy is excluded as its rate of absorption of labour was similar to that of Latin America but this was "due to the development of the tourist trade over the last ten years and because of its high rate of economic growth".

‡ Refers to 1950-1960.

industry and "basic services" at between 2.6% and 2.8%, the service sector increase has varied from -0.3% to 0.7%—but productivity has been declining, for it is the negative figure which is the more recent one.

These figures must, once again, be treated with caution, but since they refer to added value, any assumptions about their contribution to growth of their sector has to be adjusted downwards for the additional investment required to employ additional labour.

While no data are available which permit the quantification of the capital required to employ extra manpower, it will be obvious that agricultural labour is that which requires the least additional capital, while both industry and the service sectors require the most. Not only does this mean immediate productive investment but the whole complex of infrastructure investment which goes to make up urban living.

Under these circumstances it would not be unreasonable to assume that productivity of labour (net of the remuneration of capital) in the service sector has been declining, since even its gross productivity has been falling at an average rate of about 0.3% a year. What this implies is that the service sector is being expanded at an uneconomic rate. This will not be news to many.

SUMMARY AND CONCLUSIONS

The field of economic analysis is a statistical minefield on which the corpses of many economists are to be found, and it is therefore wise to tread warily before reaching conclusions.

It can be stated with some certainty, however, that the labour force in Latin America is growing extraordinarily quickly and that the major part of the increase has been absorbed by agriculture and the service industries.

The extent to which this has harmed the process of economic development is impossible to measure precisely, but if the experience of other countries is a guide it would certainly seem that service sector employment has been growing at a rate which is excessive. As far as agriculture is concerned, the rate of growth of the productivity of labour appears to have been maintained, but it is obvious that this cannot go on for ever.

As far as the future is concerned, there is no doubt that agriculture can absorb more labour but this may well not mean optimal growth. Industry is likely to absorb only a limited amount of labour so that the obvious, and only outlet for it is likely to continue to be the service industries. The evidence suggests that the contribution to development of a further big increase in this sector is negative.

Unless therefore a strenuous effort is made to slow down the rate of population growth it is likely that the service sector will have to absorb the major part of the increase and the subsidy which this implies will also have to increase.

Population control, however, while being of fundamental importance in economic development should not be used as an excuse for not carrying out the many important economic and social changes which are required in order to promote economic expansion.

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9. THE EMPLOYMENT SITUATION IN LATIN AMERICA

A. Touraine, Adriana Arenas de Touraine, and D. Lehmann

The Documentation Centre for the Study of Social Problems in Latin

Economic development has for some years now been the salient political goal of all Latin American governments, almost without exception. Many countries passed through a brief period of rapid industrial growth during the Second World War, when their traditional imports were unobtainable and they were forced into a process of import substitution, but since then development has been hampered by a whole range of factors, some stemming from the fact that Latin American countries unlike the European or North American countries who industrialized before them, cannot rely on a constant supply of cheap primary products, but are themselves on the periphery of the world market.

There are in Latin America two further factors which are new to the process of industrialization as it has been understood historically. Firstly the willingness to accept trade-union organization, social services and labour legislation, in strong contrast to the refusal of the industrial bourgeoisie of say, England, to accept any claims made by the working-classes until long after the first phases of industrialization. This apparently liberal labour policy in Latin America represents to a large extent a not always successful attempt to avert the worst industrial and social conflicts. From the worker's point of view it represents a recognition by society that it owes him a minimum wage, minimum social benefits, and a certain amount of control over his product. This is the price that employers have paid for seeking industrial peace and often (as in São Paulo¹) they have taken the initiative in setting up trade unions. Social legislation is also a symptom of a society less prepared to tolerate the evils of unemployment than were those which industrialized during the 19th century, simply because there is little eagerness in Latin America to see the European experience repeated.

The second new factor intervening in the industrialization process in Latin America is the rate of growth of the population. The effects of population growth are numerous and many lie outside the scope of this paper, which will be concerned principally with the absorption of manpower into the various sectors of the economy, the various branches of activity and the various statuses of occupation. From this angle it is clear that the rate of population growth, and of rural-urban migration are straining the employment capacity of Latin American countries. The result is that although official unemployment figures in Latin American countries do not appear intolerably high, all commentators agree that there exists extensive though largely unmeasured under-employment in the agricultural and service sectors² and that manual workers have a higher rate of unemployment than non-manual workers in highly urbanized areas. Thus between December 1963 and September 1964, in Greater Santiago, the employed population consisted of 31% salaried staff and 46.3% manual workers, but the unemployed consisted of 17.05% salaried staff and 73.1% manual workers.³

The problem for Latin American societies is how to develop economically and at the same time make use of their own demographic growth, not only because demographic growth annuls the effects of a large proportion of economic growth, through increased consumption, but also because of the effects of unemployment and under-employment. Unemployment increases the already very heavy burden of unproductive members of society. Over 40% of the populations of Peru, Brazil and Mexico are under 15 years old, mostly dependents and therefore unproductive. Under-employment reduces efficiency while encouraging clientele systems in bureaucracies and petty capitalism on the streets and in the countryside, both of which have inflationary effects, and slow down economic growth.

Although the proportion of the labour force employed in agricultural activities is falling in

most Latin American countries, the absolute number of those employed in agriculture is hardly falling anywhere, except in Argentina, and is rising in most cases. The higher fertility characteristic of rural areas,⁴ coupled with a high rate of migration by young adults and adolescent girls in particular,⁵ leads to a higher dependency ratio in rural than in urban areas. On the other hand the access of agricultural workers to employment and to the produce of the land in rural areas seems to be becoming less secure in many areas where land reforms have not been carried out. Owners and administrators of large estates have no longer any interest in letting their workers have subsistence plots on a secure basis when there is an abundant labour supply; it is more economical to hire workers when the need arises than to cede cultivable land to tenant labourers. This tendency is to be found in Chile, Ecuador and Brazil. In areas which grow primary products for fluctuating international markets, a fall in world prices will cause a sharp decline in incomes and employment levels will fall drastically. The Colombian coffee producers recently decided to stop exporting altogether for the moment and a similar coffee crisis was the origin of a wave of immigration towards São Paulo in the late 1940's. A further cause of unstable employment in rural areas, and of under-employment, is the sub-division of smallholdings until they neither can employ a man fully nor produce enough for one family to live on. The owners of these holdings must find wage-labour elsewhere in order to earn enough for subsistence, or else engage in petty capitalist commercial activities and live off small and unpredictable profit margins.

Demographic growth has created an abundant labour-supply and stimulated sub-division of holdings. Even in Chile, where the rural population is hardly increasing at all, it would have to decline for there to be stable employment and efficient use of manpower. Agrarian reform and colonization schemes should extend the area cultivated and therefore employment opportunities in Brazil, Peru, Colombia and other countries with large unexploited areas, but this is a once-for-all operation and the demographic pressures will soon re-emerge. The Mexican example in the 1930's has shown that an agrarian reform can stimulate social mobility and urban migration releasing peasants from the land rather than encouraging them to stay on it; but these results might be less beneficial in countries with a higher demographic growth, than that of Mexico in the 1930's.

In the light of the decline in consumption levels and living standards in many rural regions in recent years, and the spread of communications and urban culture, it is not surprising that rural-urban migration has attained a very high rate in many countries.

The rate of rural-urban migration has been such that in Mexico, for example, between 1940 and 1950, rural population grew at a rate of 1.6% *per annum*, whereas the annual rate in urban areas (defined as agglomerations of more than 1,000 inhabitants) was 5.9%. Mexico City had 2.5% of the country's population in 1900, and 8.7% by 1950.⁶ This concentration of urban growth is to be found in most countries.

Table 1. Proportion and number of male economically-active population engaged in agriculture

		%		Number in thousands
Argentina	1947	30.5	(2)	1,534.3 (3)
	1960	22.9	(2)	1,344.5 (1)
Venezuela	1950	47.7	(2)	668.6 (3)
	1961	38.0	(2)	744.5 (1)
Brazil*	1950	65.0	(3)	9,609.0 (3)
	1960	56.6	(1)	11,046.6 (1)
Chile	1952	37.5	(2)	668.7 (4)
	1960	34.1	(2)	683.7 (4)

Sources: (1) ECLA: *Statistical Bulletin for Latin America*, 1.1.

(2) Cardoso, F. H., and Reyna, J. L. *Industrialización Estructura y Estratificación Social en América Latina*. Latin American Institute for Economic and Social Planning, Santiago, 1966.

(3) ILO. *Yearbook of International Labour Statistics 1955*.

(4) ICAD, report on Chile.

* Includes extractive industries (proportion unknown in 1950, 2.5% of economically-active population in 1960).

Table I shows that only in a country like Argentina where the rate of population growth is comparable to that of advanced industrial countries, is the decline in the proportion of the male labour force accompanied by a decline in the actual number of men employed in agriculture. The pressure on the land continues in most countries despite migration.

In primitive economies the service to industry ratio of activity is high, since transport and distribution require relatively large numbers of people and the making of furniture and utensils does not employ so many craftsmen. In underdeveloped economies characterized by a deeply divided class structure, personal services are important in that they have a ritual function, that of enhancing the symbols of prestige of the ruling class and, later, of legitimizing, symbolically, the pretensions of the upwardly mobile sections of society. As the Latin American countries have moved towards industrialization they have preserved both these features in the structure of their employment. Thus in Brazil in 1950, 26.1% of the economically-active population was employed in Commerce, Transport, Communication and Services. Personal and Domestic Services had constituted 42.1% of these branches in 1940, and increased numerically by 4.7% between 1940 and 1950, although the proportion declined to 35%.⁷ Nevertheless the proportion is very high for a country in the process of industrialization.

Table II may not be remarkably accurate (due rather to the statistics on which it is based than to the authors of the Table) but it does have the virtue of homogeneity, and it shows quite clearly that the predominance of non-manufacturing employment existed prior to the period of intense urbanization, and that increases in the labour force outside agriculture are now absorbed mainly into the non-manufacturing sector. If this distribution is broken down according to sex, slightly more precise conclusions can be reached. The data in Table III, as long as the distinctions of primary, and secondary and tertiary sectors are accepted, show that as far as the transfer of manpower from primary to other sectors is concerned (as opposed to the absorption of the increase in the labour force) there is a pronounced trend towards the

Table II. Percentage of economically-active population employed outside agriculture

	Manufacturing			Non-manufacturing		
	1925	1950	1960	1925	1950	1960
Argentina	20	23	21	48	53	57
Chile	21	19	17	42	51	58
Colombia	17	14	15	18	29	36
Brazil	12	13	13	20	26	35
Mexico	11	12	17	19	30	30
Peru	18	16	15	21	25	31
Venezuela	10	10	12	27	48	56

Source: Cardoso, F. H., and Reyna, J. L. *Industrialización Estructura y Estratificación Social en América Latina*. Latin American Institute for Economic and Social Planning. Santiago, 1966.

Table III.* Percentage distribution of economically-active population by sex

Men		Primary	Secondary	Tertiary
Argentina	1947	32.3	28.5	39.2
	1960	26.2	37.8	36.0
Chile	1952	45.4	25.6	29.0
	1960	42.0	27.7	30.3
Women				
Argentina	1947	7.3	33.7	59.0
	1960	7.6	27.9	64.5
Chile	1952	8.5	25.4	66.1
	1960	5.0	20.5	74.5

Source: Pan-American Union document OEA(OAS)/Ser. H/X111.

* It should be noted that the figures for the primary sector are not equal to the sum of those active in agriculture and in extractive industries as given in the Pan-American Union's "*América en Cifras*," which gives census data for Argentina in 1947 and Chile in 1952.

tertiary sector only among women which might be expected irrespective of the factor of migration.

These figures probably underestimate the number of women working in agriculture, but on the other hand they do show how data for the economically active population as a whole are distorted by the very different distribution of the sexes not only according to branch of activity but also according to age, in some countries. The following are activity rates according to sex and age in some countries:

Table IV. Percentage of total population economically-active according to sex and age in selected countries.*

		10-14	15-19	20-29	30-44	45-64	65 and +
Chile (1960)	M.	—	63.6	95.1	97.7	87.3	52.0
	F.	—	23.6	30.2	22.8	17.9	7.1
Peru (1961)	M.	7.0	55.4	94.7	99.1	96.9	68.2
	F.	7.2	27.3	25.1	20.3	20.1	9.4
		14-29		30-49		50 and +	
Argentina (1960)	M.		84.7		96.6		63.1
	F.		34.4		23.1		11.1

Source: *ECLA Statistical Bulletin for Latin America*, 1.1.

* The lower age-limit defined by the census for economically-active population varies from country to country—Argentina 14, Brazil 10, Colombia 12, Chile 12, Mexico 12, Peru 10 (see also Table I).

These countries present a pattern of female employment which consists mainly of employment in domestic or similar service activity before marriage. In Chile 330,000 out of 511,000 women economically active outside agriculture, and in Peru 268,000 out of 467,000 were in the services or "inadequately specified" branches of activity in 1960 and 1961 respectively. In Argentina the proportion is 967,500 out of 1,597,000 (1960) and in Mexico 786,000 out of 1,360,000.

There is little doubt that a high proportion of domestic servants are recently arrived young migrants. Sadie⁸ gives data for Chile showing that women migrants outnumber men by far in the 10-19 age-groups, whereas the reverse is true at later ages.

The employment of men is subject to more complex determinants. The general pattern of industrial development in Latin America has been uneven, both in the geographical distribution of economic growth and in the distribution of capital among firms. Profits made from agriculture in the Peruvian Sierra are invested in the coastal provinces. The North-East of Brazil produced about 30% of Gross National Product (GNP) before 1939, and hardly 11% in 1960.⁹ Patterns of inter-regional disequilibrium are not dissimilar to the familiar patterns of international trade. From the point of view of employment the disparities among firms are more important. Frank Bonilla estimates that small firms on the continent as a whole continue to predominate, both in the number of people employed in them and in the value of their production, despite the relative decline of craft industries. Productivity ratios are exceedingly large. The ratio between factory and craft productivity on the continent as a whole was estimated at 8:1 in the period 1950-1960. Further disparities are found between urban crafts (electric and car repairs and so on) and rural cottage industry, and even within factory industries.^{10, 10} These should not necessarily be regarded as inimical to economic development (it should be remembered that the Southern USA was a depressed region for a long time within an industrializing country). On the other hand, wage-levels and employment opportunities are bound to be affected, by the juxtaposition of modern capital-intensive technology and a more traditional, sometimes almost primitive technological level in the majority of firms. In the first place wages are far higher in the more modern sector. Thus earnings in the rubber, chemical, petrol and non-metal mineral industries in Brazil, Chile, Colombia,

Mexico, Peru and Venezuela are all more than 10% higher than the national average, and mostly from 30% to 50% higher (except non-minerals in Brazil, and in Colombia, which are below the average) whereas earnings in shoe and clothes manufacturing are 90% of the average in Brazil and less than 80% in the other countries.¹¹

But a more important feature of these disparities is that capital-intensive industries need little manpower, yet they form the expanding sector of the economy. A classic case is Venezuela, where the high rate of growth of GNP due to the country's oil resources has not been paralleled by a corresponding rise in the number employed in extractive industries (44,500 in 1950; 46,700 in 1961) and there has been a fall in the proportion of the labour force employed in this branch from 3% in 1950 to 1.9% in 1961.¹² Of course, oil is a notoriously capital-intensive industry, but the phenomenon seems to recur throughout the manufacturing sectors. The following are the most recent employment indices available.

Table V. Employment indices in manufacturing in some countries
(1958 = 100 except for Chile and Venezuela)

	1960	1962	1964
Argentina	88	81	
Chile (1960 = 100)	100	102	108
Ecuador	102	107	112
Mexico	111	114	91
Peru	118	139	
Venezuela	109	109	
Venezuela (1961 = 100)		104	117

Source: *UN Statistical Yearbook 1965*.

Peru shows clearly the characteristics of a country in the early stages of industrialization and one might wonder for how long the demand for manpower will be sustained. It should be remembered that around 1960 Argentina had 25% of her labour force employed in manufacturing as opposed to 18% in Chile, 13.7% in Mexico, 13.2% in Peru, 12.3% in Venezuela and 8.9% in Brazil.¹³ Despite the growth shown in Chile a closer look modifies the picture somewhat. A sample survey carried out in September 1964, in Greater Santiago showed an overall unemployment rate of 4.2%. For manual workers it was 6.3% and when these were broken down they showed the following rates:

skilled and factory workers	6.7%
other manual and casual labour	11.5%
services	2.2%

66.7% of the unemployed were industrial workers, and 24.9% white-collar workers despite the fact that white-collar workers constituted 31.2% of the employed population of Greater Santiago and manual workers 47% at the time.¹⁴

Thus it would appear that not only is it more difficult for urban workers to find industrial work but that industrial employment is also less stable in an inflationary economy; another way of saying this is that under-employment is more easily tolerated in the services and trade sectors of employment, as well as among white-collar workers.

The most striking feature of the distribution of the urban labour force by branches of activity is its relative stability. That is to say that an initial pattern having been set quite early on, migration from agriculture has not radically altered that pattern.

The data in Table VI should not be taken as more than a guide, but they do nevertheless show where employment is most likely to absorb demographic growth. The rate of increase in manufacturing in Venezuela is remarkably high but the gap between the number employed in manufacturing and the number employed in services and "inadequately specified" activities increased in the intercensal period and the percentage distribution hardly changed at all. Venezuela is at a stage of economic development where one might have expected the proportion employed in manufacturing to increase at a fairly rapid rate, but the level of technology and the low labour-intensity of many new industries in Latin America, especially

Table VI. Absolute and proportional changes in participation of manufacturing and service and "inadequately specified" activities in distribution of employment.

		<i>No. in thousands</i>	<i>% of EAP</i>	<i>% increase p.a.</i>
<i>Manufacturing</i>				
Argentina	1947	1,426.5	22	2.7.
	1960	1,915.8	25.2	
Venezuela	1950	172.5	12	8.9
	1961	295.0	12.3	
Chile	1952	405.1	19.1	.03
	1960	406.0	17.2	
<i>Services and "Inadequately Specified" activities</i>				
Argentina	1947	1,575.5	24.2	3.4
	1960	2,287.4	30.1	
Venezuela	1950	486.3	28.2	5
	1961	706.6	29.4	
Chile	1952	565.9	26.7	3.8
	1960	694.7	29.5	

Source: ILO *Yearbooks of International Labour Statistics* 1955 and 1965, and Universidad de Chile, Instituto de Economía: *La Economía de Chile en el periodo 1950-63*

Notes: Chilean figures under "Services" include Public Services (Electricity, Gas, Water and Sanitary Services) but not Transport and Communication, whereas other countries include neither. Intercensal periods are 13 years for Argentina, 9 years for Venezuela, 8 years for Chile.

those financed by foreign capital, is such that the growth of the labour force cannot possibly be absorbed to any large extent by the manufacturing sector. Such absorption might have led to the formation of a homogeneous urban working class capable of making collective claims on society; as it is, the working class is characterized by its fragmentary nature, with divergence or conflict of interests between scarce highly paid skilled workers and the vast majority who receive only the legal minimum wage; between those who gain, or think they gain from inflation, and those whose earnings are constantly eroded by inflation, but who do not have access to political influence or bargaining procedures, and between those employed as wage earners and those who operate semi-independently as intermediaries, street-vendors and petty speculators. The latter are living off precarious and narrow profit margins, outside the labour market but within an economic sub-system which is bound to proliferate in a fragmentary economy where communications are inadequate, bottlenecks numerous, supply irregular, and in Chile, Argentina and Brazil especially, inflation is rampant.

Despite the over-abundant supply of labour, that which exists is generally agreed to be inadequately skilled for the high-level technology which is being implanted on the continent. In the 1958-1960 period technical course pupils comprised the following proportions of secondary school pupils: Brazil 2.2%; Colombia 5%; Mexico 6%; Peru 18.5%. It should be remembered, however, that most training is done on the job (95% of it in Colombia), which is not in itself a bad thing, but on the other hand a high level technology does require well-educated as well as highly-skilled labour, and it is to be suspected that those with secondary education do not always opt for factory work.¹⁵ Two surveys in Lima highlight this problem. One carried out in 1962¹⁶ on a large sample (1,096) of industrial workers, found that only 6.7% had one or less years of school, compared with a national illiteracy rate of 53%. On the other hand only 28.9% of the men, and 19.9% of the women had any secondary education. The other survey, carried out among secondary school students, found that 50% of those studying "industrial arts" preferred to become small businessmen and only 25% preferred the prospect of factory work.¹⁷ Yet it is in factories that trained manpower is most necessary and most productive in a developing country with scarce capital. The desire to be an independent operator and the prestige traditionally ascribed to white-collar jobs among those aspiring to social mobility and the lower middle classes, operate to the detriment of an optimum use of

manpower. Rottenberg⁶ in Mexico, and Fischlowitz¹⁸ in Brazil have both insisted on the need for improving the quality of the labour force, but it is possible to exaggerate the need since advanced technology can waste the skills of workers trained for an industrial system centred on crafts, and craft industry is of ever-declining importance in the employment of Latin American workers. Fischlowitz also remarks on the inadequacy of employment channels, the lack of employment exchanges, and the need for those seeking jobs to rely on newspaper advertisements or personal contacts.

It is not at all certain that the migrant worker in urban areas can be classed apart from the labour force as a whole from the employment point of view. Hutchinson (in six Brazilian cities) and Herrick (in Santiago)^{19,20} both found that migrants to cities had little difficulty in finding employment within a relatively short space of time. Herrick carried out a study in January 1964 and found that 81.9% of migrants were economically active (i.e. members of the labour force and therefore in need of employment) immediately on arrival; 62.6% of them found a job within four weeks. Hutchinson found that of those seeking a job immediately on arrival 85.1% of the males and 74.1% of the females had found one within a month.

Comparing unemployment rates, Herrick observed that 4% of migrants (i.e. who had come to the city during the previous 10 years) were unemployed as against 6.4% of natives of the city, although both are no doubt underestimations. However the same survey also found that migrants were as likely as natives to become semi-skilled and unskilled workers, but less likely to be craftsmen and operatives, and far more likely to be employed in personal services (this probably refers to young women in domestic services who always figure prominently in a migrant labour force) or be "owners" of some business enterprise, however small or precarious. The desire to be independent is a different phenomenon among migrants from the similar desire found among the middle and lower middle classes. It can be partly explained in terms of the peasant's desire to own land but only one-seventh of migrants to Santiago come from rural areas²⁰ (i.e. agglomerations of under 1,000 inhabitants). On the other hand it is clear that this desire on the part of the Nordestino migrant to São Paulo is a reaction against the regimented life of the factory by reference to the small-holding tradition of Brazil's North-East.²¹ When such a desire is found among coal-miners and other workers with a tradition of industrial work it must then be seen as an expression of frustrations experienced within an industrial framework, and the desire is rarely translated into practice,²² whereas in the short term the Nordestino may well return home when conditions improve there.^{21*}

This resistance to the regimentation of industrial life can be detrimental to the efficient use of manpower since there is a strong temptation, in São Paulo at least, to take advantage of labour legislation by getting the sack and trying to set up independently with the compensation money. This may be a peculiar feature of the migrant Nordestino, as may be his continued attachment to the land.

That all migrants do not live in shanty towns and that shanty towns are not exclusively inhabited by migrants is shown by the abnormally high level of employment in industrial work among the inhabitants of Rio's Favelas: 46% of the economically active as opposed to 26% in the state of Guanabara as a whole, according to the 1960 census.²³ There is no conclusive evidence either that the educational level of migrants is low—although it may be among shanty town dwellers.²⁴ On the whole, and certainly as far as the employment problem is concerned, shanty towns seem to be a false category on which to base generalizations, except insofar as their ecological position has an effect on their internal economic system. A shanty town is not provided with water, sanitary services, roads, communications and similar public services, nor is it reached by the normal marketing system. As a result a special set of arrangements is needed, requiring sub-contractors of public services, and innumerable salesmen and street vendors, to provide channels for goods from the shops whose owners are unwilling to set up in a shanty town. Such occupations are attractive insofar as quick and sometimes large

* See also Harris, Marvin: *Town and Country in Brazil* which describes a similar phenomenon on the provincial level in the state of Minas Gerais.

Janine Brisseau mentions Andean migrants to Caracas who retain similar ties with their homes in "Les 'Barrios' de Petare, faubourgs populaires d'une banlieue de Caracas", *Cahiers d'Outre-Mer*, 16 (21), January-March 1963.

profits can be made.²⁵ This system of petty capitalism swells the number of people who are neither unemployed nor productive—invariably in a fragmented economy.

Demographic growth and urbanization are placing a burden on the resources of Latin American countries, not only because of rising consumption and dependency, but also because the absorption of a large proportion of increases in the labour force into bureaucracy, very small businesses, and petty capitalist occupations is bound to impede decision making, increase inefficiency and corruption, and burden government with unnecessary employees through political patronage systems. Thus in Chile public personnel rose by 60% (1,947 to 116,191) between 1940 and 1955²⁶ whereas the total economically active population, only rose by 22.6% between 1940 and 1952.²⁷ This would go against ECLA's estimate that government services have absorbed a "steady" 5% of the increase in labour force. ECLA²⁷ calculates that between 1950 and 1960, 71% of the increase in the labour force in Chile, Argentina and Uruguay went into the services branch excluding basic services; equivalent proportions were 56% in Venezuela, 49% in Costa-Rica, 38% in Brazil, 37% in Peru, 30% in Central America and 29% in Mexico; in the last two agriculture is still absorbing a large proportion.

The Deputy Editor of *The Economist* estimated in 1965, that in Brazil, together with rampant inflation, there was 30% unemployment. If this is so, it appears that the "willingness to employ" which was mentioned at the beginning of this paper can no longer suffice to cope with the ever-increasing urban labour force. Nevertheless, there are numerous possibilities for rendering the present industrial labour force more productive, and increasingly so, as long as the profits resulting from increased productivity are reinvested in order to create further employment opportunities. A society can hardly cope with its demographic growth if capital flight continues to deprive it of resources for investment.

It is debatable whether certain structural features of Latin American economies which seem to impede economic growth, such as their fragmented nature, are not best maintained until such time as there is almost full employment. In this sense under-employment, which is very much a relative concept, is probably a more efficient means of providing earnings than unemployment benefits.

As education spreads so will the will to upward mobility and levels of fertility will descend. A study in Brazil shows as one might expect, that fertility decreases as social status rises²⁸ except for the highest status group of all. But at the same time an effort must be made to render higher status occupations more productive. This would involve, for example, encouraging sons of members of liberal professions to work on technical education, agricultural extension schemes, land reform projects; and to depopulate the offices. However, it must be said that the class structure of Latin America is very rigid and tends to perpetuate present patterns of employment.²⁹ It is difficult to find what Hoselitz calls a middle class prepared to get its hands dirty³⁰ for, besides the entrepreneurial elites, there exists a large bureaucratic and professional middle class.

As long as such a class persists and has prestige, and succeeds in creating enough new jobs to provide a minimum of social mobility,³¹ it is difficult to see how the vast reservoir of manpower in Latin America can be channelled towards industrial employment rather than employment in services, for at the moment, as we have seen, the former is growing very slowly. The problem of employment is not really a demographic one, insofar as it is absurd to claim that the labour force is too large in countries which are in urgent need of a rapid growth of their national product.

Birth control is not going to be the solution to the employment problem, except perhaps in rural areas, and even there the adoption of new techniques of cultivation and the opening up of employment opportunities through agrarian reform would be more beneficial. Demographic pressures as seen from the point of view of consumption may present irrefutable arguments for birth control policies. But it cannot be denied that in the field of employment the problem is one of channelling human resources into productive sectors. The phenomenon of withdrawal which has been noted among workers new to industrial life is by its very nature ephemeral. More important is the ensuing will to social mobility; if it is seen that mobility is impossible for industrial workers because they are highly unlikely to earn more than the legal minimum wage, then labour will be channelled away from industry. A study published in 1966 shows that in São Paulo, where manpower is more efficiently distributed

than in other cities in Brazil, 24% of wage-earners receive the legal minimum wage or only a little more, as opposed to 50% in Guanabara (which comprises mainly Rio de Janeiro) but there is also less disparity among wage-earners, since 11% of them received more than twice the legal minimum in São Paulo, compared with 20% in Guanabara. Clearly industrial employment offers more opportunities of mobility in São Paulo, and this remains true independently of the demographic situation, for one cause of the stagnancy of demand for industrial workers in Latin America is the lack of skilled workers. In Argentina a survey carried out in 1956 in firms employing 750,000 workers showed that there was a need to train 270,000 manual workers, 25,000 technicians and 8,000 engineers in the next 10 years. In Peru, between 1956 and 1962, industry needed 744 engineers, and although 783 were or had been trained, only 140 of these actually went into industry. Between 1963 and 1965 there were 27,500 skilled workers for a demand for 47,000 which would have been 31% of the labour force. Similarly Colombian employers forecast a need for a 70% increase in their labour force (skilled and unskilled), between 1963 and 1970. Employment opportunities would rise sharply if workers were trained on a large scale.^{11,12}

What is needed is a shift of the weight of status from administrative and professional jobs of a somewhat traditional kind to manual and skilled industrial jobs, which will entail a stratification of the working-class, as opposed to its division into two strata of highly-paid skilled workers and low-paid unskilled workers, so that industrial employment becomes the means of social mobility.

This in itself will help to bring down the urban birth-rate. Birth control will no doubt reduce misery in the short term, but it will not contribute other than indirectly to the industrialization of Latin America.

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RAPPORTEUR'S SUMMARY

In the discussion which followed the papers, the following points arose:

It was emphasized that the present demographic situation in Latin America was completely unprecedented. Fertility levels were higher than they were in the now developed countries before industrialization, mainly because the death rate had already been significantly lowered. Furthermore internal migration and population growth was causing a different kind of urbanization, caused by different motives.

Higher rates of social and economic development would not be achieved solely by lowering population growth. Other factors were: major imbalances in employment conditions, low levels of agricultural and industrial productivity, unfavourable conditions for underdeveloped countries in world markets, diversion of investment potential to deal with immediate social needs, a system of land tenure and land-working not suitable for improving agricultural methods, high industrial production costs (due largely to lack of suitable technological training, with a consequent need to change educational systems), and increased burdens on the productive sector of the economy caused by massive growth in the numbers of those employed in the service sector. Coupled with these, and other factors, there was a lack of suitable administrative machinery to channel available resources to bring about the necessary changes.

It was emphasized by Carmen A. Miró that action was required over the demographic as well as the social and economic variables to achieve sustained development rates.

The session agreed completely with the need to integrate into the development programmes population policies which will allow the needs and desires of families and communities to be fulfilled, and thus to influence the probable population size and its structure to make easier a greater social and economic development.

For this purpose several strategies were proposed: it may be convenient because of the high fertility levels in the rural areas in Latin America and because there is a favourable attitude towards family planning in the cities, to implement intensive programmes in rural areas which would reduce fertility; this, in turn, would mean a possible future lowering of the rural-city migration rates. It was also pointed out that, although in the cities couples openly express the desire to limit the number of their children, the available means are out of reach of the mass of the people and that no considerable lowering of urban fecundity has been noticed; therefore the need existed to intensify family planning programmes in the cities.

Nevertheless there was a need for special studies which would show, approximately, the effects of the lowering of rural and urban fertility and the short and long range effects of the lowering of the total fertility. There was also a need to evaluate the changes in fertility levels that family planning could bring about.

Other participants suggested that it would possibly be inconvenient to introduce family planning programmes which could be regarded as foreign to Latin American countries; the answer was that decisions in this respect would have to be made by the countries themselves, as has already happened in some, and by the couples in particular.

From the papers and discussions there appeared to be a need for studies that could make possible a better and deeper understanding of the relationship between population structure dynamics and the processes of social and economic development.

ECONOMIC AND SOCIAL PROBLEMS OF POPULATION CHANGES II

10. THE IMPACT OF POPULATION GROWTH ON HOUSING

J. Gorynski

Department of the Economics of Building and Town Planning, Warsaw

1. A feature of the world housing situation is the deep differentiation between continents, regions, countries and even within countries themselves. This differentiation clearly reflects the level of economic development. Changes occurring in the housing situation are a result of both the speed of economic growth and the rate of population increase.

As a whole, the world housing situation is bad, since the majority of people live in housing conditions far below minimal contemporary requirements. The rate of new dwelling construction does not keep pace with the rate of population growth and in some countries less dwellings are built annually than become unfit for use during the same period.

In many backward regions the housing situation—although at present alarming—is steadily deteriorating.

And so for instance, Dr. Romero's background paper states regarding Latin America that "the chronically poverty-stricken urban sector would go from one-third to half in two decades". Obviously there are countries in the world's well-developed regions where housing is improving. But no country exists which, according to its own opinion, has no important housing problems. This results from the fact that besides objective housing needs, there arise the subjective one, the standards varying according to the individual attitudes of different countries.

2. In this paper we shall not consider the problem of subjective housing needs as these are the concern of wealthy countries having attained a high level of economic development. Our main interest will be the objective, quantitative needs, although the way of handling this problem will be different from the usual approach to housing policy.

It is obvious that population growth generates housing needs and shortages but the size of these needs should not be considered as a simple, direct function of quantitative population changes. For they depend not only upon the rate of increase but upon the qualitative changes in the demographic structure.

Scientifically-based housing policies have elaborated a set of methodological tools aiming at establishing optimal housing programmes. It is not our intention to undertake in this paper yet another attempt at estimating housing needs as the result of the world's population growth. Such studies have been carried out by numerous institutions and competent organizations. Particularly studies prepared by the respective UN Committees contain data and information on a worldwide scale.

3. The purpose of our study is the opposite to the methods followed in the above-mentioned reports. We shall try to answer the question of whether an appropriated social housing policy could become a factor encouraging stabilization of population increase by generating a propensity towards family planning. In other words, it seems that the interdependence between quantitative needs and qualitative requirements could help in reaching this very goal.

4. For further considerations it will be useful to adopt some basic assumptions and definitions, i.e.

- a) Every human being has the elementary right to decent housing.
- b) The definition of decent housing is given by a minimum standard adopted in the respective region or country according to climatic conditions, local traditions and customs and social behaviour of the population.
- c) Housing is a comprehensive concept including not only the family shelter as such, but also the indispensable social and communal facilities related to normal housekeeping, elementary social and educational facilities, etc.

5. The standard consists of two basic elements: space and equipment; its aim is to regulate their size and mutual proportion. For practical reasons space allocation to the individual can be expressed by its reciprocity, i.e. density. Density can be related to the scales of dwelling, house, residential area, town, region, country.

Equipment means the sum of technical and other components, elements and fixtures determining the utility and amenity of housing. Equipment is represented by installations and services in dwellings and houses, as well as in residential areas, urban districts and towns. The latter elements of equipment are frequently called parts of social and technical urban infrastructure.

Space and equipment are complementary and to certain extent substitutional (e.g. the kitchen in a dining car and the sleeping compartment in a vehicle where abundant equipment compensates for minimal space).

6. Regularities ruling the interconnections between space and equipment can be studied by taking equipment as the independent variable and density as its function (see Fig. 1).

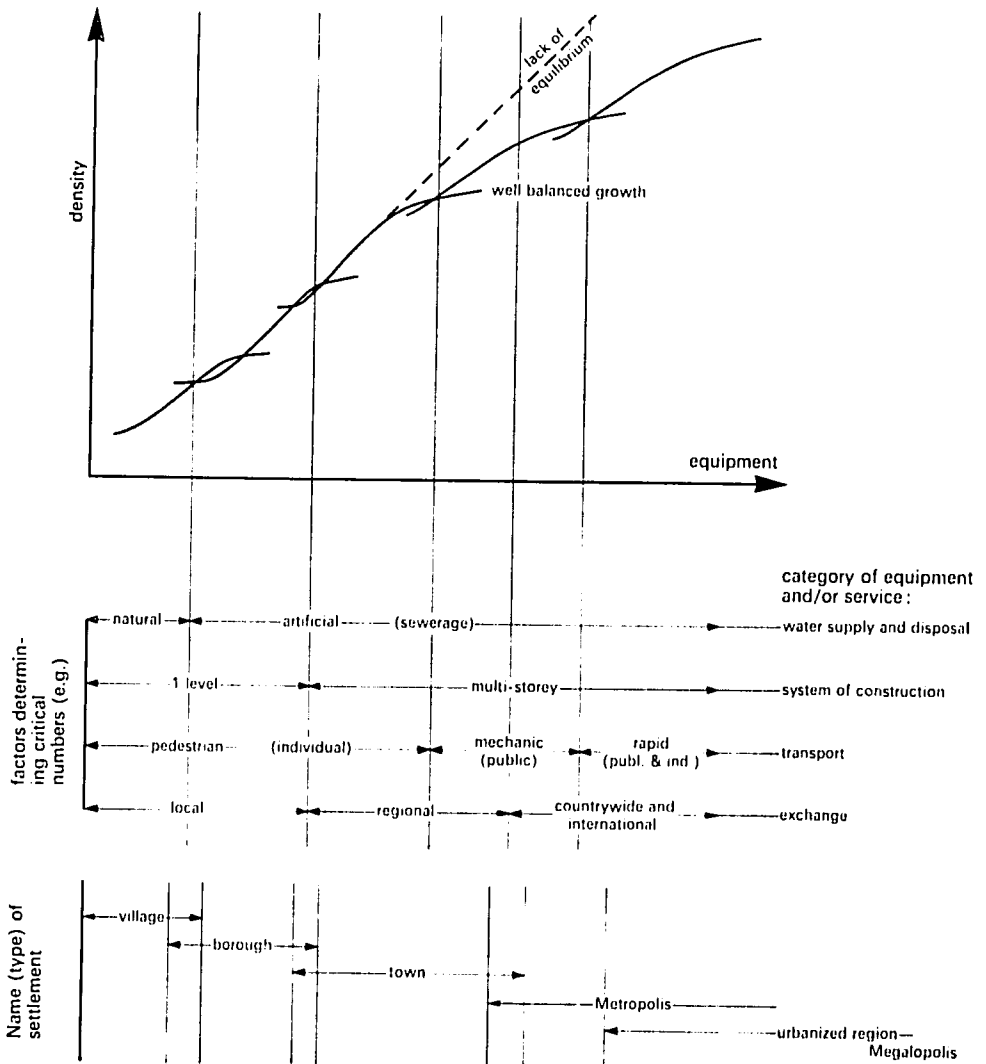


Fig. 1

Given a determined area equipped with a defined set of services and facilities (e.g. water supply, communication system, etc.), of limited capacity, the increase of density follows a trend resembling the logistic curve observed in ecological phenomena in biology.

Having approached the level of saturation, density can jump to the successive phase of increase only after the introduction of new services or the enlargement of the capacity of existing ones. E.g. lack of piped water and sewerage system limits residential densities per hectare (depending on soil quality, etc.) to say, 20–50 residents. Installation of such systems shifts the limit to 300–500 residents per hectare. Further increase is possible after providing for vertical and horizontal transportation. Using again biological terms we can observe the existence of critical numbers as related to specific services.

7. Depending on their critical size human settlements change their character as it is manifested in the traditional terms: village, borough, urban district, town, metropolis, agglomeration, etc. To each type of settlement corresponds a specific set of equipment elements and services and a more or less flexible critical size. However, unlike the realm of animals and plants the described system is self-correcting only to a certain extent, since the human mind can master the principle of self-correction ruling other biological groups in their natural environment. But the violation of technically and socially defined critical sizes means the loss of material and socio-psychological equilibrium. The results of such loss of equilibrium are the blight of overcrowded areas, the increased death rate, unsocial behaviour and delinquency; these are well known, and there is no need to comment on them. We confine ourselves to the statement that the lack of natural brakes has to be mastered by planned intervention based upon scientific survey, by means of economic, social and even administrative measures.

8. It is further assumed that rapid urbanization is the irreversible trend of our times.

The afflux of population masses to towns is generated by two main factors. The first one is the historical process of land-escape caused by the increased productivity of agriculture and its corollary: lack of employment and overpopulation in the countryside. Searching for non-agricultural jobs is the basic driving force behind migration to towns.

But not less important is another factor which has come to the fore recently: the sociological attractiveness of the town as a symbol of what is called the urban way of life.

The distinction between economic and socio-psychological reasons of migration to the town is pertinent for our subject matter. Purely economically-oriented migrants going to the town for the purpose of finding work in industry or in other urban jobs used to maintain connections with their village background. In many countries it may be observed, that the so-called peasant-workers frequently leave their families in the village, and become commuters or temporary town dwellers only. Sometimes their income is a source of financial aid destined to improve the productivity of the family farm, by means of additional investments. Poland, where peasant-workers, in the total of about 8 millions employed in non-agricultural jobs, number almost 1½ million, proves the importance of the first factor.

On the other hand migrants moving to the town drawn primarily by urban attractiveness, although compelled by hopeless rural poverty—and this seems to be the main factor in developing countries—as a rule take with them the whole family and cut their ties with the countryside. Having neither permanent urban employment nor housing they become dwellers of *bidonvilles*, *villas miserias* and shanty towns. Their living conditions continue to be bad or even worse than they experienced previously in the countryside. But nearness to the glamorous town keeps the expectation alive that one day they will join the more fortunate part of its inhabitants.

9. As already mentioned the basic menace produced by this superficial urbanization lacking economic foundations is the upsetting of the balance between the housing density and the corresponding adequate equipment. This makes inefficient efforts aiming at improvement by means of emergency measures applied only to the dwellings themselves. As a result settlements are created that are urban in name only. High densities combined with primitive or non-existent equipment lead to progressive deterioration of living standards and social conditions.

It is not our intention to blame the actions undertaken by men of good will, including experts, social workers and politicians, in order to alleviate the life of slum dwellers through

community-supported improvements and aided self-help measures. However, these actions touch only the symptoms of superficial urbanization without treating the illness itself. Moreover, temporary improvements can encourage more newcomers, parents and kinsmen, to the town poverty belts.

As has been shown above, the population capacity of a town is limited by the existing technical and social infrastructure as a whole. Enlarging the capacity of one element only—e.g. the dwelling stock—without proportional extension of other services deprives the town of its *raison d'être*, i.e. the urban way of life.

It is quite certain that as regards the outlay of investment, housing the same number of residents is more expensive in towns than in the countryside. In the long run, however, urban settlement assures social advantages and even economies in running expenses. Half-measures generate the highest social costs unless excessively expensive steps of comprehensive renewal are undertaken. Hence a rational settlement and housing policy has to have clear aims, either rural or urban. An important part of such conscious policy is education, explaining the advantages of urban life not only in terms of its external and superficial attributes, but also in the sense of fundamental changes in family life, the way of housekeeping, professional promotion and social stability. As well as the difficulties of becoming a permanent member of the urban society, efforts have to be made to raise living conditions in rural settlements in order to discourage their population from premature departure to the town. These efforts should cover two types of action. The first is improvement of housing conditions on the spot. Due to the lower density in rural settlements than in urban shanty towns, primitive measures, mainly based on aided self-help, can prove highly efficient. It seems therefore that contrary to widespread opinions, emergency measures for improving primitive housing should be concentrated not in urban but in rural agglomerations of shanty houses.

Other efforts in the countryside should be directed towards offering the rural population more benefits of technical civilization hitherto considered as the monopoly of urban life. This does not mean the forced vulgarization of "gadget civilization" but concerns introduction of services and installations facilitating housekeeping and the participation in cultural life through mass media.

10. Turning back to urban housing policy, we have to comment on the way of establishing an appropriate standard for the construction of new dwellings erected by public institutions or with public aid. In Fig. 2 the distance *A-B* represents actual housing standards expressed in terms of space (e.g. surface per person or family) or value.

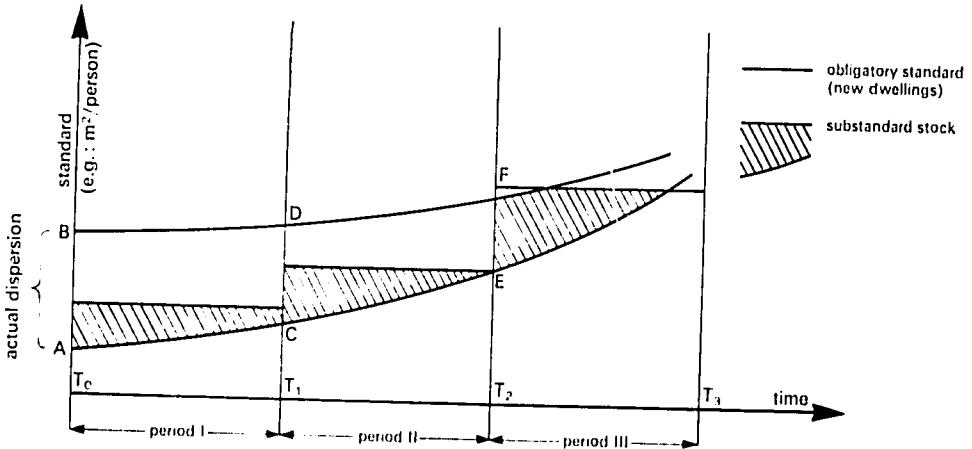


Fig. 2

The level of the standard to be applied to new housing construction has to be chosen between existing extreme values. It will be closer to the lower extreme in the case of the predominance of low quality housing or closer to the upper one if the average housing situation is better. During the first period *T-T₁* implementation of the chosen standard in

newly erected housing, elimination of the most obsolete houses and prevention of deterioration through repair and maintenance, allows the number of sub-standard houses to be reduced by *T1*. This enables the new dwellings standard to be raised during period II, to a value close to point *D*, marking the upper value of actual dispersion. Point *T2* already represents a situation where, compared with the standard required for new construction, there are no sub-standard houses. This allows the standard for the subsequent period of housing to be fixed above the limits of dispersion and the problem of subjective qualitative housing needs can then be tackled.

This procedure of a realistic housing policy explains the reasons for the failure of spectacular housing projects performed in a period of prevailing quantitative needs. As a rule such projects do not contribute to the solution of massive housing problems or even to the needs of a small group who wish to obtain luxurious dwellings without being prepared to use them in the right way. The urban housing policy outlined aims at making accessible to every family a dwelling corresponding to a standard of space and equipment considered in the given period as satisfactory. This policy does not apply emergency half measures consisting of superficial and transitory improvements to slums, nor does it create spectacular but restricted luxury islands in the middle of poverty belts.

11. The socio-psychological effect of a realistic housing policy is a feeling of security as regards the possibilities of the actual improvement of the housing situation and participation in the urban way of life after settling down in the town. The decision to migrate to the town ceases to be an act of despair and hopelessness. Experience proves that such security is one of the strongest incentives towards planned parenthood whereas lack of a reasonable expectation of improved living conditions fosters unplanned procreation.

12. Summing up the problems we can come to the following conclusions:

Population growth leads to an alarming deterioration of the housing situation, particularly when combined with massive escape from the land, and the uncontrolled growth of towns.

Urban housing conditions depend not only on the standard of the dwelling itself but also on the equipment and management of the urban area in line with the actual population density.

Emergency and self-help measures confined to urban sub-standard dwellings themselves lead to transitory improvements only and encourage further uncontrolled growth of the number of inhabitants.

On the other hand emergency and aided self-help measures related to rural housing are an effective means of discouraging the rural population from departure to towns before the foundations of proper economic and technical conditions are laid.

Education in the urban way of life with the purpose of stimulating the demand for decent housing, as opposed to mere shelter, is pertinent as a means of increasing the inclination towards planned parenthood.

In line with such education has to go a realistic urban housing policy based on modest standards and on the deliberate elimination of sub-standard dwellings. The social character of this policy must be free of wrongly applied charity, which is frequently manifested in emergency measures, and from unrealistic philanthropy leading to isolated spectacular projects with no effect on the average housing situation.

11. THE IMPACT OF POPULATION GROWTH ON FOOD SUPPLIES

B. R. Sen

Food and Agriculture Organization of the United Nations

POPULATION GROWTH

Since the beginning of this century the world's population has more than doubled. Of the total increase of some 1,700 millions, the last decade alone added over 600 millions and of these four-fifths were in the developing countries. Its growth has been particularly rapid in Latin America where the population has been quadrupled since the year 1900. So rapid is the speed of population growth that it seriously curtails any progress towards better living conditions. Whatever advances are made in the economy are resulting in all too little improvement of living conditions because they are cancelled by the needs of the rapidly increasing numbers. It is against this background that in his recent statement in connection with the Human Rights Day, the Secretary-General of the UN singled out the enormous growth of population in the developing countries as an important factor in the rate at which nations can attain their economic goals. What holds for economic development in general, holds equally, or even more so, for food supplies in particular.

The main cause of this growth in population is the decline in the rate of mortality which still stands at a high figure compared to that in the developed countries. With no significant downward trend in fertility in sight, population growth may therefore be expected to accelerate with further declines in mortality. Currently, the developing countries are adding some 60 million mouths to feed every year. According to the UN medium assumption, the population in the developing countries is expected to be close to 3½ billions by 1980 and to reach the 5½ billion mark by the year 2000 (Table I). Should present trends continue, the population would even exceed 6 billions in 2000. The expected population growth under the UN medium assumption implies that even without any improvement in current consumption levels, food supplies in the developing countries should have to be increased by 40% from 1960 to 1980 and by 120% by the year 2000.

CURRENT LEVELS OF DIET

The problem of increasing food supplies is, however, not merely that of providing for the growing population. It is necessary at the same time to remove the existing deficiencies in the diets of the developing regions. The current level of diet is shown in Tables IIa and IIb. To get an idea of the utter inadequacy of the diet in the developing countries, one need only compare it with the diet in the developed countries. As Table IIa shows, the developing countries consume about 2,200 calories *per capita* per day (mainly derived from cereals and starchy foods) which is only two-thirds of the consumption in the developed countries. They do not have more than 10g. of animal protein per day which is only one-fifth of the consumption in the developed countries. The disparities in other nutrients—fat, minerals and vitamins—are of a similar order of magnitude. Even allowing for differences in climate, body weight and other factors determining calorie and nutrient requirements, the level of nutrition in the developing countries is found so grossly inadequate that at least one in every five persons goes hungry, one in three suffers from protein malnutrition and three in five from malnutrition.

FUTURE FOOD NEEDS

The fact that 1,000–1,500 million people in the developing countries are either hungry or malnourished and that their numbers are likely to grow with the accelerating growth of

population unless there are adequate increases in food supplies, gives us some idea of the major task before the developing countries. Clearly, the situation demands an immediate increase in food supplies to make good the calorie deficiency and an increase in protective foods to reduce the incidence of malnutrition. With this in mind, FAO has formulated the goals of nutrition shown in Tables IIIa and IIIb. In working out these targets, care was taken to ensure that the diet will cost the least, and is realistic from the point of view of the eating habits of the people and consistent with production possibilities. For the Far East and Africa, where the food problem is most acute, the goal of reducing the incidence of malnutrition, can only be reached in successive stages. Consequently, for these regions, short- and long-term targets have been formulated. The short-term target aims at eliminating calorie deficiency and meeting the most urgent needs of protective foods of the vulnerable groups of the population, and of children in particular. The long-term target covers the needs of vulnerable groups for nutrients more liberally. As Table IVa shows, *per capita* total food supplies available today to the developing regions must be increased by one quarter and those of animal foods by one half to attain the short-term target. Increases are largest in the Far East and smallest in Latin America, but even for this latter region they amount to one-eighth of their total food supplies and one quarter of those of animal foods. These are minimum increases which people have a right to expect overnight, as it were, and whose realization cannot be put off too long without serious detriment to the economic development and even political stability and peace in the countries. Even setting the attainment of these increases by as late a date as 1980, to be realistic, total food supplies of the developing countries would have to be increased by 3.8% compound per annum ranging from 3.4% for Africa to 4.0% for the Far East, and those of animal foods by 5.1% ranging from 4.3% for Latin American to 5.4% for the Far East. Despite the fact that the deficiency in diet is the smallest in Latin America, the region requires rates of increase of about the same order as the other regions. This is due to the relatively faster rate of population growth in this than in the other regions. In absolute quantities, this means that the supply of non-animal and animal foods, which stand at about 1,000 and 350 million metric tons respectively of economic grain equivalent today, would have to be increased by 700 and 400 million metric tons respectively, over the next 15 years (Table Va). The increases called for to meet the needs of the year 2000 are, of course, very much larger. In fact, the long-term goal calls for increases of 230% in total food supplies and 380% in the supplies of animal foods.

PAST TRENDS IN FOOD PRODUCTION

How do future needs of growth in food supplies compare with past achievements? Tables VIa and VIb summarize trends in total and *per capita* food production since the pre-War period. Although not fully reflecting the trends in food supplies because of external trade and changes in stocks, the tables serve to give an indication of the possibility of achieving the needed growth from domestic production. It will be seen, that the rate of growth in food production in the less developed countries since before the War was some 2%, which is no higher than the population growth rate and only half the required rate of growth for the next 15 years. The situation is more or less similar in all the developing regions. In particular, in Latin America, the rate of growth in food production was 2.4%, which is actually slightly less than the population growth rate and will have to be stepped up by 50% to achieve the nutritional goals. For some time during the 1950's it appeared that the developing countries might succeed in turning the trend to the better. In fact, the rate of growth during 1950-58 was as high as 3.3%, which exceeded the population growth rate by 1.4%. Since then, however, growth in food production has been gradually falling and for the period 1958-64 works out at only 2.6%. At the same time, population growth has accelerated, with the result that over this period the *per capita* rate of growth in production has been negligible and actually been negative in the Near East, Africa and Latin America. The situation was particularly bad during the last year when, owing to the widespread drought, *per capita* food production fell by 3% to 5% in all the developing regions. This fall in growth rate of production was mainly due to the difficulties of maintaining the rates of increase in cultivated areas, from which most of the increase during the early 1950's had come, accompanied by decreases in crop and livestock yields (Tables VIIa and VIIb).

In comparison, the rich countries, with no greater rate of growth in food production but with increases in productivity and with only half the rate of growth in population compared to the developing countries, improved their *per capita* availability of food and were able to export increasing quantities.

As a consequence, trends in the food supplies of the developing countries have been somewhat more favourable than trends in production but this has taken place at the expense of the trading pattern between the two groups of countries. As Table VIII shows, the Far East and Near East, which were exporters of food before the War, are now importing 6% and 7% respectively of their supplies. Africa and Latin America are still exporting but on a much reduced scale. This unfavourable development has tended to increase balance of payment problems and to accentuate the difficulties resulting from the almost continuous decline since the Korean war boom in world prices of primary commodities. The situation is illustrated by the example of cereals; the less developed countries (excluding Mainland China) which exported 10 million tons of cereals before the War are now actually importing nearly 20 million tons, and this largely to maintain their current unsatisfactory level of diet. Judged by these trends, the prospects of stepping up the rates of growth to 3.8% in total foods and 5.1% in animal foods over the next 15 years seem bleak indeed.

POSSIBILITIES OF INCREASING FOOD PRODUCTION AND THE NEED FOR AGRICULTURAL DEVELOPMENT

There is little doubt that considered on a global basis, the world could grow enough food to meet all its needs, at least up to the year 2000, and that the developed countries in particular could achieve much higher rates in food production than they have done in the past, considering that some of them are taking restrictive measures to keep their surpluses within manageable limits. If we were to take into account recent developments in the use of atomic energy and those in the fields of unconventional foods, the possibilities seem immense. But this cannot solve the immediate problem of food supplies for the growing populations of the developing countries. Trade and aid can hardly be conceived as a means of overcoming their growing shortages. Even apart from problems of transportation, it is hardly wise for the developing countries to import food and use up their limited export earnings which they badly need for buying capital equipment from the developed countries. Nor can the developing countries depend upon aid with the risks involved without serious detriment to the incentives of domestic production. Non-conventional foods, such as protein from petroleum, green leaves and algae, economic problems apart, require further research in processing to make them palatable to children and acceptable on a large scale. Furthermore agriculture in almost all developing countries represents the most important sector of the economy and will remain so for a long time to come. More than 70% of the population lives today on agriculture. Reductions in this percentage are limited by the development prospects of the other sectors, so that the agricultural population will continue to grow in absolute numbers until 1980 and even beyond. Agriculture, together with industries processing agricultural products and services connected with agriculture, contribute more than half to the gross domestic product and foreign exchange earnings. Export earnings from processed agricultural commodities are growing faster than those of any other product and are one of the main hopes of narrowing the foreign exchange gap. The food problem of the developing countries and the related problem of general economic development can, therefore, only be solved by developing their own agriculture. In fact, as President Johnson stated in his recent address to Congress, agriculture should have the highest priority in all efforts for economic development of the developing countries.

The necessary land resources exist in Africa and Latin America, though in practice it has been found increasingly difficult to exploit them for lack of capital outlay. The situation appears more critical in the Far East where the shortage of land is acute and the only hope is an increase in productivity. In the Near East the situation is aggravated by lack of water resources. What holds for crops also holds for livestock, which in many countries is actually a heavy burden on the limited land resources. In the final analysis, therefore, future increases in agricultural production will have to be brought about mainly by increases in productivity of land and livestock. In saying so one should, of course, not overlook the possibilities of

exploiting to a greater extent the sea and inland water bodies as a source of fish, which could bring about a substantial increase in the animal protein supply, particularly in those areas of the world where the need for this is most urgent.

The principal factors of improving land productivity are fertilizers, pesticides, efficient use of water and, above all, improved varieties responsive to high doses of fertilizers. Animal health services, improved animal husbandry including animal nutrition and genetic improvement of stocks are the main methods of increasing livestock productivity. Abundant experimental evidence is available which shows that yields could be increased several fold as the result of efficient use of these factors. Some of these techniques have been adopted in the developing countries but the scale of their application is so small that it has made little impact on the technology of production. To mention only chemical fertilizers, which is the key factor in the transition from the method of area expansion to that of yield increase, the average consumption per hectare of cropland works out at 6 kg. as against 50 kg. per hectare in the developed countries (Table IX). In fact, in some of the developed countries with intensive agriculture, the rate of application of fertilizers reaches several hundred kilograms per hectare.

The situation regarding the use of pesticides and herbicides is even more backward. In fact, they are hardly used in many of the developing countries. Their use alone should be able to add appreciable quantities to the supplies available for consumption in the developing countries. Likewise, agricultural research has not been sufficiently geared to practical problems, as is shown by the failure of plant breeding programmes to evolve high yielding varieties which can stand heavy doses of fertilizer under the environmental conditions prevailing in many of these countries. Much remains to be desired in the efficient use of land and water resources and animal husbandry techniques are even more backward. It is, however, precisely in this technological backwardness that there is hope and scope for increasing productivity.

PROSPECTS OF RAISING THE NEEDED FOODS

While the possibilities of increasing food production in the developing countries definitely exist, the increases required are large, the need for better nutrition immediate and the crucial question is whether the needed foods can be produced quickly enough to attain a rate of growth of 3·8% per annum with most of it coming from increases in productivity, against a rate of less than 0·5% in productivity attained since before the War. The question can only be answered against the background of the effort and investment required in the countries themselves.

There should be little difficulty in evolving high-yielding hybrid varieties responsive to large doses of fertilizers by proper strengthening of agricultural research in plant breeding and the associated disciplines. The task of achieving increases in the consumption of fertilizers is more difficult. Not only are fertilizers in short supply but rising prices and payment in foreign exchange make it difficult for most countries to import them in adequate quantities. The ideal course would be to develop indigenous production of fertilizers wherever feasible, but the investments and technical knowhow needed for the purpose are beyond the possibilities of many of the developing countries. Much the same is true of pesticides and the development of water resources.

With the uncertainties of bilateral aid and its political implications, international agencies have an important role to play here. I have, therefore, proposed a Food Production Resources Programme to make available to the countries fertilizers and other inputs. With this assistance and technical and financial aid from the developed countries, the developing countries should be able to turn the tide by 1980 even though realization of the goal of nutrition may still be nowhere in sight. For even if land productivity were increased, releasing in the process the areas needed for growing grasses to feed the livestock, it will certainly take us beyond the next decade to expect livestock to begin contributing to the animal food supply needed to reduce malnutrition.

The raising of the needed foods is, however, not only a technical problem. The introduction of technical measures will, of course, have to be linked up with appropriate institutional and

economic measures in order to educate, induce and enable farmers to adopt improved technology.

Foremost of all, the limited methods of subsistence farming which are nearly always associated with low productivity of land and labour have to be overcome. Another serious obstacle is the unfavourable land use pattern, fragmentation of holdings and traditional tenure systems which render it difficult for the farmer to produce more food than needed for his own consumption. These obstacles, together with lack of capital and credit, and the absence of suitable markets to sell agricultural products at remunerative prices must be overcome, in order to create an economic and social environment which will enable the available technical knowledge to be applied. To bring this about will call for drastic changes in agricultural policies of many of the developing countries.

The stupendous size of the task confronting the developing countries calls for careful planning to formulate policies ensuring the best use of the available resources. It is, therefore, encouraging to see that more and more developing countries are drawing up national development plans. To provide a world-wide perspective for these plans, FAO has recently embarked on the preparation of an Indicative World Plan for Agricultural Development.

The preliminary studies undertaken so far have already shown that the gap between population prospects and needs can be bridged only if technical aid to the less developed countries were continued and financial aid considerably increased.

THE POPULATION ISSUE

In these circumstances, the high rate of population growth is clearly an impediment to progress and, as I have repeatedly advocated, deliberate steps must be taken to reduce it. Reduction in fertility will progressively help saving on consumption and on capital for essential social services, such as health and education, and non-productive investment, such as housing. Reduction in the fertility rate will also help bring about a more favourable age/sex structure in that the dependency ratio will be reduced. This is not to disregard the advantage which, particularly in sparsely settled areas such as Latin America, in the long run might accrue from a larger population. It is only to suggest that their economic progress would be more satisfactory if they could arrive at these larger numbers at a more leisurely pace. It is, therefore, satisfying to note that many less developed countries have already recognized the need for stabilizing their population growth to bring it in balance with their resources.

In fact, population policies and programmes in family limitation now loom large in the development plans of many countries, e.g. India, Pakistan, Ceylon, Taiwan, Korea, UAR, etc. Also in Latin America, several countries have adopted a favourable attitude toward population programmes. Fortunately for them there has been a breakthrough in the technology of contraception which has thrown up a number of devices suitable for use under conditions of the developing countries. The people also appear in general to be receptive to the idea of limiting family size. Nevertheless, even with the immediate implementation of programmes for reducing fertility, it would still take developing countries a considerable time to bring down their population growth to a manageable rate. For example, even if the developing countries succeeded in halving their birth rate by 1980, the population would still grow by more than 25% by 1980. This implies an annual compound rate of increase in population of 1.5% against 2.3% under the UN medium assumption. With an annual rate of increase of 1.7% in *per capita* food supplies under the short-term nutritional target, the developing countries would therefore need to increase their food supplies by 3.2% annually over the next 15 years, compared with the present rate of 2.5%.

It follows that providing food for the growing millions of the developing countries with a view to achieving the minimum nutritional goal will be a formidable task reckoned in terms of resources, cost and effort. There seems no alternative but to fight the battle on both fronts, agriculture as well as population. Even then the nutritional goal may be nowhere in sight by 1980. However, conditions could have been created by then which would promise a better future in the years ahead by a combination of increased facilities for improving agricultural production combined with a falling population growth.

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APPENDIX TABLES

The regions used in the Appendix Tables are defined in the FAO *Production Yearbook and Trade Yearbook*. The coverage of the subregions of Latin America is given below:

Mexico, Central America and Caribbean countries:	Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Mexico, Panama.
Northern and western countries of South America:	Bolivia, Chile, Colombia, Surinam, Ecuador, Peru, Venezuela.
Brazil.	
River Plate countries:	Argentina, Paraguay, Uruguay.

Table I. Future population, index numbers of population and related rates of growth (1965 = 100)

	1965 (in millions)	1980 (in millions)	1980 Index numbers	2000 (in millions)	2000 Index numbers	Annual percent rates of increase (compound)	
						1965- 1980	1980- 2000
Far East (incl. China M.)	1,791	2,473	138	3,568	199	2.2	1.9
Near East	148	222	150	355	240	2.7	2.4
Africa	266	387	145	667	251	2.5	2.8
Latin America	244	373	153	623	255	2.9	2.6
Mexico	41	69	168	126	307	3.5	3.1
Caribbean countries	18	25	139	38	211	2.2	2.1
Central America	14	22	157	40	286	3.1	3.0
Mexico, Central America and Caribbean total	73	116	159	204	279	3.2	2.9
Northern and Western countries of South America	57	89	156	147	258	3.0	2.5
Brazil	81	127	157	217	268	3.1	2.7
River Plate countries	27	34	126	45	167	1.6	1.4
Developing regions	2,450	3,460	141	5,350	218	2.3	2.2
Europe (incl. USSR)	675	761	113	888	132	0.8	0.8
North America	214	253	123	356	166	1.4	1.5
Oceania	17	23	135	32	188	2.0	1.7
Developed regions	906	1,047	116	1,276	141	1.0	1.0
World	3,360	4,510	134	6,630	197	2.0	2.0

Table IIa. Current levels of diet (*per capita* per day at retail level) by regions

	Far East (incl. China M.)	Near East	Africa	Latin America	Deve- loping Region	Europe (incl. USSR)	North America	Oceania	Deve- loped Regions	World
<i>Major food groups (g.)</i>										
Cereals	402	446	330	283	385	372	183	235	325	369
Starchy roots	164	46	473	206	195	378	134	131	316	228
Sugar	29	41	29	98	37	77	112	133	86	50
Pulses and nuts	47	47	37	51	46	14	18	12	15	38
Vegetables and fruit	144	426	215	298	182	337	507	384	378	235
Meat	24	34	40	92	33	118	230	299	148	64
Eggs	3	6	4	10	4	25	52	35	32	9
Fish (edible)	13	6	8	10	12	19	14	15	18	13
Milk	60	216	96	237	91	504	830	614	583	224
Fats and oils	10	20	19	25	13	44	57	44	47	22
Economic grain equivalent (g.)	950	1,660	1,270	1,610	1,090	2,560	4,360	3,540	3,090	1,700
<i>Calories and nutrients</i>										
Calories	2,080	2,480	2,360	2,550	2,180	3,060	3,110	3,240	3,080	2,420
Calorie requirements	2,300	2,400	2,340	2,400	2,320	2,590	2,590	2,610	2,590	2,390
Proteins (g.)	56	76	61	65	58	89	93	94	90	67
Animal	8	14	11	24	10	38	65	63	45	20
Vegetable	48	62	50	42	48	51	28	31	45	48
Fat (g.)	29	45	56	63	36	97	143	139	109	56
Calcium (mg.)	270	596	400	510	328	1,016	1,465	1,115	1,124	543
Vitamin A (I.U.)	2,150	5,130	3,530	2,750	2,540	5,240	6,060	5,920	5,450	3,320
% Calories from cereals, starchy roots and sugar	80	71	74	64	77	62	40	46	57	72

Table IIb. Current levels of diet (*per capita* per day at retail level) by sub-regions of Latin America

	Latin America	Mexico	Caribbean countries	Central America	Northern and Western countries of S. America	Brazil	River Plate countries
<i>Major food groups (g.)</i>							
Cereals	283	349	203	322	242	299	251
Starchy roots	206	47	278	34	323	198	263
Sugar	98	91	93	83	94	110	94
Pulses and nuts	51	63	50	32	24	81	11
Vegetables and fruit	298	206	544	347	305	261	351
Meat	92	62	65	43	75	75	268
Eggs	10	15	8	10	6	9	18
Fish (edible)	10	3	15	3	15	10	5
Milk	237	341	180	232	231	151	389
Fats and oils	25	31	27	13	19	22	43
Economic grain equivalent (g.)	1,610	1,510	1,520	1,180	1,480	1,470	2,760
<i>Calories and nutrients</i>							
Calories	2,550	2,610	2,340	2,170	2,170	2,780	2,860
Calorie requirements	2,400	2,350	2,390	2,330	2,410	2,350	2,550
Proteins (g.)	65	72	54	56	56	66	83
Animal	24	23	18	16	21	18	52
Vegetable	42	49	36	41	35	48	31
Fat (g.)	63	72	60	42	48	59	106
Calcium (mg.)	510	632	477	473	493	417	716
Vitamin A (I.U.)	2,750	2,590	4,000	3,000	2,810	2,560	3,510
% calories from cereals, starchy roots and sugar	64	63	58	69	69	67	57

Table IIIa. Food supply targets by regions (*per capita* per day at retail level)
(A = Available; T = Target)

		Short-term target					Long-term-target		
		Far East (incl. China M.)	Near East	Africa	Latin America	Developing regions	Far East (incl. China M.)	Africa	Developing regions
<i>Major food groups (g.)</i>									
Cereals	A	402	446	330	283	385	367	330	359
	T	402	401	330	310	386			
Starchy roots	A	164	46	473	206	195	146	323	161
	T	155	46	394	160	175			
Sugar	A	29	41	29	98	37	33	35	39
	T	29	41	32	82	36			
Pulses and nuts	A	47	47	37	51	46	92	44	80
	T	74	47	44	49	67			
Vegetables and fruit	A	144	426	215	298	184	305	215	302
	T	228	426	215	298	245			
Meat	A	24	34	40	92	33	62	72	67
	T	36	53	56	106	46			
Eggs	A	3	6	4	10	4	8	8	9
	T	5	10	6	16	7			
Fish	A	13	6	8	10	12	39	12	32
	T	23	8	10	17	20			
Milk	A	60	216	96	237	91	140	203	170
	T	101	307	143	271	135			
Fats and oils	A	10	20	19	25	13	18	23	20
	T	16	25	22	27	18			
Economic grain equivalent (g.)	A	950	1,660	1,270	1,610	1,090	1,640	1,620	1,660
	T	1,230	1,930	1,450	1,790	1,340			
Calories	A	2,080	2,480	2,360	2,550	2,180	2,410	2,460	2,440
	T	2,310	2,480	2,420	2,620	2,360			
Total proteins (g.)	A	56	76	61	65	58	78	69	76
	T	68	77	65	72	69			
Animal proteins (g.)	A	8	14	11	24	10	20	20	21
	T	12	20	15	28	15			

Table IIIb. Food supply targets by sub-regions of Latin America (*per capita* per day at retail level)
(A = Available; T = Target)

		Mexico and Central America	Northern and Western countries of S. America	Brazil	Latin America
<i>Major food groups (g.)</i>					
Cereals	A	308	242	299	283
	T	330	330	299	310
Starchy roots	A	101	323	198	206
	T	101	200	151	160
Sugar	A	90	94	110	98
	T	63	74	100	82
Pulses and nuts	A	54	24	81	51
	T	54	38	66	49
Vegetables and fruit	A	315	305	261	298
	T	315	305	261	298
Meat	A	59	75	75	92
	T	74	86	93	106
Eggs	A	12	6	9	10
	T	21	12	14	16
Fish	A	6	15	10	10
	T	12	25	20	17
Milk	A	281	231	151	237
	T	281	245	241	271
Fats and oils	A	27	19	22	25
	T	27	22	25	27
Economic grain equivalent (g.)	A	1,450	1,480	1,470	1,610
	T	1,620	1,680	1,690	1,790
Calories	A	2,460	2,170	2,780	2,550
	T	2,470	2,490	2,750	2,620
Total proteins (g.)	A	64	56	66	65
	T	71	71	70	72
Animal proteins (g.)	A	20	21	18	24
	T	24	25	25	28

Table IVa. Required increases in the supplies of animal and all foods, *per capita* and total, and related rates of growth, by regions

	<i>Far East (incl. China M.)</i>		<i>Near East</i>		<i>Africa</i>		<i>Latin America</i>		<i>Developing countries</i>	
	<i>per capita</i>	<i>Total</i>	<i>per capita</i>	<i>Total</i>	<i>per capita</i>	<i>Total</i>	<i>per capita</i>	<i>Total</i>	<i>per capita</i>	<i>Total</i>
<i>Short-term goal, 1965-1980</i>										
% increase in supplies of:										
all foods	29	79	17	75	14	66	12	71	24	75
animal foods	58	120	48	121	41	108	23	89	47	112
% annual rates of growth (compound):										
all foods	1.7	4.0	1.0	3.8	0.9	3.4	0.7	3.6	1.4	3.8
animal foods	3.1	5.4	2.6	5.4	2.3	5.0	1.4	4.3	2.6	5.1
<i>Long-term goal, 1965-2000</i>										
% increase in supplies of:										
all foods	72	244	17	181	28	220	12	185	53	226
animal foods	176	454	48	255	86	369	23	214	123	379
% annual rates of growth (compound):										
all foods	1.6	3.6	0.4	3.0	0.7	3.4	0.3	3.0	1.2	3.4
animal foods	2.9	5.0	1.1	3.7	1.8	4.5	0.6	3.3	2.3	4.6
<i>Long-term goal After attainment of short- term goal, 1980-2000</i>										
% increase in supplies of:										
all foods	33	92	—	60	12	93	—	67	24	86
animal foods	75	152	—	60	32	126	—	67	51	125
% annual rates of growth (compound):										
all foods	1.4	3.3	—	2.4	0.6	3.3	—	2.6	1.1	3.2
animal foods	2.8	4.7	—	2.4	1.4	4.2	—	2.6	2.1	4.1

Table IVb. Required increases in the supplies of animal and all foods, *per capita* and total, and related rates of growth, by sub-regions of Latin America

	<i>Mexico and Central America</i>		<i>Northern and Western countries of South America</i>		<i>Brazil</i>		<i>Latin America (incl. River Plate countries)</i>	
	<i>Per capita</i>	<i>Total</i>	<i>Per capita</i>	<i>Total</i>	<i>Per capita</i>	<i>Total</i>	<i>Per capita</i>	<i>Total</i>
<i>1965-1980</i>								
% increase in the supplies of:								
all foods	12	71	14	73	15	74	12	71
animal foods	26	95	24	89	40	114	23	89
% annual rates of growth (compound):								
all foods	0.7	3.7	0.9	3.7	0.9	3.8	0.7	3.6
animal foods	1.6	4.6	1.5	4.3	2.2	5.2	1.4	4.3

Table Va. Total food supplies available and needed by regions

Item	Year	Far East (incl. China M.)	Near East	Africa	Latin America	Deve- loping regions	Europe (incl. USSR)	North America	Oceania	Deve- loped regions	World
(million metric tons of economic grain equivalent)											
Total food	1965	621	89	123	144	977	631	340	22	993	1,970
	1980	1,109	156	204	244	1,713	712	418	30	1,160	2,873
	2000	2,134	250	394	407	3,185	831	566	41	1,438	4,623
Animal food	1965	207	29	39	71	346	358	223	13	594	940
	1980	456	64	81	134	735	404	274	18	696	1,431
	2000	1,147	103	183	223	1,656	472	371	25	868	2,524

Table Vb. Total food supplies available and needed by sub-regions of Latin America

Item	Year	Northern and Western countries of			
		Mexico and Central America	South America	Brazil	Latin America
(million metric tons of economic grain equivalent)					
Total food	1965	129	132	132	144
	1980	220	229	230	244
Animal food	1965	58	63	57	71
	1980	113	119	122	134

Table VIa. Index numbers of total food production and related annual per cent rates of growth (compound) (pre-War = 100)

	Index numbers			Per cent annual rates of growth (compound)				
	1948- 52	1957- 59	1963- 65	Pre-War	1948-52	1957-59	Pre-War	1948-52
				to 1948-52	to 1957-59	to 1963-65	to 1963-65	to 1963-65
Far East (excl. China M.)	107	138	162	0.5	3.2	2.7	1.7	3.0
Near East	116	161	184	1.1	4.2	2.3	2.2	3.3
Africa	129	156	182	1.8	2.4	2.6	2.2	2.5
Latin America	126	165	192	1.7	3.4	2.6	2.4	3.1
Developing regions (excl. China M.)	116	150	175	1.1	3.3	2.6	2.0	3.0
North America	139	160	182	2.4	1.8	2.2	2.2	1.9
Europe (incl. USSR)	105	143	165	0.4	3.9	2.4	1.8	3.3
Oceania	113	135	171	0.9	2.2	4.0	1.9	3.0
Developed regions (incl. USSR)	117	149	171	1.1	3.1	2.3	1.9	2.7
World (excl. China M. and incl. USSR)	116	149	172	1.1	3.2	2.4	2.0	2.8

Table VIIb. Index numbers and related annual per cent rates of growth (compound) of *per capita* food production (pre-War = 100)

	Index Numbers			Per cent annual rates of growth (compound)				
	1948-52	1957-59	1963-65	Pre-War to 1948-52	1948-52 to 1957-59	1957-59 to 1963-65	Pre-War to 1963-65	1948-52 to 1963-65
Far East (excl. China M.)	88	97	100	-0.9	1.2	0.5	—	0.9
Near East	100	114	112	—	1.6	-0.3	0.4	0.8
Africa	97	98	99	-0.2	0.1	0.2	—	0.1
Latin America	93	99	97	-0.5	0.8	-0.3	-0.1	0.3
Developing regions (excl. China M.)	93	101	102	-0.5	1.2	0.2	0.1	0.6
North America	116	116	120	1.1	—	0.6	0.7	0.2
Europe (incl. USSR)	103	128	138	0.2	2.8	1.3	1.2	2.1
Oceania	94	93	104	-0.4	-0.1	1.9	0.1	0.7
Developed regions (incl. USSR)	110	126	135	0.7	1.7	1.2	1.1	1.5
World (excl. China M. and incl USSR)	100	111	114	—	1.3	0.4	0.5	0.9

Table VIIa. Per cent changes in area, average yield per hectare and production of nine major crops*

	Developing regions (excl. China M.)			Developed Regions			World (excl. China M.)		
	Area	Yield	Pro-duction	Area	Yield	Pro-duction	Area	Yield	Pro-duction
Pre-War to 1948-52	12 (1.0)	-6 (-0.5)	6 (0.5)	-1 (-)	9 (0.8)	9 (0.8)	5 (0.4)	3 (0.2)	8 (0.6)
1948-52 to 1957-59	22 (2.5)	16 (1.9)	41 (4.4)	3 (0.4)	14 (1.6)	17 (2.0)	12 (1.4)	12 (1.5)	25 (2.9)
1957-59 to 1962-64	3 (0.6)	4 (0.9)	8 (1.5)	1 (0.3)	6 (1.3)	8 (1.6)	2 (0.4)	5 (1.1)	8 (1.5)
Pre-War to 1962-64	41 (1.3)	14 (0.5)	61 (1.8)	4 (0.1)	32 (1.1)	37 (1.2)	20 (0.7)	22 (0.7)	46 (1.4)
1948-52 to 1962-64	26 (1.8)	21 (1.5)	51 (3.3)	4 (0.3)	21 (1.5)	26 (1.8)	14 (1.0)	18 (1.3)	35 (2.3)

* Wheat, Rye, Barley, Oats, Maize, Rice, Potatoes, Groundnuts, Soybeans.
 Figures in brackets are annual per cent rates of growth (compound).

Table VIIIb. Per cent changes in cattle numbers, cattle products output and yield*

	Developing regions (excl. China M.)			Developed regions (excl. USSR)			World (excl. China M. and USSR)		
	Cattle Nos.	Yield	Output	Cattle Nos.	Yield	Output	Cattle Nos.	Yield	Output
Pre-War to 1948-52	4 (0.3)	3 (0.2)	7 (0.5)	6 (0.4)	-3 (-0.2)	3 (0.2)	4 (0.3)	-1 —	4 (0.3)
1948-52 to 1957-59	16 (1.9)	6 (0.7)	22 (2.6)	12 (1.5)	14 (1.7)	29 (3.2)	15 (1.8)	10 (1.2)	27 (3.0)
1957-59 to 1962-64	10 (1.9)	-1 (-0.3)	8 (1.6)	10 (2.0)	3 (0.6)	14 (2.6)	10 (1.9)	2 (0.4)	12 (2.3)
Pre-War to 1962-64	32 (1.0)	7 (0.3)	42 (1.3)	32 (1.0)	14 (0.5)	50 (1.5)	32 (1.1)	11 (0.4)	47 (1.5)
1948-52 to 1962-64	28 (1.9)	4 (0.3)	33 (2.2)	24 (1.7)	18 (1.3)	46 (3.0)	27 (1.8)	12 (0.9)	42 (2.7)

* Meat and milk in terms of milk equivalent taking 1 unit of meat as equal to 10 units of milk. Figures in brackets are annual per cent rates of growth (compound).

Table VIII. Net trade as percentage of food supplies, by regions
(+ = net imports; - = net exports)

	Pre-War	1948-52	1963-65
Western Europe	+ 21	+ 17	+ 16
North America	+ 1	- 6	- 13
Oceania	- 89	- 83	-102
Far East (excl. China M.)	- 2	+ 3	+ 6
Near East	- 1	+ 3	+ 7
Latin America	- 25	- 11	- 9
Africa	- 14	- 10	- 10

Table IX. Consumption of commercial fertilizers, total and per hectare of cropland

	Total consumption				Consumption per hectare of cropland			
	Pre- War	1948- 52	1957- 59	1962- 64	Pre- War	1948- 52	1957- 59	1962- 64
	(Thousand metric tons)				(Kg. per hectare)			
Far East (excl. China M. and Japan)	332	352	852	1,746	1.2	1.3	3.2	6.5
Near East	100	170	290	516	1.2	2.0	3.4	6.1
Africa	110	240	393	563	0.4	1.0	1.6	2.3
Latin America	140	360	793	1,370	1.4	3.7	8.3	14.3
Mexico and Central America	35	106	297	503	1.1	3.3	9.2	15.5
N. and W. countries of South America	65	113	176	396	3.6	6.3	9.8	22.0
Brazil	30	54	176	221	1.6	2.8	9.2	11.6
River Plate countries	2	17	18	39	0.1	0.7	0.8	1.7
Developing regions (excl. China M. and Japan)	682	1,122	2,328	4,195	1.0	1.6	3.3	6.0
North America	1,440	4,570	6,793	9,976	6.3	20.1	29.9	43.9
Europe (incl. USSR)	6,063	8,239	14,228	19,293	15.9	21.6	37.2	50.5
Oceania	360	520	796	1,133	10.3	14.9	22.7	32.4
Developed regions (incl. Japan)	8,550	14,067	23,285	32,189	13.1	21.6	35.8	49.5
World (excl. China M.)	9,232	15,189	25,613	36,384	6.8	11.3	19.0	27.0

12. POPULATION GROWTH AND ITS IMPACT ON EDUCATION

Lim Tay Boh

University of Singapore

HOW POPULATION GROWTH AFFECTS EDUCATION

The main impact of population growth on education is its effect on the age-structure of the population. In countries with rapid population growth, the age-group which shows rapid rates of growth relates to those attending schools, colleges and universities. Those in the school and college going age-group 6-19 show rapid growth, and the impact of rapid population growth on the age-structure can be clearly seen in projections of future population covering a period of 15-20 years.

The impact has its effect on enrolment in educational institutions, e.g. enrolment in primary and secondary schools, and in colleges and universities. The increase in the population in the current year affects the number of school children entering school six years later. It will continue to affect the number of children enrolled in schools for a further period of 11 years after that. The increase in the school enrolment means that more schools will have to be built, while some classes will have to increase in size. The number of sessions in each school may also have to be doubled. The impact will also increase the need for more teachers and this will in turn increase the need for more training facilities to turn out more teachers for the primary and secondary schools. The financial impact will be reflected in the annual government budget for education.

TRENDS OF POPULATION GROWTH

WORLD POPULATION GROWTH

The first points to determine are the trends of world and regional population growth and their impact on the age-structure. The trends of world population growth are well known. The rate of growth of world population has been accelerating during the last three centuries. Between 1650 and 1950, the rate of growth averaged 0.5% per year. Over this period the rate of growth increased from about 0.3% per year between 1650 to 1750 to 0.9% per year between 1900 and 1950. The average rate of growth between 1930 and 1940 averaged 1% per year. Since the end of World War II however, the growth rate has been further accelerated and has now reached a level of about 1.7% per year. At this rate of growth, the world population will double in only 42 years.

What is significant from the point of view of the impact of population growth on society is the fact that the future rate of growth is likely to be even higher. According to a UN forecast of the future rate of population growth, the present world population of about 3,300 million is likely to increase between 1950 and 1975 at a rate of 2.1% per year. This expected rate of growth is of course based on the assumption of a moderate rate of growth. On the same assumption, the rate of growth between 1975 to 2000 is expected to increase to 2.6%. This means that the world population will double in 33 years at the 1950 to 1975 rate of growth and in 27 years at the 1975 to 2000 rate of growth.

REGIONAL RATE OF POPULATION GROWTH

When we look at the regional picture, the trends in the rate of population growth are even more alarming. According to Dr. Hernan Rom6ro, the rate of population growth in the Latin American region rose from 1.9% in the second decade of this century to 2.8% between 1960 and 1962. The current rate of population growth is 3%, at which rate the population is expected to double in 23 years time. This is a significant rate of increase, especially as Latin America's total population of 240 million constitutes about 7% of the total world population.

In the South East Asian region the total population is about 230 million which is only slightly smaller than that of Latin America. This region consists of smaller countries, including Burma, Thailand, Cambodia, Laos, Vietnam, the Philippines, Malaysia, Singapore and Indonesia. Indonesia is an exception because it has a population of about 100 million and is the largest unit in the region. The annual rate of its population growth is now over 2%. In Malaysia which has a population of about 9 million, the annual rate of population growth is now about 2.5%, whereas in Singapore, the annual rate of growth is now about 2.8%. At the current rate of growth, the population of Singapore is expected to double in 25 years.

IMPACT ON THE AGE-STRUCTURE OF POPULATION

The rapid rate of population growth affects significantly the age-structure of the population. This tends to be concentrated on the younger age-groups. For the highly developed countries in Europe, the proportion of those below the age of 20, which includes most of the young people in the school-going and college-going age-groups, is about 20%. In Latin America about 40% to 45% are in these age-groups. In South East Asia more than half of the population are below 20 years old.

In South East Asia the effects of rapid population growth on age-structure can be seen from the following table which shows the changes in the age-group 5-19 expressed as percentages of the total population between 1950-1980.

Table I. Population in age-group 5-19 as percentage of total population in South East Asian countries, 1950-1980

<i>Countries</i>	<i>1950</i>	<i>1960</i>	<i>1965</i>	<i>1980</i>
Burma	49.5	49.9	50.5	51.5
Indonesia	47.7	48.1	49.4	50.0
Malaya	51.8	54.9	56.2	58.3
Philippines	55.7	57.1	57.0	57.3
Singapore	47.7	52.7	55.6	58.2
Thailand	53.9	53.9	54.6	54.8
Vietnam	47.1	45.6	46.3	49.4

The above table shows clearly that by 1980 for nearly all of the countries in South East Asia, more than half of the population will be in the age-group 5-19.

POPULATION GROWTH IN THE REPUBLIC OF SINGAPORE

The impact of population growth on education in the small Republic of Singapore illustrates the problems which confront developing countries with rapid population growth. The small Republic of Singapore is on a small island with a concentration of population in a rapidly growing city. The total land area of the Republic is only 224.5 sq. miles but the population has reached nearly 2 million. Over the last four years population has been increasing at the rate of about 2.5%.

There is evidence to show that the population has been growing progressively younger since 1921. From 1921, the proportion of persons below the age of 20 years was 29%; by 1957 it was 52.5%. This proportion is also true for both sexes. The mean and median age of the population calculated from data of the three censuses 1937, 1947 and 1957 are shown as follows:—

Table II

	<i>Mean</i>	<i>Median</i>
1937	26.6	26.3
1947	25.2	22.7
1957	22.9	18.8

The population of Singapore was approaching a settled one by 1957. With a more even sex ratio and a high birth-rate the population was progressively getting younger. The pressure of the population on existing resources will be increasingly felt unless there is a rapid decline in fertility.

The forecast of the future growth of population has been calculated on existing rates of fertility and a normal decline in the rate of mortality, and on the assumption of the absence of any future effect of immigration. This represents a conservative projection. On this basis the population compared with 1950 would treble by 1980. If 1960 population is taken as the base the population would about double by 1980.

Table III. Singapore: total population (in millions) estimated for 1950 and projected conservatively to 1980, and relative increases in population 1950-1980

1950	1960	1980	1980 population per 100 of 1950 population
1.1	1.6	3.3	300

The above estimates are based on the assumption that the fertility of the population of Singapore does not decline. There is evidence of a decline of fertility in the Singapore population in the last few years. If we assume moderate fertility decline, the estimated population of Singapore will be about 3.1 million in 1980 and on the assumption of a rapid fertility decline, the population will be about 2.9 million by 1980. It is clear, therefore, that unless there is rapid decline in fertility, the population of Singapore in 1980 will be about double that of 1960.

IMPACT ON ENROLMENT IN EDUCATIONAL INSTITUTIONS

Both actual and projected changes in the age composition of the population of Singapore between 1950 and 1980 show that the population is growing progressively younger. In 1950 the population in the age-group 5-19 was about 48%. By 1960 it had risen to about 53%. By 1980 it will be about 58%. By then persons in the younger age-groups will be nearly four times those of 1950 or two and a half times those of 1960.

This rapid growth in the size of the younger age-groups will in turn increase the number of children and young people attending schools and colleges. It has been estimated that by 1970, the total number of school children in Singapore will be over 630,000 compared with over 340,000 in 1960, i.e. the school population will almost double itself within this decade.

A projection of enrolment in the University of Singapore shows that the student population by 1970, even on an assumption of a moderate rate of growth, will be four times that of 1960.

IMPACT OF POPULATION GROWTH ON EDUCATIONAL FACILITIES

The increase in the school and university student population has important implications from the point of view of the provision of educational facilities. This is illustrated by the experience of the USA during the fifties and early sixties. The increase in the percentage of population of school-going age, due to population growth, resulted in the fifties in tremendous pressure on elementary school facilities throughout the country. The elementary schools in the USA "were inundated by a tidal wave of postwar babies who reached school entrance age early in the fifties, many of whom flowed through the eight years of elementary schooling within the decade. During the sixties, pressure on elementary schools levelled off, reflecting the plateau in the postwar birth rate. But the tidal wave continued its relentless surge through the high schools of the United States in the early sixties, and will later in the decade exercise its pressure on the colleges."¹

Enrolment increases of the magnitude experienced in the USA in the fifties and sixties "have not been accompanied by adequate expansion in school plant, facilities and teachers. As a result, there was a deterioration in the quality of education at the elementary school levels during the fifties. The adverse effect on the quality of education has spread to the high schools and colleges during the sixties. During the seventies the colleges and professional schools will still be reeling under the impact of rapidly increasing student enrolment. Part of the upturn

in enrolment especially in high school and college arises from increases in rates of enrolment rather than the population explosion. Gains in enrolment rate are, of course, indicative of the rising level of living. The expansion of educational facilities that would be necessary to accommodate increased enrolment alone would, however, be but a fraction of the present and prospective needs arising from both higher rates of enrolment and rapid population growth."¹

In Singapore one of the main quantitative problems posed by the increase in the number of children of school-going age is the provision of more places in the schools. This problem was tackled by the present government with characteristic drive and vigour. Two stages in the handling of this problem may be distinguished. In the first stage attention was paid to the building of additional schools mainly for primary school children. Most of the existing primary and secondary schools also introduced double sessions, one for the morning, and the other for children in the afternoon. Some of the existing schools were extended to provide more classrooms for the increasing number of pupils. The above measures provided a sufficient number of places in the primary schools to accommodate the increasing number of school children. With the problem of the primary school children under control, more attention was paid in the second stage to the problem of expanding more rapidly the secondary schools. In this respect the efforts were directed not only to the building of traditional secondary academic schools, but also to the building of more secondary vocational and technical schools. Since 1960, the government has pushed forward vigorously its programme of school building which has resulted in the completion of a total of more than 70 additional schools.

Its record in this respect over the five-year period 1961-1965 can be seen from the following table.

Table IV. Number of primary and secondary schools built in Singapore, 1961-65

Type of school	1961	1962	1963	1964	1965
Primary	6	11	9	N.A.*	N.A.*
Secondary (Academic)	4	3	3	2	7
Secondary (Vocational)	-	1	1	1	3
Secondary (Technical)	-	-	3	4	3
Total	10	15	16	7	13

* Not available.

The total number of primary schools in the Republic in 1964 was five less than that for 1963, and in 1965 was one less than that for 1964. This may have been due to the reorganization of primary schools into larger units. It is probable that while additional primary schools continued to be built, the main effort of the Ministry of Education was concentrated on the building of secondary schools.

The increase in the total enrolment in the primary schools which was made possible by the expansion of primary schools is shown in the following table:—

Table V. Total enrolment in the primary schools, Singapore, 1960-65 (in thousands)

Primary schools	1960	1961	1962	1963	1964	1965
Government and Government aided	280.8	298.7	315.5	332.8	350.0	359.5
Private	9.7	9.2	9.2	8.7	8.2	7.3
Total	290.5	307.9	324.7	341.5	358.2	366.8

It can be seen from the above table that the total enrolment in the primary schools in 1965 increased by about 26% over that of 1960.

The secondary school enrolment in 1965 was, on the other hand, almost double that of 1960. This can be seen from the following table:—

Table VI. Total enrolment in the secondary schools, Singapore, 1960–55 (in thousands)

<i>Secondary schools</i>	<i>1960</i>	<i>1961</i>	<i>1962</i>	<i>1963</i>	<i>1964</i>	<i>1965</i>
Government and Government aided	56.3	65.3	68.7	80.5	98.3	113.3
Private	3.0	2.6	3.6	4.0	4.3	4.0
Total	59.3	67.9	72.3	84.5	102.6	117.3

The increase in the number of school children posed a problem of whether they should all have an academic type of education at secondary level or whether their education should be diversified by the provision of more vocational and technical schools. The policy of the Singapore Government was to give greater emphasis to vocational and technical education. During the last five years, the Singapore Government has included in its programme of school building the construction of 6 vocational and 10 technical secondary schools besides that of building new secondary academic schools. The Singapore Vocational Institute was opened in 1963 for the training of craftsmen, while the Singapore Polytechnic provides courses in building and engineering at technicians level.

The quantitative problem of expansion has, however, unfavourable consequential effects in that the increase in the size of student enrolment was accompanied by a deterioration in the quality of school education. Among the factors which have been responsible for this deterioration is the increase in the size of the classes (the maximum for each class is 44) and the decline in the teacher-pupil ratio. The expansion in the student enrolment has imposed a severe demand on the supply of teachers. As a result, the quality of teaching suffers on two accounts—(a) owing to the need to recruit additional teachers in large numbers within a short period of time, many of the teachers appointed are not of high calibre, and (b) the crash programme of teacher-training which was necessitated by the need to train teachers in large numbers on a part-time basis, diluted the standard of training of new teachers. In the primary schools, the quantitative problem of the number of teachers required to man the classes in the schools was solved by increasing the supply of teachers trained under the crash programme, but there are serious weaknesses in the quality of education. In the secondary schools there is still a severe shortage of graduate teachers. Moreover, such graduate teachers as are trained under the crash programme of a year of part-time training cannot play as effective a role in raising the quality of secondary education. There is statistical evidence of the increase in the number of teachers at both primary and secondary level. But the defects and the quality of education due to rapid expansion of the student population are still engaging the attention of the school authorities and the Ministry of Education.

The only college for the training of teachers, the Singapore Teachers' Training College, continues to play its role in helping to solve the problem of the supply of teachers for the primary and secondary schools. During the last few years, the number of trainees enrolled in the college has increased from 2,330 in 1960 to about 3,600 in 1965. The University of Singapore School of Education gives a one-year full-time training course to graduate teachers who wish to qualify for the University Diploma in Education. The supply of graduates from this source serves to supplement the total supply of graduates for the secondary schools.

The major problem in the expansion of training facilities in the Singapore Teachers' Training College is the difficulty in the recruitment of qualified instructors or lecturers. A large number of these must necessarily consist of those who have done graduate work either in the University of Singapore or in overseas universities. The need to turn out in the first place, degree graduates for the schools as well as to provide higher training for potential lecturers to staff the Teachers' Training College, impinges more and more on the limited resources of the University. The University itself is facing difficulties in recruiting staff of high calibre in the severely competitive international market, and its own modest programme

of expansion is being hampered by severe limitations of finance and difficulties of staff recruitment.

FINANCIAL IMPACT OF POPULATION GROWTH

The impact of population growth on the government budget for education is shown by the rapid growth in government expenditure on education during the last few years. The 1967 government budget for education is \$47.9* million, compared with \$22.7 million in 1961, an increase of 110.7%. It now constitutes 25.6% or more than a quarter of the total government budget. In 1961 it was only 20% or one-fifth of the total government budget. The education budget includes an allocation of \$5.5 million for higher education. This is about 11.5% of the education budget or about 3% of the overall government budget.

As a result of the expanded school building programme, capital expenditure on school buildings increased sharply from \$0.2 million in 1960 to \$2.3 million in 1962 and to over \$3.3 million in 1963. Owing to the competitive claims of other important aspects of national development, especially economic and industrial development, it will be increasingly difficult to allocate sufficient money to finance the expansion necessary to cope with the effects of the impact of an explosive population growth.

* \$ = U.S. Dollars.

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13. IMPACT OF POPULATION GROWTH ON MENTAL HEALTH

G. M. Carstairs

Department of Psychiatry, University of Edinburgh, Royal Edinburgh Hospital

INTRODUCTION

When statisticians warn us about the inevitable consequences, in terms of population, if recent trends are allowed to continue unchecked during the next few generations, our first concern has naturally been over the basic question of survival: will the world's resources suffice to feed all those extra millions? No sooner have we heard the arguments on this theme, than we find ourselves facing the next question: what will be the *quality* of the life led by the inhabitants of an over-crowded planet?

In former centuries, the vast majority of mankind could not indulge in the luxury of aspiring to a high standard of living. Simply to survive into late adulthood, at the same level of subsistence as one's forefathers, was good fortune enough. From the time of the earliest pre-historic civilizations to the present day, in almost every human society, it was only the privileged elite who were in a position to cultivate their sensibilities, and to expand the boundaries of human experience and understanding. As recently as the beginning of the present century, the very chances of survival through early infancy were more than twice as high for the children of the rich as for the children of the poor in the same city. Throughout the world, survival has become more generally attainable, for rich and poor alike; and now, for the first time in the history of mankind, education, self-awareness and the aspiration for a meaningful and satisfying life-experience are being shared to an increasing extent by the entire mass of the population.

Inevitably, once the killing disease and the threat of starvation have been averted, people become increasingly aware of, and discontented with, minor forms of discomfort or unhappiness. One of the striking changes in morbidity, in both highly developed and in developing countries during recent decades has been the apparent increase in neurosis and psychosomatic disorders. These functional illnesses—which some people would prefer to regard as manifestations of “problems of living” rather than of disease—have long been recognized among the privileged classes. Already in 1689 Thomas Sydenham declared that half of his non-febrile patients, that is a sixth of his total practice, were hysterical, and in 1733 George Cheyne stated that a third of his patients were neurotic.

But both Sydenham and Cheyne were fashionable physicians, whose clientele was drawn from the wealthy minority of the English society of their day. Sydenham himself observed that hysteria was commoner among women of the leisured classes than among those who had to toil. It is only in the present day that the working classes have been in a position to enjoy the luxury of being neurotic; but recent surveys, both in the East¹ and in the West² have shown that already the rates for almost every form of mental illness are highest among the socio-economically under-privileged sections of contemporary societies.

It must be emphasized that the very marked increase in the “visibility” of mental disorders in most countries of the world is partly due to the better control of infections and other serious physical illnesses. Neurosis is a by-product of a raised level of expectation of the quality of life-experience; it can, therefore, act as a spur towards the further enhancement of the standard of living—provided, of course, that steps can be taken to remedy the adverse environmental factors to which the symptoms of neurosis have drawn our attention.

Here we are confronted by a vital question: what will be the consequences, for mental health, of a massive increase in human populations?

As yet, the science of human behaviour is not sufficiently developed to be able to answer this question with precision, or even with confidence. Nevertheless it is possible to learn from studies of animals, both in their natural environment and under experimental conditions, and to note certain apparently invariable consequences of severe overcrowding; with due caution, one can infer similar repercussions of overcrowding in man. There are also a number of direct observations, in human populations, on the inter-relationships between overcrowding and certain indices of mental health, from which we can predict with greater confidence the likely consequences of overcrowding on a still larger scale.

STUDIES OF ANIMAL BEHAVIOUR

At first sight, it might seem that much could be learned from observations on species such as lemmings, or voles, which are subject to periodic fluctuations of population size. It proves, however, that these fluctuations are determined by rather gross environmental factors of food supply or infection, which predominate in importance over social interactions. On the other hand, the work of ethologists, has taught us a great deal about the interaction of innate, biological propensities and learning experiences in many animal species. At a relatively crude level, this can be shown in the modification of the animals' adrenal size and activity. The adrenals play an essential role in an animal's response to stress, whether by fighting or by taking flight. There is a conspicuous difference between the size of the adrenals in wild rats and in rats which have been bred for generations in captivity, the latter having much smaller adrenal glands. When wild rats are caged, and allowed to breed, a diminution in adrenal size becomes apparent in a few generations.

Adrenal activity is stimulated by social interaction especially by the challenge of attack and the need for counter-attack in self-defence. It is an interesting finding that the quality of the stress response takes on a different character for the animal which is victorious in the contest. Such an animal can go from strength to strength, able to fight one battle after another and in the intervals of fighting its sexual potency is also at a high level. In contrast, an animal which undergoes a series of defeats becomes debilitated, even although suffering no obvious physical injury, and is sexually less active. The biologist, S. A. Barnett, has epitomized this reaction as follows: "evidently the bodily response to humiliation resembles, in some ways, that to danger to life or limb".³ Usually the loser in such contests is able to survive by escaping from the scene of battle and thereafter refraining from challenging its victor; but there are situations both in the wild and in the captive state where animals are unable to escape, and are repeatedly confronted by the threat of a contest in which they are doomed to defeat. There are well-authenticated observations, in rats, of the weaker animal's sudden death under such circumstances, and even careful post-mortem examination has failed to show any organic pathology to account for these deaths³. An analogy may be found in observations on the toxicity of amphetamine drugs, whose action is similar to that of adrenaline, the secretion of the medulla of the adrenal gland. A relatively small dose of amphetamine will prove fatal to a rat which is confined in a cage with many other rats, whereas a rat which is kept in isolation can survive doses of amphetamine up to four times greater. It is presumed that the effect of the drug is greatly enhanced, in the former situation, by the numerous stressful interactions with the other rats, each of which stimulates the output of more adrenaline until complete exhaustion supervenes.

These, of course, represent extremes of over-stimulation. Many species of animals and birds have evolved self-protective behaviour patterns to ensure that such extremes will not occur. Typical of these behaviour patterns is the "peck order" or status hierarchy, by virtue of which a group of animals who meet each other regularly first fight each other, and then mutually agree a rank order of ascendancy after which the animal of inferior status invariably concedes in the face of a challenge from those above him in rank. Wynne-Edwards¹ and Leyhausen² have shown that status hierarchies can be either *absolute*, where every member of a group of animals invariably remains in the same position in relation to each of his fellows, or *relative*, in which under different circumstances of time or place the individual's respective degrees of ascendancy over each other may change. Absolute status hierarchy is most likely to be found where all the animals in a group share the same living-space, and it becomes most clearly defined when that space is a restricted one.

Relative dominance is seen most clearly in animals which have individual territories. When on their home ground, they are often able to vanquish an intruder and compel him to retreat whereas if they are challenged by the same individual on *his* home territory they in turn will admit defeat. It seems that not only birds, but most mammals (including man) exhibit this kind of territorial behaviour. Not only football teams, but all of us, tend to perform best on our home ground—mental as well as physical—and to resist anyone who ventures to challenge us there. Naturalists have recognized in territorial behaviour, and in the varying degrees of dominance associated with the centre and the periphery of the territory, a self-regulating mechanism which ensures an optimal degree of dispersion of the species.

When animals such as domestic cats, which customarily enjoy quite a wide range of movement, are crowded together in a limited space there tends to emerge one particularly tyrannical "despot" who holds all the others in fear, and also one or more whom Leyhausen⁶ terms "pariahs", at the bottom of the status hierarchy. These unfortunate creatures, he observes, are "driven to frenzy and all kinds of neurotic behaviour by continuous and pitiless attack by all others". Although these "pariahs" bear the severest brunt, the whole community of cats held in such close confinement is seen to suffer. These cats "seldom relax, they never look at ease, and there is continuous hissing, growling and even fighting. Play stops altogether, and locomotion and exercise are reduced to a minimum".⁶

This clearly represents a pathological social situation, in which overcrowding and confinement conspire to accentuate disturbing confrontations between individuals. Another observer, studying the behaviour of colonies of rats under different degrees of overpopulation observed similar changes in their customary interrelationships. Where overcrowding was most marked, the enforced social interactions were seen to interfere with the satisfaction of quite basic biological needs such as feeding, nest-building and the care of their young. Normally, mother rats whose nest is disturbed will carry their young one by one to a place of safety, but in overcrowded pens this behaviour pattern was lost, and the rats' maternal care became so faulty that in one experiment 80% and in another 96% of all the young died before reaching maturity. Among the males, some became ascendant over their fellows but others showed a number of disturbances of behaviour, of which two patterns were particularly striking: some males appeared to opt out of sexual and social interaction altogether, skulking alone on the periphery of the group, while others became morbidly pansexual, mounting female rats, whether receptive or not, whenever they could do so without being attacked by one of the ascendant males. These hyperactive rats contravened many of the norms of behaviour of their group, even becoming cannibal towards the young of their own kind.⁷

It is, of course, a far cry from the behaviour of rats and cats to that of humans; but observations on the behaviour of higher primates have a more immediate relevance. Recent studies of apes and monkeys in their natural habitat have greatly modified earlier pre-conceptions about the frequency of both fighting and sexual behaviour, based upon observations of apes in captivity. In the wild state, protective mechanisms operate to control the frequency of both types of behaviour; but when groups of primates outgrow their territory, the frequency of quarrelling and fighting increases.⁸ The behaviour of caged apes, on which Zuckerman⁹ based his generalizations of primate behaviour has proved to be only a travesty of their conduct in the wild, the product of their being confined in overcrowded conditions without the possibility of escape. In human populations, however, boundaries can be set by social institutions and by communicated attitudes and values, and these boundaries can under certain circumstances create a sense of confinement no less demoralizing than the bars of a cage:

OBSERVATIONS ON HUMANS

It is perhaps significant that Leyhausen and Lorenz, the two naturalists who have devoted more attention than almost any others to the disruptive effects of overcrowding, themselves both underwent the painful experience of being closely confined in a prisoner-of-war camp for several years. Their personal observations, which have been corroborated by other medical and psychiatric witnesses¹⁰⁻¹² were that when a group of men were penned up together in close quarters for many months on end they tended to become hyper-irritable, and to find each other's small mannerisms positively intolerable.

These, too, like the observations on caged cats and rats, were instances of extreme conditions; and yet one has to realize that there are many impoverished groups in the world whose conditions of life today are scarcely better. In theory, of course, they can escape from their surroundings; but in practice the "culture of poverty" can induce a sense of despair of ever being able to escape.¹³ One is tempted to draw an analogy between the rat which is subjected to a series of physical defects, or the "pariahs" in an overcrowded colony of cats, and the members of problem families in our city slums who display a seeming inability to make a successful social adaptation. Many years ago, Faris and Dunham¹⁴ drew attention to the ecological concentration of certain forms of mental illness in those parts of a large city where social disorganization—or *anomie*, as Durkheim¹⁵ had earlier described it—was most marked. Subsequent research has challenged Dunham's specific contention that schizophrenia is generated by the conditions of life in a socially disorganized community; but many other studies have confirmed his demonstration that alcoholism, illegitimacy, divorce, delinquency and numerous other forms of social pathology are most prevalent in such areas.

There remains, however, an interesting contrast, in the social correlates of suicide and attempted suicide respectively—at least, as they are observed in cities of the Western world. Suicide rates are highest in areas where many people live in a state of *social isolation*, bereft of the support of family, or of any other primary group. On the other hand studies of attempted suicide have shown that the most important social correlate is *overcrowding*. Typically, the person who makes a non-fatal suicidal gesture has been harassed beyond endurance by recurrent friction within the domestic group, in cramped and overcrowded premises. Here too, as in the instance of rats' dose-resistance to amphetamine, one can see the mutual reinforcement of multiple factors. A majority of those who attempt suicide are relatively young men and women, who often have had a bad start in life with unstable or absent parent-figures. These patients tend to experience great difficulty in their turn, in forming inter-personal relationships: they are often at the same time demanding and inconsiderate towards others, and yet themselves emotionally immature and dependent. Their deficiencies prompt them to seek out partners from whom they hope to derive support, but all too often the partner whom they select is handicapped in much the same way; so far from meeting each other's dependency needs, these unfortunates only succeed in making each other's state even worse than before. Often, too, they turn to drink or drugs to allay their need for dependence and this in turn further impoverishes their ability to form rewarding personal relationships.^{16,17} During recent years, countries have been obliged to take stock of increasing rates of alcoholism, delinquency and attempted suicide, indicating that an increasing number of citizens in our large cities feel alienated from the goals, and the rewards, to which their fellow-citizens aspire—and alienated so profoundly that they despair of ever being able to get back into the mainstream of humanity.

Alienation and despair are the product of extreme situations—such as, for example, were realized in the grotesque, doomed societies of the Nazi concentration camps. Many, if not most, of the inmates of such camps found themselves surrendering their customary standards of behaviour and their values, becoming completely disoriented by the inhuman conditions under which they were forced to live.¹⁸

There have been crises, in the course of human history, when quite large sectors of mankind experienced this sense of alienation from participation in the life of their fellow-countrymen. Sometimes, after prolonged deprivation, their discontents have exploded in outbreaks of revolution, as a result of which a new social order has been created; but at other times leaderless masses of the dispossessed have shown themselves only too ready to become the dupes of mentally unstable, yet charismatic demagogues, who promised them a magical deliverance from their miseries. The historian Norman Cohn¹⁹ has shown how often in European history periods of social and economic disruption have resulted in quite large populations feeling trapped and victimized; and without exception these alienated sections of society have resorted in the end to violence. The same phenomenon has occurred repeatedly in modern times, when the pace of political change has outstripped a society's capacity to meet the newly aroused expectations of its members. When, because of increasing overpopulation, the standards of living actually decline at the very times when people's aspirations have been raised, the stage is set for further outbreaks of collective irrationality and violence.²⁰

It is imperative that we recognize the gravity of this threat, because mankind today possesses weapons of such destructive power that the world cannot afford to risk outbreaks of mass violence; and yet the lesson of history points to just such a disaster, unless population control can be achieved before vast human communities degenerate into the semblance of concentration camp inmates, if not to that of Zuckerman's pathologically belligerent apes.

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RAPPORTEUR'S SUMMARY

The four speakers had to condense their remarks within the time limits assigned, and to concentrate on the most important aspects.

Insofar as their formal presentations are concerned, no additional statements are required over and above the submitted papers contained in this volume.

The first topic chosen for discussion was mental health. There was an indication that under some circumstances, the anxiety and stress caused by the rapid growth of population would be rather conducive to an increase in production, providing it was not too serious. This "divine discontent" has stimulated progress in social reform. Another comment was concerned with the relatively high risk of mental and physical illness particularly among those individuals migrating into cities from rural areas. During the period of adjustment to a new environment, there are often seen relationships of aggressor versus victim. After a complete transition from a rural to an urban way of life, people tend to practice family planning, but early education in family planning is necessary to cope with this problem. Furthermore, it was pointed out that a higher prevalence of mental disease among the socio-economically under-privileged might be better explained by their higher expectations for a better life rather than by the level of their I.Q., which could be relatively high.

As for education it was reported that 25% of the total revenue was spent on education in Singapore. Also, the speaker from Singapore emphasized the need for educational development to proceed hand in hand with over-all social and economic development. Without such consideration, the increase in the number of highly educated men and women might only give rise to frustration on the part of many individuals when they are faced with the reality of the unavailability of satisfactory jobs. It was stated that an increase in education did not mean an increase in quantity alone; opportunities for more advanced technical and vocational education were required as well. Graduates with certain technical skills are obviously in a better position to seek better jobs. Likewise, if we could give farmers a feeling of security for their products by providing a guaranteed market such as "food bank", they would become more receptive to technological advancement.

In relation to the topic of food supplies, discussions were mostly concentrated on the role of FAO. It was recognized that the contributions made by FAO in the past were outstanding. However, it was admitted that there were still so many problems in many countries—in some, political difficulties were involved in the problem of food production, and in some others, a real difficulty was the education of food producers as compared with the fairly efficient education of consumers. The solution calls for approaches from various angles; institutional reform on a large scale as well as international trade and aid. The representative from FAO, on the other hand, called attention to the nature of the organization; because of its international structure, it could not act directly in individual countries; the initiative must come from the government concerned to ask for the FAO's possible active contributions. Also, in a discussion with particular reference to Latin America, the possibility of doubling or even trebling the arable area was suggested. However, more important is an increase in productivity in order to raise the yield per unit of land, which certainly calls for more research into tropical farming.

In the last place, there were brief discussions about housing. The speaker from Poland presented his observations on the relationships between housing and population growth on the basis of his experience in Poland. Three stages are recognizable; from the first "pioneering stage" they move to the second stage of "planning new homes" in which a baby boom occurs as a result of a "feeling of security." Then there comes the third "stage of stabilization" which is characterized by lowered fertility as a result of the drive for material goods.

The discussions, though fragmented by each topic for the sake of procedure, indicated that in actuality there were obvious close interrelationships between the four subjects of housing, education, food and mental health as related to population problems.

Session 4

PATTERNS OF FAMILY LIFE

14. THE FAMILY AS A SOCIAL UNIT: RESPONSIBILITIES OF HUSBAND AND WIFE

Aziza Hussein

Delegate of the UAR to the UN Commission on Human Rights

The family, according to sociologists, is the only institution so far devised by human society for the preservation of its race and its culture. Viewed abstractly, it is the most stable, enduring and universal of all social institutions, Church and State included. Having existed in pre-history, the family institution is said to satisfy certain universal needs among men in all times. For this reason, calculated efforts to destroy the family institution on so-called Utopian grounds appear to have systematically failed.

There are different forms of family systems which correspond to variations in social cultures. Every society devises its own family structure based on the formula which proves successful in satisfying certain basic human needs under its particular circumstances. In their various and ever changing forms all family systems aim to achieve one common goal, considered essential for the very survival of society, which is procreation and the support and socialization of children.

According to Murdock, after his study of 25 different societies, the nuclear family, which is made up of husband, wife and children, was found to be universal, whether it be an independent unit or attached to a larger family aggregate. Murdock lists four basic functions which are performed by the nuclear family. These are sexual cohabitation, economic cooperation, procreation, and the socialization of children. It is the combination of these four functions which have given the nuclear family its universal utility.

I shall take these functions as outlined by Murdock as a basis for the preliminary discussion of the subject of the responsibility of husband and wife in the family.

1. Sex cohabitation is a necessary condition for procreation and serves to cement the affectional relationship between husband and wife. Because sex is a powerful instinct, restrictions and taboos are imposed on sex activity by all societies. These serve to establish the physiological nature of the offspring in the family, as well as to ensure the harmonious relationships upon which human social life should rest. Sex controls and licences differ from one culture to another. Some societies allow sex activity outside of marriage; others demand chastity before marriage and fidelity during marriage. Under the most permissive culture, however, freedom of sex intercourse does not usually extend to include freedom of procreation—there is no place for children born out of wedlock in almost all societies. And in societies where standards of chastity and fidelity are required, on religious or other grounds, the fear of illegitimate procreation places a heavier burden of responsibility upon women, married or unmarried. In many of these societies chastity becomes by and large to be solely demanded of the girl, while boys may even be encouraged “to sow their wild oats”. In the same way infidelity committed by a wife is considered a graver offence than when committed by a husband, not only socially but very often legally. Unequal treatment of men and women with regards to adultery crimes in many national legislations is but another reflection of this double standard of sex morality. The new sex revolution, which is beginning to spread in Western society (and which is viewed with horror and indignation in the Oriental part of the world), is among other things a reaction against this traditionally unbalanced outlook on sex. According to the proponents of the new view, contraception is one of the important means of achieving equal moral responsibility in sex matters between men and women, in and outside

of the family. It serves to dissociate the procreative function from the sex activity, so that no penalty need be attached to the women's sex behaviour.

2. Economic cooperation is another function which holds husband and wife together and which makes possible the rearing of children. Man and woman make an exceptionally efficient cooperating unit by virtue of their primary sex differences. The utility of such a division of labour between man and woman in the family, exercised over the centuries, is made partly responsible for what is now called sex temperament and sex aptitudes—these are now attributed more to "habituation to different occupations in adulthood and early sex-typing in childhood" than to innate psychological differences. This assumption finds support in the fact that modern women have entered almost every field of occupation which had been traditionally considered a masculine preserve.

The modern phenomenon of the employment of women outside the home and the entire philosophy of female equality, which was brought about by social, economic and political developments all over the world, "has no precedent in world history, and its implications for the family are far reaching". The ancient division of labour, which has everywhere given function and solidarity to the family, is giving place to a new concept of inter-personal cooperation and almost interchangeable roles between husband and wife. This results in a tendency to redefine marriage as a "mutually contingent pair of careers".

3. The third indispensable function of the family is procreation, which is the natural result of sex cohabitation. Not only do offspring satisfy psychological, spiritual, and often economic needs of individual parents, but human society has always had a stake in the maintenance of its numbers, and therefore has insisted that parents fulfil this obligation. Sanctions have often been applied against measures which threatened to curb procreation. High mortality in the past due to various hazards, epidemics, wars, famines, unavailability of adequate medical care, etc., was responsible for a subconscious fear of racial extinction. For this reason, perhaps, a narrow conception of womanhood developed over the centuries which emphasized the preservation of the species role of women at the expense of their human rights as persons free to exercise their personal power and to shape their destiny. To relieve themselves of the drudgery of unplanned pregnancies, women have almost everywhere resorted to one standard course: *induced abortion*, probably the most widespread crime committed by women for long centuries. With the population surge posing a new kind of threat to humanity, conception control is being recognized as a "social necessity for the well-being of the entire society, and not as a concession to the individual wishes of particular women". As parenthood becomes voluntary, not only are women delivered from the biological servitude of unplanned pregnancies, but children come to be wanted "more consciously as expressions of the creative and affection-giving potentialities of their parents".

4. The fourth universal function of the nuclear family, as listed by Murdock, is the socialization of children. While the physical rearing of the small children is almost the exclusive responsibility of the mother, their social rearing is more equally distributed between father and mother. This includes the subjugation of inborn impulses by cultural discipline as well as the transmission of traditional knowledge and skill. While kinship groups or outside agencies may share in the socialization process of the children, it is the immediate family which has the primary responsibility for the personality development of the child, whose psychological and social make-up is in a sense an expression of the family's values. No agency can supplant the family in this respect.

In countries of high birth-rate and low standard of living, the main aim of child-rearing is physical survival. The higher the standard of living, the greater the emotional, intellectual and spiritual investment by parents in their children. In some highly developed industrial societies self-conscious improvement for competent parenthood is sought with the assistance of professionals. Parents are getting to be aware of their responsibility for the kind of personality they turn out as their product.

There is a broad historical movement away from the joint-family system, in which several generations and degrees of relationships are combined, towards the independent nuclear form of family, characteristic of mobile industrial societies. The traditional family performed many functions—social, political, religious, educational, responsibility for the aged, etc., which had promoted family solidarity, but most of which have in modern societies been taken

over by outside institutions. According to conservatives the joint family conferred on its members an unquestioned sense of identity and security, while the member of the modern mobile nuclear family tends to suffer from a sense of isolation and loneliness. Moreover, the increase in the incidence of divorce in modern societies, the relinquishing of parental authority, the new liberalism in sex ethics, and the increasing employment of women outside the home are all taken by them as an indication of the impending disintegration of the family system. The optimists, on the other hand, consider these developments as marking a temporary state of reorganization in which the nuclear family will be increasingly integrated into the larger human society whereby the rights, duties and loyalties of its members transcend kinship relationships, and reach into the world community of the brotherhood of man.

Although there are general trends of changing family patterns in the world, yet in different cultures the changes take somewhat different forms. Here I shall take the Egyptian society, of which I am most familiar, as the specific example for a further discussion of the problem.

Egyptian society seems to be at the threshold of drastic social changes. The stability of its traditional family system is being shaken through social, economic and political developments, which started at the turn of the century, and which have increased in intensity in the past decade. The traditional family system of Egyptian society has for a long time been dominated by three main factors: Moslem family law, the family patterns of an agrarian society, and the tradition of the seclusion of women called the Harem.

1. For the majority of Egyptians the Moslem Shari'a law defines some of the most important facts of their legal rights and responsibilities in the family. Under this law, which reinforces the social values of the extended family system based on patriarchal authority, the husband has privileges as well as responsibilities not shared by his wife. A Moslem man has the right to marry more than one wife as well as the right to divorce his wife at will without recourse to court. He is restricted, in the exercise of these privileges, only by the dictates of his religious conscience. In fact he is enjoined by the Koran (the Moslem Holy Book) either to treat his wives with absolute justice—"and you will never succeed no matter how hard you try"—or to marry only one wife. (The licence to marry up to four wives was already a restriction over pre-Islamic practice.) Moreover divorce is described in the Koran as "the most hated of God's permitted acts", and the Prophet Mohammad is quoted as saying: "The most perfect among the believers are those kindest to their womenfolks". These privileges are now strongly contested by progressive elements in the Egyptian society, both men and women.

The Moslem woman, on the other hand, once married (by her freely signed consent), cannot obtain divorce except through court ruling on the basis of certain specified grounds among which are lack of adequate maintenance by her husband, physical violence, impotence, etc. . . . A divorced wife has the right of custody of her children up to a certain age, 7 and 9 for boys and girls respectively. But the father is their natural and legal guardian.

The Moslem man has further privileges in inheritance rights (he inherits double the share of the woman). But this privilege is not strongly contested, as it is often justified by the fact that the head of the family has maintenance obligations not only to his wife and children, but to dependants of his extended family, especially his aged parents. Moreover, women are considered dependants irrespective of age, and as such entitled to maintenance by their closest male kin. While they have independent property rights, and an independent legal personality, they are not required to contribute in any manner to the financial support of the family.

Although arguments are still sounded defending the sacredness and unalterability of Moslem Shari'a Law, as well as its underlying wisdom in balancing family rights with responsibilities, and in providing a system of social security for the family, the revision of these laws is under serious consideration by the official authorities in Egypt—a few other Moslem countries have already taken steps in this direction. The view is held by more and more Moslems that Islam is a progressive religion which makes allowance for the modification of its social legislation—to be differentiated from its purely theological dogma—in accordance with changing conditions and in conformity with the current interest of the community.

The view of Islam on some aspects related to sex is worth noting here. Sex according to the Moslem religion is an important and legitimate function of married life, both for the husband

and the wife, and not only a means for procreation. In fact the wife's deprivation of sex life entitles her to a judicial divorce. As to birth control, the Prophet Mohammad is said to have permitted his disciples to practise it under certain conditions. This fact is used as an argument in the Egyptian family planning campaign, to give a religious sanction to birth control. On the question of sex offences or adultery, the Moslem Shari'a Law deals equally with men and women. However, this is one case in which the Egyptian penal code deviated from the Moslem Shari'a, and borrowed a foreign legal system which discriminates between men and women in the penal treatment of adultery crimes.

2. Another dominant feature of the family system in Egypt is the tradition of an agrarian society. The vast majority of Egyptians are agriculturally occupied or have their origin in a rural background. Under this system the home and field are one economic unit in which husband and wife play complementary parts. Marriage is an economic necessity; hence is contracted at an early age, often below the legal minimum standard (16 and 18 for girls and boys respectively). Children assume responsibilities very early in life, accept their parent's authority unquestioningly, and are considered a source of security for their parents in their old age. Although peasant women are known to resort to induced abortion, they generally tend to regard uninterrupted child-bearing as a protection against the possibility of their repudiation by their husbands. In fact an important part of the status of the rural woman is derived from her child-bearing potential. The rural family is the centre of most functions, social, economic, religious, educational, political, etc., and family interests supersede those of the individual or of the community—the larger the family, the greater its social prestige, political importance and strength especially in the face of family feuds, which are a special feature of Upper Egyptian society.

3. The tradition of the seclusion of women, commonly attributed to the Moslem religion, had its origin in pre-Islamic civilizations, such as Persia and Byzantium. It had been practised to differentiate the free woman from the slave-girl who was exposed for public scrutiny in the slave market. Having been adopted by Islamic society, this tradition plagued the life of Egyptian women for centuries, and became moreover a sign of prestige and status. One day 45 years ago, an upper-class Egyptian woman, Mrs. Hoda Shaarawi, undertook to defy this tradition publicly by dropping her veil into the Mediterranean, and thereafter starting a movement for the emancipation of Egyptian women. To appreciate the significance of the subsequent change that took place in the role and status of the modern Egyptian woman, it is important to have a look into the practical implications of this long-standing tradition of seclusion for the woman's role in the family. This is especially true because the Harem era left its stamp on many people's minds in the form of a nostalgic image of the ideal woman which has not been easy to erase and which is still responsible for many ambivalent attitudes within the modern Egyptian family.

Until fairly recently the image of the ideal woman was that of a beautiful lady of leisure, who should neither be seen nor heard, but whose beauty could always be ascertained through her photograph, which could be obtained with the intermediary of a *khāṭiba*, or marriage broker. Her moral quality and reputation was in direct proportion to the degree of strictness of her seclusion. Her chastity was a matter of family honour, which had to be defended by the male members of her family, even at the cost of her life. Romantic love had no place in her life as a basis for marriage, as it was equated with sex immorality. Her marriage was a matter to be arranged by the family. As a wife, her passivity and submissiveness to her husband's desires and whims was the criterion of her success. She was, moreover, expected to have no interest in sex except by way of submission to what should be for her an unpleasant wifely duty. Her education, beyond the primary grade, was considered a waste of time, or even a dangerous risk to her femininity, while her employment was a plain disgrace, as it indicated the incapacity of the head of the family to fulfil his basic function as the financial provider of the family. In her relation to her children the Harem lady's paramount concern was feeding, which usually meant over-feeding. Moreover she usually doted on her son at the expense of her daughter, and thus prepared him for his role as autocrat in his own future family. Surrounded by attendants and servants, and devoid of basic functions, the ideal woman of the Harem era often resorted to magic and the supernatural to give release to her frustration, and her main concern in so doing was usually to find the formula which would enable

her to keep a hold over her husband. On the other hand, the Egyptian women of this era were said to have often compensated for their socially and legally weak position in the family by developing a psychological finesse which gave them an important affectional role in the family.

While there naturally were examples of deviations from the norms just described, and the picture was not always so grim, the segregation of the sexes could be said to have had at least one logical effect, which was to produce an inevitable chasm between the respective mentalities of husband and wife.

Having touched on some of the dominant features of the traditional Egyptian family system, I shall now take up some of the factors which recently led to a drastic change of values in this system.

1. Urbanization, which usually helps to dissociate the nuclear family from the larger family unit, has recently been intensified in Egypt for various reasons, foremost among which are the recent efforts to industrialize the country as well as the increasing population pressure on the land. Distance loosens the control of the larger family; reliance on a wage-earning economy weakens the economic utility of the kinship tie—all of which results in greater independence of individual members, including women. As a compensation, attachments and loyalties begin to expand beyond the kinship group. The independent life in cities, however, exposes the family to new kinds of dangers and hazards practically non-existent in rural areas, such as juvenile delinquency, husband desertion, pauperism and street-begging. Moreover, problems arising from congestion, like poor housing, unemployment, etc., create an urgent need for government-sponsored services in these cities besides the services administered by women's voluntary organizations. These services have recently included family planning. As children's support and education in the cities makes them economic liabilities to the parents instead of economic assets, the value of planned parenthood, from an economic point of view at least, is more easily grasped in urban than in rural areas.

The cosmopolitanism of the large Egyptian cities like Cairo, Alexandria, etc., as well as the availability of girls' schools in all urban centres, have in the last two generations played a major part in influencing Egyptian society to change gradually its traditional outlook towards women's role and status.

2. The socialist measures, which were intensified in recent years by the Egyptian government, and which aimed at narrowing the gap between the social classes, are another factor which helped to shake the traditional social values in a positive and drastic manner. Such measures included land reform, nationalization of major industries, the limitation of income, etc., all of which tended to weaken the power of the wealthy traditional large families which used to set the pattern for social norms and values. Individual skill and achievement rather than wealth and family prestige came to be the means of advancement in society. As a consequence of this, marriage for women ceased to be the main means to their economic security and the alternative to a career. Now the tendency is for women of all classes to seek education for the purpose of gainful employment. They willingly contribute to the support of their families to supplement their husband's income, in spite of the legal provisions which exempt them from this obligation. In addition, the National Charter, promulgated in 1962, gave strong emphasis to the principle of women's equal rights and various measures were taken to encourage women to participate in the social, economic and political life of the country.

While the state lays stress on the importance of the family as the fundamental unit of society, it is assuming more and more responsibilities which were formerly the domain of the large family. It offers such services as free education, nursery schools, social security schemes, socialization of the young through youth organizations, etc. Moreover, the state also seeks to integrate family goals with national goals in such important areas as national production, consumption, family planning, etc. The family planning educational programme originally initiated by women's voluntary organizations is now given the highest order of priority by the government. The cooperation of the Egyptian housewife in this and other areas is considered essential for the successful implementation of the government's social and economic development programmes. In one sense the family responsibilities of the formerly secluded wife are consciously becoming national responsibilities.

3. The emancipation of Egyptian women through their education and employment is the keystone to the change in family patterns in Egyptian society. The image of the ideal woman is gradually being reversed. Co-education is spreading everywhere with great success, even in the rural areas. Chastity is still demanded of the girl (the double standard of morality is still in force), and dating in the Western sense of the word is theoretically not permitted. However, the Egyptian woman now enjoys much greater social freedom in her relation with the other sex, in schools, clubs or at work. As a result of this, love and mutual understanding begin to play their natural role as a basis for marriage—usually, however, with remote family guidance. The educated working woman who used to be despised is now the most eligible for marriage. She is valued for her economic contribution to the family, for her intellectual companionship to her husband, as well as for her greater competence in the rearing of her children. Although family law, which gives the Moslem husband so many privileges, is still in force, the working woman's economic independence gives her a *de facto* status in the family which redresses the balance in favour of a more equalitarian relationship between her and her husband. She is no longer afraid of her husband's repudiation. As a matter of fact recent statistics showed divorce cases to be more and more initiated by wives, most of whom were educated working women. New reasons for divorce, such as incompatibility, are reflecting a new sense of individualism which rejects the unquestioned acceptance of traditionally prescribed roles. This same tendency is exhibited in the socialization of children on a more democratic basis. Moreover, polygamy, though still permitted, is practically non-existent among the educated groups. And family planning plays a natural part in the life of the educated mother. (The average number of children in families where the mother is illiterate is 7. It is below 4 in the case of the university graduates.)

There are many problems and conflicts attending the changes which affect the Egyptian family system. There are the obvious conflicts between the old and the new generation, as most families are in an intermediate state between the extended and the nuclear family. There are ambivalent attitudes on the part of some men towards women's new role and status. Further conflicts exist between the women's new status in the social, economic and political spheres and her unchanged legal status in the family. There is the standing problem of how to reconcile family responsibilities with work outside the home. There is also some concern over the ill effect on women's morality which might result from the widespread use of contraceptives.

But whatever the difficulties and tensions encountered by the modern Egyptian family, one can safely say that family orientation is moving in the direction of greater identification with, and adjustment to, the interest of the wider community.

The rapid rate of population growth in the world today, which is recognized as a serious threat to the welfare of human society, has placed urgent responsibilities on the family everywhere. This is one of the few serious world problems, the solution of which is to be found solely within the private concerns of the family, specifically in the capacity of husbands and wives to exercise responsible parenthood.

The responsibility of parents for the welfare of their children is bound now more than ever with their responsibility, as world citizens, for the welfare of all human society.

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15. THE FAMILY AS A SOCIAL UNIT: THE EFFECT OF FAMILY SIZE ON GROWTH AND DEVELOPMENT OF THE CHILD

R. Rueda-Williamson

The National Institute of Nutrition, Colombia

FOOD AND POPULATION

In recent years the sincere effort of underdeveloped and developing countries to speed their economic and social growth has become clear. Through regional conferences a variety of programmes have been begun with the common objective of reaching a better socio-economic balance in the population centres and attaining higher living standards through increase in goods and services, and the incorporation into the national life, of large marginal sectors of both the region and the population. However, success of these programmes is threatened by a rapid population increase. Latin America grows at a rate of 3% annually, which is without precedent in the history of man, and in fact the highest growth rate in the world. At this rate the population will double in 23 years.¹ The growing supplies of basic goods and services in each country (education, housing, nutrition, health, employment opportunities) have to be divided among an even faster growing number of individuals, giving *per capita* results that are continually less.

One of the most acute difficulties in this growing imbalance is the lag in the rise of food production, aggravating the already serious problems of malnutrition among the world's lowest socio-economic strata.

A rapid glance at the world food situation shows a great contrast between the highly industrialized developed regions and the less developed regions which include 70% of the population. In the latter, caloric and protein consumption per person-day hardly amounts to two-thirds of that in the developed areas, and consumption of animal protein is five times less.

If Latin America's deficiency is estimated by the food required to give a dietary average sufficient for the population (2,400 calories and 70 grams of protein per day, including 20 grams of animal origin) then it appears that the region has not reached such critical levels as in Asia or Africa, at least as regards national averages which do not take into account socio-economic strata. To reach this dietary level would require an increase of 5% in food production, whereas for Asia and Africa the figures would be 67% and 28% respectively.

Nevertheless, the situation in Latin America is equally dramatic viewed dynamically, projecting future food requirements against population growth. According to FAO², the index of total food requirements for the 548 million Latin Americans of the year '2000 will call for an increase of 238% over present production or more than tripling production in less than 35 years, an objective difficult to achieve with present resources. Thus to keep this unavoidable task within proportions compatible with the real possibilities of production growth without deterioration in the average diet of the region, the demographic growth rate must be brought down at once, in order to diminish the number among whom available food is to be divided.

MALNUTRITION AND PHYSICAL AND MENTAL RETARDATION IN CHILDREN

According to United Nations' estimates, half the world's population continues to suffer from hunger and malnutrition to a greater or lesser degree. This is corroborated by studies which show that in most underdeveloped or developing countries there is a high proportion of protein-caloric malnutrition among children, especially those less than five years old,

who are affected by a number of adverse environmental factors—economic, social and cultural.

In most countries, an enormous break on development efforts results from the high prevalence of infant malnutrition—demonstrable physical and mental retardation caused by advanced malnutrition in pre-school children who survive it. Repeated studies in various of the developing countries have shown that severe protein-calorie malnutrition in children less than five years old, widespread in the low socio-economic strata, is accompanied by clear retardation both in physical growth and mental development.³⁻¹⁵ It is the child's nutrition which determines the degree to which its genetic potential is fulfilled.

The problem becomes more complicated when it is realized that the mental retardation associated with protein malnutrition in children may not be the effect of insufficient intake of foods but the result of concomitant social deprivation in which the psycho-affective stimuli essential to the child's proper intersensorial organization, are few.¹⁶

The relation between infant malnutrition and retarded physical and mental growth has been insufficiently appreciated up to the present. However, the many studies on this question witness a growing recognition that malnutrition can, in this way, hold back decisively the economic and social development of a people. Today's children will be the future leaders in the different fields of social science, technology and economy, responsible for the planning and carrying out of each country's development programmes. On the other hand, the country's general productivity will depend on the proper technical training of farm and factory workers and their improved output which will in turn depend largely on their nutritional state.¹⁷

INFANT MALNUTRITION AND FAMILY SIZE

Bearing this in mind, those factors of the family's physical, biological, social and cultural environment can be discussed, which are commonly associated with malnutrition and retardation of the child and are in some way related to the size of the family.

(a) In various parts of the world, families in the lowest socio-economic classes commonly have more children than those of the upper classes. Surveys on food consumption also show a lower nutrient intake for the same families, not only quantitatively, for each nutrient, but especially for protein quality.¹⁸ On the other hand, carbohydrates, which cannot be used by the body as raw material for the formation of tissues or the maintenance of its defences, make up a high percentage of the diet. Naturally, the subdivision of this limited diet among a larger number of children reduces *per capita* intake still further.

(b) It has also been fully demonstrated that the interaction of malnutrition and infection leads to low health levels in individuals and in communities, and has an unfavourable synergic effect on the individual, especially the child under five years of age. Thus infection is more frequent and much more serious in undernourished organisms which lose their organic defences as a result of tissue and enzyme changes—for instance the high mortality from measles in children with malnutrition. On the other hand, undernourished organisms, when attacked by infection, add adverse factors to the condition such as lack of appetite, reaction against food, loss of body nitrogen, to which must be added severe and unnecessary dietary restrictions arising from mistaken cultural patterns, which help to bring about cases of advanced malnutrition.^{19, 20}

It is estimated that in three-quarters of the world's population a very considerable proportion of excess morbidity and mortality among children arise from the synergic relation between malnutrition and infection. The high prevalence of infectious and parasitic diseases is well known in unhealthy housing conditions, aggravated by overcrowding in the large families of the socio-economic class living often in shacks. Under such conditions the larger family size gives more and closer opportunities for infestation and infection.

(c) One of the most important aspects in the epidemiologic analysis of infant malnutrition is the frequency of pregnancy of the mother. It is well-known that protein-calorie malnutrition is characterized at the same time by a series of factors adversely affecting the nutrition and health of the child, starting with the early weaning caused by a new pregnancy. The word "kwashiorkor" often used to denote protein-calorie deficiency, comes from the West African

dialect Ga and literally means "first-second", that is to say "the sickness of the first child when the second is on the way" or "the sickness of the deposed child", and occurs almost exclusively between the time of weaning and five years.^{1,5,8,13} For the child of two years who is early and suddenly weaned, the new pregnancy means not only the loss of a protein of high biological quality which is necessary to proper growth and development and which is substituted by foods rich in carbohydrates, but also less attention on the part of the mother at an age when the child is in need of greater protection and care in regard to feeding and to the physical and biological environment. This very short epidemiological description shows us that the prevention of infant malnutrition and physical and mental retardation in children must take place through campaigns directed at the mothers in order to produce longer lactation and greater spacing between pregnancies. Numerous and successive pregnancies also weaken the mother, and maternal malnutrition results in low average weights for the new-born.²¹ It follows that overall health protection in the child must begin with protection and education of the mother.

(d) Also important in infant malnutrition are social and cultural factors arising from mistaken beliefs and practices regarding food, health and illness, and the taboos and wrong feeding habits that often reduce the intake of essential nutrients in children under five in families with sufficient available food.^{22, 23} It can be said that the pre-school child eats with the mind of its mother who, unfortunately, often denies it foods rich in protein that are eaten by the elder children and adults in the family, through ignorance of the nutritional content of foods and the child's true needs, thus causing it to reach advanced stages of deficiency, especially in protein.

The educational level of the parents has a decisive influence on the nutrition of the child, especially in those classes where the availability of food is minimal, and a mistake regarding the child's diet can cause grave nutritional imbalance. On the other hand, it has been found that advanced infant malnutrition can be cured merely by education of the parents regarding feeding.²⁴

Recent studies have shown that the educational level of the parents, especially the mother, is important in the child's intellectual development, the IQ of the child varying with the mother's educational level.²⁵

Moreover, the local availability of educational services in the Latin American countries is limited in relation to the needs of the growing population; it is logical to assume that educational opportunities for members of families in the low socio-economic strata diminish as the numbers increase, thus leading to low educational levels in parents and children.

(e) Lastly, small family incomes further limit food purchases and payments for educational and health services, when the number of those too young to earn is large. This number has been recently utilized to derive an Economic Protein Coefficient²⁶ which makes it possible to stratify socio-economic classes and measure indirectly the nutritional state of the family as based on the relation between total family income and the local cost of protein needed by the whole family.

These facts clearly show the inverse ratio existing between the size of the family and the children's physical and mental development.

Recent studies by Cravioto and colleagues in Latin American populations of low socio-economic backgrounds and identical racial composition show clearly that children with low weight growth, measured by weight increase in the first years of life, belong to families of five to eight members, whereas children showing adequate weight gain come from families of only three or four. The group of retarded children were also associated with the above patterns of feeding, frequency and duration of infectious disease, family income, housing conditions and educational levels of the parents.²⁷ These findings indicate that further research should be made to confirm the presence of parallel mental development.

The importance of these results should not be underestimated and should increase motivation for the implementation of family planning programmes to diminish infant protein-calorie malnutrition which by the physical and mental retardation of children, is today one of the most serious obstacles to speeded economic and social growth in Latin America.

The aims of the IPPF are certainly aims of social justice. Therefore we believe that one of

the basic purposes of family planning programmes should be that all children of the world should fulfill their genetic physical and mental growth development potential.

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16. THE FAMILY AS AN ECONOMIC UNIT AND AS A BASIS FOR NATIONAL PLANNING

G. W. Roberts

Department of Demography, University of the West Indies

INTRODUCTION

There are several ways in which the human family may be studied. From the demographic standpoint a biological approach has many advantages, since in these terms the prime function of the family may be taken as the perpetuation of the species and the maintenance of the society in which it exists. In this context the family constitutes the vehicle for reproduction. However, reproduction is much more than a biological process. Since in fact it takes place against a background of customs and institutions, it is essential, for a proper appreciation of its potentialities and prospects, to examine these social factors. And the complexities of these factors mean that there are many foci of interests in assessing the social and economic background to reproduction. It is with the economic focus of interest that we are here concerned.

An economic frame of reference within which to view the family is of prime significance for national planning. The implications of population growth rates are of importance at any stage of social or economic planning. For basically the plans must be geared to the expected population and must take full cognisance of the implications of its future structure and characteristics. This is all the more necessary, because the reproductive performance of the functioning family is now under close scrutiny, as societies come to realize that continuance of current rates of population growth may, within a few generations, overwhelm mankind, and are even now threatening to negate the efforts being made in certain countries towards economic and social development.

Many early writers stressed in one way or another the relationship between economic factors and population movements. Economic considerations underlay much of Malthus's writings. In particular he emphasized that higher incomes enabled people to marry earlier, which induced them to have larger families, unless greater abstinence followed also. Ernst Engel and Frederic Le Play approached the study of the family largely through analyses of budgets and standards of living. Engel investigated the variation between income and proportional expenditure on various consumer goods, while Le Play considered hypotheses aimed at specifying the type of family on the basis of breakdowns of its consumption patterns. Empirical English investigators such as Booth and Rowntree made very close and detailed studies based mainly on analyses of family budgets, and were especially interested in the extent to which consumption levels and patterns depict poverty standards of the society. This line of investigation has continued and developed into important branches of micro-economics.

These are the topics under which the family may conveniently be discussed in the present context: the concept of the family as a producing and consuming unit; relationship between essentially economic characteristics of the family and its size; the extent to which the analysis of the family may prove useful in national planning, especially where such planning has as an integral part policies aimed at controlling population growth.

THE FAMILY AS A PRODUCING AND CONSUMING UNIT

In the words of A. S. Rice, "Within the economic framework the family is viewed as an economic unit composed of individuals each with a set of mutual economic rights and responsibilities as well as relationships."¹ She argues that the family can be treated as a unit which must be sustained from its own resources, and whose consumption patterns are

functions of these resources. The level of goods and services which the family enjoys rests largely on the resources it commands. Levels of resources and consumption patterns are functions of the social and economic position of the family within the society as well as of the society itself. In a largely undifferentiated society, such as a subsistence economy, the manpower resources of the entire unit represent its productive capacity, as it is from its own joint efforts that the goods and services it requires for its sustenance must in the main be drawn. Moreover, under such conditions, there tends to be hardly any differential of family type within the society. In more advanced societies, however, there are appreciable variations in levels of resources and consumption enjoyed by families. These differentials are in fact aspects of differential socio-economic status of the family in these societies.

The fact that under a subsistence economy the family has to depend on the productive efforts of all its members to sustain itself indicates that there are manifest advantages in a large family, more so since the high mortality in such societies involves considerable loss of life before children attain an age at which they can contribute to the productive output of the unit. This does not imply that institutions and practices tending to curtail fertility are absent from such societies, or that desires to limit the number of children are necessarily incompatible with prevailing value systems. But even where these are operative they probably achieve little, since in the absence of knowledge of adequate methods of fertility control such decisions can hardly be implemented. In any event, as Wharton puts it, "the decision-making calculus of the subsistence farmer is focused more upon the role of children as potential productive agents than as a consumption good".²

Since in a developed society the emphasis is less on the family as a producing unit and more on its consumption aspects, it is no longer necessary, or indeed feasible, for the family to seek to produce all the goods and services it requires. At the same time welfare and other considerations stress the levels of adequate consumption of the several goods and services consumed by the unit. Division of labour and mechanization have long made it impossible for the several members of the family to continue production together. Smelser has shown how these operated in the transformation of the textile industry in Britain from the small household productive unit of the pre-industrial era to the modern factory-based system.³ Accompanying this change in the productive process has been a change in the position of children. Specialized institutions and agencies have taken over many of the socializing functions hitherto performed within the family; this has been notably the case in education. With this the period of dependency of the child on its parents has lengthened. All these factors have therefore meant that the functioning family as a producing unit must be considered differently from the productive unit associated with a subsistence economy.

As will be seen presently, the resources of the family are intimately associated with its size. But factors other than the size of family and its correlates play a part in determining the resources of the family. Prevailing value systems, customs and habits constitute basic determinants of consumption patterns of the society. Housing and associated social amenities now account for a substantial portion of consumer's expenditure, while further contributions are made up from the expenditure on a wide variety of services which modern standards of living dictate. Patterns of dress and food habits are other significant determinants of consumption.

RELATION BETWEEN ECONOMIC CHARACTERISTICS OF THE FAMILY AND FERTILITY

In the industrialized society the size of family unit, that is the number of children it produces, has a close relationship to the level of its economic resources or position. Rising costs of rearing children have been widely stressed as a causal element. Costs of upbringing, and of education together with the cessation of child labour since the 19th century have meant that children can now hardly be described as economic assets of the unit. It is true that the concept of a "cost of installation" now frequently linked with the expenditure on the upbringing of children through infancy, childhood and adolescence, can be extended to consider children as investments. But returns to these investments are usually long in coming and indeed may appear only after the children have left the family unit which nurtured them to establish their own families.

There are subtle problems in the study of this relationship. To a degree these hinge on the

variety of indices of socio-economic status that must be relied on. Such indices usually relate to the head of the family and may take the form of occupation, income or educational attainment, although composite measures of socio-economic status have at times been employed. In the case of income, while that of the head is important, some modern approaches favour the joint income of the entire family. Occupation as a measure of economic status likewise is generally related to the male head, but the extent to which the female partner is occupied and the kind of work in which she is involved also demand special attention.

Studies of fertility in the USA during the period 1800-1840 by Jaffe indicated marked differentials in accordance with economic status.⁴ By the 1930's, however, evidence was available that this long standing differential was undergoing modifications. In fact, in place of the past negative correlation a positive correlation between fertility and economic status now characterizes many societies. It must be noted, however, that the level of these correlations is generally low. Studies in the USA, further, yield evidence that the influx of rural populations into urban areas may be linked with the small positive correlations between income and fertility encountered in many societies today.^{5,6}

Occupation constitutes an important index of economic status in the analysis of fertility differentials. In the advanced societies, declining proportions of families dependent on the land—those families traditionally associated with large family patterns—have contributed to the falls in fertility in these countries. But in many of them falls throughout all occupational ranks have been experienced. The long established differentials noted among European populations, which took the form of relatively low rates among higher social strata and high rates among the lower strata, have been undergoing changes in recent decades. Indeed in many societies—especially within urban populations—fertility now tends to be positively correlated with occupational status. For instance during the period 1910-1940 there have been marked declines in every occupational category in the USA, and the white-collar workers especially showed marked falls; but the period 1940-1950 witnessed a rise in fertility among all occupational categories, the increases being most noticeable in the professional groups. This has tended to narrow the previously observed differentials,⁷ and a positive association between fertility and occupation now emerges from many studies.

Fertility differentials by occupation in the developing societies have also been recorded. In an examination of Latin American cities, Miro found that, with the exception of Bogota and Buenos Aires, women whose husbands were engaged in lower-class occupations had markedly higher fertility than those whose husbands were in higher classed occupations.⁸ But other studies do not always reveal a type of differential associated with low fertility societies. Thus El Badry and Rizh found that in urban areas fertility was lowest among the professional classes, whereas in rural areas fertility was highest among professional and administrative classes and lowest among farmers.⁹ In many cases it would seem that other factors besides occupation are the true determinants of differentials noted. For instance in many countries diseases—often in the form of venereal infections—affect the lower classes more than the higher, and this apparently tends to unduly depress the fertility of the former.

Another relevant subject is the extent to which female participation in the labour force may constitute a determinant of fertility differentials. In both the USA and England there is evidence that female participation in the labour force has tended to reduce the level of fertility.^{7,10} In most societies industrialization has involved a growing proportion of females in economic activity and at the same time induced a decline in their participation in agriculture. In Japan, where industrialization has been very rapid, the position of women has been closely linked up with patterns of change in fertility. As Taeuber has shown, the search for cash incomes among agricultural families led them to have their daughters enter factories to perform cheap labour.¹¹ Associated with this rising absorption of females in industry has been a postponement of marriage, which has formed a notable adjustment to industrialization and urbanization. Many of the changes taking place in the role of the female in modern industrial societies in Europe have contributed to movements and differentials in fertility. Among these are the growing participation of married women in economic activity in general, their declining participation in agriculture, their growing involvement in manufacture and service industries.

It is to be expected that studies dealing with costs of bringing up children and the close

association between such costs and reproduction should lead to attempts at treating this process as strictly one of producing (and consuming) a good, just as the family produces and consumes a wide variety of goods. For with the extension of the use of contraception the family has the power in general to control the number of children it has, as well as their spacing. One analysis along these lines which may be considered is that of Becker.¹² In his words, children may be considered, from the standpoint of the economist, as a consumption good, although in so far as they provide income for the unit they may be more properly deemed a production good. On this basis, "the theory of the demand for consumer durables is a useful framework in analysing the demand for children".

Like other goods, children have their cost of production and here also movements in cost may be related to changes in quality. Becker argues that the price of children to rich parents is the same as the price of children to poor parents. The rich merely choose higher quality children, that is spend more on their training and education. In his view, the rich do not have fewer children than the poor because the cost of children is greater to the former than to the latter. Moreover, the negative association, long noted between level of income and family size, he maintains, is ascribable principally to differential knowledge of contraception.

From Becker's analysis it follows that, as family income increases, parents will provide a higher level of living for their children, while they will tend to increase the number of their children as their income increases. Plausible as this analysis is, it undoubtedly imputes to parents a degree of freedom of choice in respect of the number of their children, which is unlikely to operate under actual conditions.

Whether or not a rise in income will be accompanied by falls in fertility remains a question of relevance to developing societies, since one of the major effects of economic development is the introduction of a class of workers receiving higher incomes. As shifts from the traditional to the modern enterprises take place two levels of income have to be faced: the traditional low level continues and to this must be added a new high level enjoyed by workers absorbed by the newer enterprises.¹³ The possible effects of these new levels of income on fertility levels of the country are of interest. Arguments deriving from the theory of demographic transition would suggest that rising overall levels of income may precipitate falls in fertility. This may not however materialize, at least in the short run. Rising income may bring with it better living standards and improvements in health, which may reduce disease and illness, frequent causes of sterility and sub-fertility in non-industrialized societies. So that even where, as in the case of West Indian populations, there is evidence of declines in completed family size, these may be masked, in terms of period rates, by pronounced reductions in proportions of childless women.¹⁴

RELEVANCE OF THE FAMILY IN NATIONAL PLANNING

In the context of national planning the family is relevant from two standpoints. From the first of these it constitutes a unit which is most convenient for relating the several facets of the population to the social and economic phases of planning. The number of families in the country as well as their rates of formation (and of dissolution) are closely related to economic and social change. It is by considering the quantity and movements in families or their equivalent concepts, households, that planning for housing requirements and the many ancillary social amenities must be attempted. Moreover several studies have demonstrated the relationship between movements in marriage rates and economic change in industrialized societies, especially in the USA.¹⁵

The relevance of the family to planning is further seen when its several stages are taken into account. This is most conveniently done through Glick's concept of the family cycle.¹⁶ Indeed the formation of families, just noted, is basically the initial stage of the cycle. One of the most important stages in this cycle is the succession of births. Each of these constitutes an addition to its size and an increment to the population at large. Each creates demands on the countries' resources for educational facilities and other social services necessary for children. The greater the average size of the family the heavier the demands on these resources. In a wider sense the planners have to reckon with three immediate results of high fertility:

(1) it implies a large population; (2) it determines a high rate of increase; (3) it determines the age structure of the population.¹⁷

The next stage in the cycle materializes as children leave the home to establish families of their own or merely to set up separate living arrangements. In either case this means a demand for employment and it may also mean demands for housing. At the same time their withdrawal from school reduces the demand on school facilities. Following the withdrawal of children from the family the latter decreases in size and the death of one of the parents which is to be expected at this time may disrupt the unit. The latter can of course be dissolved at an early period and by other means than widowhood. An important late stage in the family is the retirement of the parents from economic activity. And at this stage provision for their upkeep has to be made. This may come from state resources or from private schemes. In accordance with modern notions of welfare many societies provide for social occasions of stress at many stages in the family cycle, such as sickness, unemployment or invaliding.

Demands for social services and patterns of investment are determined, in scope and extent, largely by patterns of fertility. Thus high fertility, because it results in large proportions of the population in school age calls for investment in educational facilities and at the same time means a heavy drain on the production resources of the country, especially where output per head is low. An added drawback is the unfavourable dependency ratio obtaining under these circumstances. On the other hand low fertility patterns call for less investment in educational facilities, while in general a more favourable dependency ratio can be counted on. Demands on the social services in such societies take the form of old age benefits and retirement payments, which as a rule can be relatively easily met, in the societies now experiencing low fertility.

From the second standpoint the family is relevant to national planning because of the modern movement towards family planning and fertility control in general. It is essential to realize that this relevance stems basically from the successes in curbing high mortality, and the acceleration in the rates of natural increase that this has brought to a large portion of the world's population. These often exceed 3% per year. It is the widespread realization that checks to such growth rates are essential that has led to the endorsement of plans for fertility control in so many countries. Few social scientists still subscribe to the view that the sequence of events that the industrialized societies experienced—culminating in declining fertility—will be witnessed in the non-industrialized societies, unless definite policies aimed at achieving this are initiated. Indeed high fertility, far from being reduced by economic and social advances, may seriously impede the very social and economic advance from which it is supposed to flow.

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17. THE PLACE OF FAMILY PLANNING IN COMMUNITY INTEGRATION AND DEVELOPMENT

O. Adeniyi-Jones

Family Planning Council of Nigeria

INTRODUCTION

The governments of all member states of the United Nations have indicated their assent to the Universal Declaration of Human Rights, as an ideal standard of conduct to which they and their peoples aspire. Let us consider a few of the articles of this Declaration. Article 16 (3) states that "The family is the natural and fundamental group of society and is entitled to protection by society and the state". In Article 25 (i) we note that "Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age, or other lack of livelihood in circumstances beyond his control". And in Article 29 (i) "Everyone has duties to the community in which alone the free and full development of his personality is possible".

But it is only in those countries which are advanced that it has been possible to make adequate provision for the development of a high standard of living and a high income on the part of a large proportion of the community, in the form of a high level of education, good housing, adequate nutrition, efficient medical and social services, and a high employment ratio.

These are prerequisites for the development of respect for the dignity and rights of the ordinary man and woman in the community. They can be achieved only when a sufficiently large proportion of the community are in a position to contribute to their achievement by performing their individual functions and duties in a responsible manner.

In his statement at the opening of the Eighth Session of the Economic Commission for Africa two months ago, Mr. Tom Mboya, of Kenya, pointed to the disappointing progress which had been made in the current Development Decade. "Over that period the average person in the wealthy countries improved his income by approximately \$220, to \$1,800 per annum while *per capita* income in the very poor nations advanced by perhaps \$7, to \$90 per annum." The gap in *per capita* income levels between wealthy and poor nations thus increased by \$193, or, more than 10%.

Professor Romero of the University of Chile also referred to this great disparity in terms of different sections of the community, at the Latin American Conference on Child and Youth in National Development two years ago. He said "With an average personal income of \$370 a year, half the population of Latin America has an income of \$120 and 5% of the privileged groups \$2,400 or 20 times as much. In Chile, 3% of the population has 25% of the total income, while at the other end of the scale, 55% of the people have less than 16% of the income. The wealthy class and the amount of total income it enjoys would be respectively 5% and 36% in Mexico, 8% and over 50% in El Salvador, 15% and 50% in Venezuela and 1% and 17% in Ecuador".

There has been growing interest in, and concern for, planning to bridge the existing gap between wealthy and poor communities, and between wealthy and poor sections of the same community by community integration and development. The major paradox which faces the world in general and underdeveloped or less advanced countries in particular

today, is that it is much easier for an advanced country to achieve further progress and development. Perhaps the most alarming feature of this problem is the fact that it is being aggravated still further by a rapid rate of population growth in the less advanced countries.

TO PROMOTE AND PROTECT THE LIFE OF THE FAMILY

We are gathered together in this delightful country and setting as individual members of a family of nations brought together by the unifying bond of a common interest in the subject of family planning. Many of us have particular interests in specific aspects of this subject. With some of us the interest is of a general or merely related nature. There are strong protagonists or opponents of certain methods of contraception. In others conflicting or even directly opposed interests may be represented. There are many who are mainly interested in birth control, while a few others may be concerned primarily with increasing the chances of conception in the sub-fertile. Many will have more than a passing interest in the inter-relationship of these two aspects on each other, as well as on the health and well-being of the community. Birth control by badly induced abortion may cause sterility. On the other hand efficient use of the Pill or IUD, to ensure a long pregnancy-free period of rest and recuperation, during which treatment of underlying infection or anaemia can be effected, will increase the chances of a subsequent pregnancy and safe childbirth.

This conference community has progressed very satisfactorily because of very careful planning and programme preparation; because of the conscious efforts which we are all making to live and work together; to incorporate or integrate our work; to adopt new attitudes and learn new skills, to help us adapt our conference lives to the circumstances which prevail. We keep up with and make the best use of the plenary meetings, panel discussions, medical and scientific sessions, private sessions, educational, cultural and recreational visits which have been arranged.

If we were to take our stands on our respective special interests alone and ignore the inter-relationships, or lose sight of the overall objectives, we should not be able to continue in association for very long.

So it is with community development. Ever since human beings first lived together in any form of social grouping they have been faced with the need to provide for the maintenance and improvement of the health and happiness of the group. In order to promote and protect the life of the family all members must make an effort to live and work together.

Lagos is an example of a very congested cosmopolitan capital city port of contrasts and compromise between the old and the new, the primitive and sophisticated, the undeveloped and the overdeveloped. It is grossly overcrowded in many parts and is likely to become more so in the future. Even a casual look at the society will show that it contains examples of most if not all of the various culture patterns which exist in different parts of Nigeria, Ghana, Sierra Leone and other West African countries; and indeed Britain, France, Syria and Lebanon, America, India and other parts of the world from which the inhabitants have come.

Admittedly these culture patterns are not reproduced in pure form. They are modified on the basis of the temperament and personality of the individuals concerned, and the conditions which prevail in Lagos.

There are 800,000 people on 27 square miles in all shapes and descriptions of houses, only about 36% of which can be described as being in good condition, and provided with modern facilities. More than 20% of the population live under rural conditions in fringe and lagoon villages and settlements. Like similar cities elsewhere Lagos attracts a constant stream of people from other parts of Nigeria in search of opportunities for education, employment and the good life. They swell the number in slums and fringe settlements where they remain almost as poor, unemployed and hungry, and more exposed to disease, accidents, mental, social and political disturbances than they were in the rural areas from which they came.

There is no doubt that education is one of the foremost needs for the promotion and protection of the life of families in Lagos. Only about 63% of the children of school age actually attend schools. Only 20% attend secondary schools. Many who have gone through school have received little or no education in the requirements of the social organization on which their newly acquired knowledge depends.

That is why there is often a considerable amount of frustration and apathy among those who have acquired knowledge and material wealth which fits them for some category of work in a developed society, but not for stimulating a burning desire for a better, healthier and happier life for themselves and the rest of the community in which they live.

TO BUILD HAPPY FAMILIES

To be happy a family must also keep healthy. This means that all the children and adults must have enough food to eat, clothes to wear, education and employment, and a comfortable place to sleep. The children must feel that they are wanted and loved by their parents. That is why it is necessary for parents to decide how many children they can love and care for properly; and plan to have only that number. But many people do not consider whether they can provide a good home and good care for all their children. This lack of planning is responsible for much of the anxiety and weakness, and some of the ill-health from which many mothers suffer and for some of the poor nourishment and development, illness and high death rate among young children.

It takes time for a mother to regain her health after one baby, to ensure that the next will be strong and healthy. Also, she needs time to provide proper care, feeding and love so that each baby has a good start in life before she has to turn her attention to the next one. That is why it has been the custom and tradition for some women to allow three years between babies.

In a polygamous family, each individual mother can achieve this child spacing by staying away from her husband. It is more difficult to do this in a monogamous family. In such cases this prolonged abstinence upsets husband-wife relationships. Some mothers try to space their children by prolonged breast feeding, by the rhythm method or by withdrawal. Others resort to abortions with consequent danger to the health and life of the mother, which may prevent her from having any more babies. Now there are safe, simple, more effective and reliable ways of making sure that mothers do not have too many babies too quickly.

There need be no anxiety that birth control is foreign to our custom and contrary to any religious beliefs. World leaders of all religious groups have acknowledged the need for regulation of childbirth. The actual method of contraception used will depend on individual choice.

Birth control is fully justified in the interest of the individual mother, her husband and their children—the family unit on which society is based. Much of what has been said and written about the importance of planning for needs, problems and future of children and youth, and indeed the whole community, will be meaningless and impossible to translate into responsible action if we do not insist on making information and facilities for family planning readily available to all sections of the community.

It is significant that those who belong to the privileged sections of underdeveloped countries; or to highly developed countries can succeed in spacing and limiting their families to manageable proportions, irrespective of their race, religion or political belief. This is an expression of the fact that parents want their children to attain a higher standard of living than they themselves. To this end parents protect and prepare their children to attain an ever increasing standard of living and development. In underdeveloped countries the majority of people do not have this knowledge and ability. This same difference exists between privileged sections or social classes.

A wider expression of this difference is that in the developed country or privileged social class, the majority of people have succeeded in breaking the vicious circle of poverty, disease, hunger and ignorance.

In the underdeveloped country or under-privileged social class, the majority of people are still imprisoned by this vicious circle, which retards their development.

FAMILY PLANNING IN LAGOS

The stimulus for the development of organized community effort in support of family planning arose out of an appeal by social welfare workers in 1956 for voluntary help to provide marriage guidance and counselling for young couples. When the Lagos Marriage Guidance Council was formed it included persons from the social welfare, education, legal,

public information and public health fields; Christian and Moslem leaders; and traders. Courses were organized on family welfare and sex education for engaged couples, newly married couples, employees of commercial firms, school teachers and school leavers. Radio talks, discussions, debates and press articles were also produced.

The occurrence of two tragic cases of septic abortion in 1957 directed the attention of the Council to this problem, and an informal enquiry by social welfare workers revealed the fact that it was common for married women with unwanted pregnancies to attempt to induce abortion by various means. A family planning sub-committee was appointed to examine the need for and the feasibility of running family planning clinics. This sub-committee reported that there was a great need for organized work in this field. While it could not be described as a strongly felt need, there were many people who would avail themselves of the service if it were provided.

The sub-committee recommended:

1. That a family planning clinic be run one evening each week in the domiciliary mid-wifery centre of the local health department.
2. That the clinic be called the Marital Health Clinic, to forestall any opposition to the concept of birth control or family planning as a new and foreign discipline, and to give expression to the intention to offer advice, information and service on both birth control and infertility.
3. That as much publicity as possible be given to the clinic in the press, on the radio and through press publications.

Three main factors contributed to the lack of expansion of family planning work between 1958 and 1963.

1. The work of the Marriage Guidance Council was more or less abandoned after a few years owing to inadequate public support and lack of funds. It was, however, possible to continue the weekly clinic.
2. Funds were not available to pay doctors and nurses, to buy equipment and supplies to open clinics in other parts of the town, or to engage at least one full or part-time nurse to follow up the cases and to develop the educational aspects of the work.
3. It was not possible at the time to persuade government to assume responsibility for developing this work; nor was it possible to gain the support of an established non-governmental organization through which assistance could be obtained from abroad, to permit the work to be done on a sufficiently large scale to demonstrate to the government that it is needed by, and acceptable to, the public.

In 1964 both the Pathfinder Fund and the IPPF sent out field representatives who helped in setting up a local voluntary organization. The National Council of Women's Societies agreed to sponsor the work and set up an Advisory Committee on Family Planning to carry out educational work through the usual mass media.

Funds made available by the Pathfinder Fund, the IPPF and the Unitarian Universalists Service Committee made it possible to engage full and part-time staff, procure equipment and supplies, and produce material for publicity.

Now the Advisory Committee has become the Family Planning Council of Nigeria with the following aims and objectives:

- (a) To encourage the building up of healthy happy families.
- (b) To protect the health of mothers and children, and reduce child mortality by spacing babies.
- (c) To help parents understand the value of having only those children for whom they can provide adequate care, housing, good clothing and education.
- (d) To advise and help those who want children.
- (e) To enable women to take a more active part in the affairs of the community and to enjoy greater happiness in family and social relationships as a result of child spacing.

It is not possible to over-estimate the potential of the family planning movement for community development in countries where up till now the status of women is quite low; where parents take pride in the number rather than the quality of their children. In such countries it will be necessary to appeal directly to the men and organize special educational groups in business and commercial houses and in social, religious and recreational organiza-

tions in order to enlist their support and cooperation, pending the time when a sufficient number of women would have broken through the sex discrimination barrier for them to be in a position to take the initiative in achieving the objective described in the statement by 12 Heads of States at the United Nations, on the last anniversary of the United Nations Declaration of Human Rights, “. . . the enrichment of human life, not its restriction; that family planning, by assuring greater opportunity to each person, frees man to attain his individual dignity and reach his full potential. . . .”

18. MATERNAL HEALTH AND INFANT MORTALITY

A. Kessler

Human Reproduction Unit, WHO

It is hardly surprising that there should be intimate relationships between maternal and child health. But the extent to which infant mortality and maternal health are mutually interdependent is also striking. Maternal health of course has a very direct influence on the outcome of any pregnancy; high levels of infant mortality on the other hand, by initiating certain patterns of childbearing, notably a rapid succession of pregnancies, in turn, may have marked effects on maternal health. This interdependence leads in many parts of the world to a vicious, self-perpetuating pattern of high general infant mortality and poor maternal health.

The health of mothers and children has always been one of the most sensitive indices of the general environment, way of life and state of health services of any society. In the processes of pregnancy and infant development, the interplay of physiological and other general environmental factors is particularly evident. Mothers and children are especially vulnerable to hardships; on the other hand their health may respond rapidly to simple environmental improvements.

In recent years, it is being shown increasingly that the interaction of the many factors that affect maternal and child health begins at the time of conception. Such ante natal influences, as well as those which act at the time of birth and during infancy, in the long run, are important determinants of the health of the whole population, since they leave indelible imprints on the vitality of each individual.

A review of current vital statistics of mothers and children presents simultaneously bright and dark features (Table I).¹ Progress is being made towards better chances of survival and health for mothers and children in most parts of the world. Levels of death rate for example, although they hardly give more than first approximations to the state of maternal and child health, have declined almost everywhere during the past few decades. Deaths resulting from childbearing are estimated now as six per 1,000 in India compared with 10 only five years ago and 25 in 1939. Within a period of five years, from 1959 to 1964, maternal mortality declined by almost 20% in studies carried out in several Middle and South American countries.² Infant mortality also is falling sharply; typical changes range from -14% to -35% in the period 1960 to 1964.

Equally striking, however, is the persistence of vast differences in levels of infant mortality rates in different parts of the world and in adjoining communities within given nations. For example the general infant mortality rate (death rate 0-12 months) in Sweden is 12.4, in Colombia is 83.3, while in Morocco it rises to 149³ and levels of 350 to 400 per 1,000 continue to be reported in many countries. Inside each country, maternal and infant mortality rates vary in different groups according to socio-economic status. Thus although the decline in death rates of mothers and children are reasons for satisfaction, there remains a vast amount of maternal and child morbidity and mortality, and many yet unresolved problems of maternal and child health.

Considerable variation exists in the patterns and causes of mortality during the first year of life and these in turn can be related in great part to distinctive aspects of maternal health. It has been found useful to consider the problems of infant health during the first month of life—the neonatal period—distinct from those presented during the remainder or post-neonatal period of the first year.

First month: During the first month of life causes of death are about equally divided into those associated with the processes of intra-uterine development of the infant and labour and those associated with nutrition and infection which are the predominant causes of fatalities during the remainder of the first year of life. These different causes require different methods of prevention and treatment. For example, most of the deaths in the first two weeks of life are associated with low birth weight, congenital malformations and birth injuries and are thus very similar to stillbirths and are more dependent on the mother's health and development and on the standard of obstetric care. *Period 1-12 months:* Infections and nutritional diseases represent the predominant causes of death during this period and are related to the quality of the environment to which the child is exposed.

The interaction of many complex factors is responsible for the outcome of pregnancy for both mother and child. Some of those that have been studied include the general health and physique of the mother, her age, her nutrition, both during her own development and during pregnancy, childbearing habits such as age at first pregnancy, parity and spacing of pregnancies, activity and work, housing, educational level and the availability of medical resources as well as the mother's ability to use these. All of these factors are interrelated. Moreover, they have a tendency to carry over from generation to generation since a mother's health, depending in turn on the quality of her own environment from birth to maturity, is directly influenced by the competence of previous generations.⁴

A basic prerequisite for efficient childbearing is good general health. Nutrition is a vital component in the development of good physique and women with good physique tend to have fewer obstetrical complications and produce children of optimal weights. Under-nutrition during critical periods of childhood may produce permanent damage such as pelvic flattening which is associated with obstetric disproportion and difficult labour. In addition, under-nutrition during the period of lactation results in the production of insufficient and inadequate milk. Pregnancy produces a strain on the maternal organism even in health and in the presence of pre-existing disease or intercurrent infection stresses may damage the mother or foetus. A relatively high percentage of maternal deaths, stillbirths and prematurity result for example from heart failure secondary to extreme anaemia in certain regions of Africa and South-East Asia.

The age at first and last pregnancy, the interval between pregnancies and the total number of pregnancies, are important aspects of childbearing. The most efficient age to have a first child appears to be between 19 and 25 years of age when physical maturity has been attained and physiological ageing not yet begun. Infant prematurity rates are lowest in second pregnancies and then rise slowly but steadily with increasing parity. The lowest overall rates are found in those women who have had fewer than four children by the age of 30. The risks for both mother and child are high, for example from a difficult labour, from prematurity and even from failure of lactation, at the extremes of the childbearing period. Too many births appear to decrease the efficiency of the physiological processes of reproduction and are associated with increasing mortality of newborns, and of the mothers themselves.

In the general context of maternal health, the mother's ability to care for the infant, to understand the principles of hygiene required for its care, and to avail herself of whatever facilities for care are offered by the community both before and during pregnancy and after the birth of the child, must also be considered. These are dependent in part on the mother's intelligence, her education, on the socio-cultural milieu, and on the demands made on the mother especially in terms of work and required care of other children.

It may be difficult of course to estimate the contribution of any one of these factors to the outcome of pregnancy and to the health of newborns and infants, especially since factors of one type tend to be grouped together and to be associated with social and economic situations that further reinforce them. In comparable studies of pregnancies of women in Western Europe, Western Africa and South-East Asia,⁵ women who had been reared in good environments and who had been well nourished from conception to sexual maturity, had highly similar obstetric histories, largely free of complications, and produced healthy infants of similar birth weight. On the other hand the "poorly nourished woman is often the one who gets or seeks little care during her pregnancy, lives in poor circumstances, is badly

housed, ignores signs of impending obstetrical difficulties, has many previous and closely spaced pregnancies, has many family problems, knows little of simple hygiene and sanitation and is in general ignorant and poorly motivated to care for herself",⁶ and she tends to have a higher percentage of complications in pregnancy, low birth weight babies, etc.

The most striking factor about the diseases which exist where high levels of mortality and morbidity among mothers and children are found—the less affluent countries and communities—is that they are largely due to environmental factors which are potentially remediable. The burden of deaths is due to communicable diseases such as gastroenteritis, pneumonia and parasitic infections, and to nutritional disorders. The level of mortality due to these causes is so large in these communities that it quite overshadows the considerable mortality due to stillbirths and prematurity. Poor hygiene, poor sanitation and inadequate care, compound the natural vulnerability of the infant to infection, and inadequate nutrition including problems arising in the weaning period, further lowers resistance. With the control of environmental conditions that predispose to the infections and malnutrition of infancy, the bulk of mortality during the first year of life comes to be concentrated in the first four weeks. Here again, the highest risk groups are to be found in mothers with poor health, poor development and inadequate care.

Essentially, then, the reproductive wastage which high infant mortality produces, promotes patterns of reproduction which further compound the hazards to health and survival of mothers, newborns and infants. These patterns are characterized by high natality, and include childbearing beginning at too early ages, in too rapid succession and in too great numbers. Moreover, high fertility with its inherent demands on the mother both during pregnancy and after birth, tends further to decrease infant care and thus potentiates environmental risks. Thus a self-perpetuating cycle of high infant mortality and of childbearing patterns that impair maternal health is set up that leads to defective foetal development and high newborn and infant mortality. The toll on maternal and infant vitality, and the economic and psychological drain of high mortality are intensified by the negative effects of poor socioeconomic conditions and lack of health facilities that characterize these situations.

Many of the important causes of maternal and infant ill health and death are eminently preventable and in many areas of the world they have indeed largely been eliminated. To a large extent, improvements in maternal and child health result from control of environmental factors in association with social and economic development, but improvement in maternal and child care services have played equally important roles. The application to all infants and mothers of existing knowledge and the extension to them of good health facilities would promote a drastic decline in death and disease.

The promotion of maternal and child health is surely one of the most valuable forms of preventative medicine and the most natural pathway along which basic preventative and curative services should be organized. In the developing countries especially this assumes great importance since children and childbearing women make up such large proportions—often three-quarters—of the total population. Infant and child mortality constitutes the largest segment of total mortality in such environments and the associated high level of maternal morbidity of course contributes to this. In areas where malnutrition and infectious diseases prevail, maternal and child health services must be broad enough in scope to deal with the general health needs of mothers and children as well as with the special problems relating to reproduction and growth. The health needs of mothers and children are often responsive to relatively simple measures. Positive results from these measures produce favourable settings in which health workers can introduce additional education, advice and medical practices.

It must be remembered that high infant mortality is invariably associated with high life-long morbidity manifested characteristically as low life expectancy. This constellation imposes an enormous economic burden on any community as well as physical and mental strains. The promotion of maternal and child health can contribute substantially to the reversal of these patterns and to economic advancement. Reduction of infant mortality and increased expectation of child survival are basic factors in the development of responsible parenthood. It is in such a context of maternal and child health promotion that family planning and fertility regulation can most safely and effectively be carried out.

Table 1. Maternal, infant and child mortality rates

Country	Maternal mortality per 1000 live births			Infant mortality 0-11 months per 1000 live births			Child mortality 1-4 years per 1000 population			Percentage decrease since 1950					
	1950	1960	1964	1950	1960	1964	1950	1960	1964	Maternal mortality		Infant mortality		Child mortality	
										1960	1964	1960	1964	1960	1964
<i>Africa</i>															
Mauritius		1.8	1.5	76.3	69.5	56.7	14.9	10.7	6.2			8.9	25.7	28.2	58.4
<i>America</i>															
Chile	3.6	3.0	2.6	153.2	131.6	114.2	15.0	10.9	7.1	16.7	27.8	14.1	25.5	27.3	52.7
Colombia	4.0	2.6	2.5	123.9	99.8	83.3	22.0	19.7	15.6	35.0	37.5	19.5	32.8	10.5	29.1
Ecuador			2.4	109.7	100.0	94.0			27.4			8.8	14.3		
El Salvador	2.4	1.7	1.1	81.2	75.3	65.0	24.9			29.2	54.2	6.0	20.0		
Guatemala		2.3	2.7	106.8	91.9	91.6						14.0	14.2		
Mexico		1.9	1.8	96.2	74.2	64.5	27.8	15.6	12.7			22.9	33.0	43.9	54.3
Panama		2.1	1.6	68.4	56.8	42.8	11.0	9.2	8.0			17.0	37.4	16.4	27.3
Paraguay				102.0	52.1	80.3		5.6				48.9	21.3		
Peru				103.7	92.1	83.5	23.4	18.7				11.2	19.5	20.1	
Venezuela		1.0	1.0	80.9	53.9	48.7	12.0	7.7	6.2			33.4	39.8	35.8	48.3
<i>Eastern Mediterranean</i>															
Israel, Jewish population	1.0	0.6	0.2	45.6	27.2	23.9	3.9	1.5	1.0	40.0	80.0	40.4	47.6	61.5	74.4
Tunisia				54.7 ^a	121.9										
UAR ^b		1.1		170.9	141.1							15.7			
<i>Europe</i>															
Greece		0.6	0.6	35.4	40.1	35.8		2.0	1.5			+13.3	+1.1		
Poland		0.4	0.4	108.0	56.8	47.7		1.7	1.4			47.4	55.8		
Turkey				75.1											
Yugoslavia		1.5	1.4	118.4	87.8	77.5	11.0	6.5	4.7			25.8	34.5	40.9	57.3
<i>South-East Asia</i>															
Ceylon	5.6	0.9		81.6	56.8		24.2	9.9		83.9		30.4		59.1	
India				127.1	86.5							31.9			
Thailand		4.2	3.2	62.4	49.0	37.7	13.6	17.3				21.5	39.6	+27.2	
<i>Western Pacific</i>															
China: Taiwan		1.1	0.8	35.3	30.5	23.9		7.9	4.9			13.6	32.3		
Philippines		2.0	2.2	101.6	73.1	70.5		9.3	8.2			28.1	30.6		

^a Europeans^b Localities with health bureaux

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RAPporteur's SUMMARY

Integration into community life

Amongst the subjects discussed was the desirability of integrating family planning programmes into community life at all levels. In order for family planning to achieve its proper effects it should not be limited to specialized clinics but should be included in neighbourhood community centres concerned with all aspects of social welfare. The modern integral community programme centred on public health and nutrition services would be a suitable nucleus. Effective family planning needs the active participation of the parents, with a special education programme aimed at them; also it is desirable to include the teaching of sex education to the young which should ideally start in their early years.

Birth control alone is not a solution to the world's economic and social problems but family planning with spacing is one of the factors that must be considered with economic and welfare measures. It was pointed out that integration of family planning in community life is as necessary in developed countries as in developing countries.

It was suggested that an effective means of integration, if it were feasible, might be by requiring advanced registration by couples of the children they planned to have, these children could then be granted extra privileges, such as better schooling, while unplanned children would not be eligible for these privileges. This would, however, only be effective where there was limited available school accommodation. The idea has already been further developed in the "Titmus Survey" in Mauritius which had suggested such measures as restriction of family allowance to three children, a marriage bonus for girls who married after 21 years of age and pre natal allowances for mothers who had registered at family planning clinics.

Role of midwives

It was asked whether there had been any experience of obstruction to family planning programmes by midwives, particularly in rural areas, due to the dependence of such people upon deliveries and abortions for their livelihood. In many countries midwives were qualified personnel working with doctors and nurses to promote family planning and this question did not arise but where there was opposition from the unqualified and more ignorant, it had been found that an effective solution was the employment of these people, in some way or other, in the programme, thus winning them over to the cause. Mention was made of the special large-scale training programmes for midwives undertaken in Japan, whereby thousands of them had been turned into effective family planning consultants and were paid for their work in this field.

It was pointed out that apart from midwives there were still many doctors who showed a marked lack of enthusiasm and even hindrance to family planning work because of their envisaged reduction of income. This was due to lack of understanding of the necessity of such programmes and needed to be remedied.

Vicious circle

The effective ways of breaking the vicious circle of poor maternal health, high pregnancy rate and high infant mortality were discussed. It was suggested that this might be accomplished by teaching women that they no longer needed to have many children in order to ensure survival of the few. But it is unlikely that mothers could be "talked into" reducing the numbers of their children, they could only learn this by experience. One of the useful functions of urban society, with its better medical facilities, had been that it had proved to mothers, who had come from rural areas, that their children could have a better survival rate and from the cities this experience was transmitted back to the villages. This process was naturally very slow and it would take many years to establish the concept of security in raising children.

The vicious circle can, however, be broken by raising the level of health in infants and mothers, thus there is a priority in raising the standard of maternal and child health services.

Development of the child

Kindergartens and nursery schools can play an important part in the development of the child, especially where the mother comes from the under-privileged groups, as she is readily influenced by the ideas of her children's teacher. Compensation for lack of stimuli in poor home life can also be made, assisting children to realize their absolute potential.

Instability of family life—size of family

It was noted that where family instability is high, in North America and Western Europe, the number of children in the families is small; though there is a correlation which is particularly marked in the Caribbean, with its specialized form of instable union, there is no scientific evidence to show that this is a cause and effect relationship.

Effect of contraception on illegitimacy rate

Questions were asked concerning the moral and penal codes in North Africa and it was stated that strict moral codes enforced by the women themselves resulted in low illegitimacy rates but that growing liberalism might affect these in the future. Contraceptive advice was officially provided only for married people in that area.

Rights of women

The right of women to happiness was a subject that met support from all quarters, particularly with regard to the plight of the Moslem women with the existence of polygamy and its biased divorce laws. It was stated that the insecurity of the Moslem wife was one of the reasons for her desire to have so many children. While the desirability of revision of the Islamic laws falls outside the purpose of this discussion, the Session Chairman wished it noted that the matter had been raised here.

Man's inhumanity to woman

It was suggested that this attitude was fostered by the women themselves by their passive acceptance of man's superiority in many countries. Women should be made more aware of their rights and duties. Perhaps the key to the situation was the low cultural level of women in many regions where insufficient attention was paid to their education. By education of the women the problem would be eliminated.

Endorsing the revival of the rights of women, the Session Chairman concluded by remarking that it was well known there would be no problem, if it were the men who had the babies!

N.B.—The "Family" we are discussing here is the family unit of man, wife and their children, their duties and obligations and rights. This can be further interpolated to be the "Family of Nations" as all nations should consider their needs as relevant to those of other nations.

EDUCATIONAL FACTORS IN PLANNED PARENTHOOD

19. ATTITUDES TOWARDS PLANNED PARENTHOOD

J. Y. Peng

*Department of Population Planning, School of Public Health,
University of Michigan*

INTRODUCTION

According to Berelson, the term attitudes in general refers to judgments based on reason or emotion, and often a combination of both. Attitudes are usually conscious in their content and amenable to change and can influence people's choice in controversial matters such as political issues, religious ideas and practices such as family planning.¹

In the past few years, sample surveys of knowledge, attitudes and practices with regard to fertility matters have been conducted in many developing countries. The coverage of attitudes studies as summarized by Berelson are: "approval or disapproval of family planning in general, of contraception, of sterilization and of abortion: reasons for approval or disapproval, readiness to practise family planning, willingness to learn methods of family planning, approval or disapproval of government programs for family planning, attitudes toward national population growth, source of influence on fertility attitudes and perception of others' attitudes on similar questions."²

In these recent studies, the results show a remarkable similarity in people's desire to have smaller size families, and the high proportion of married couples interested in learning fertility control. The ideal number of children in a family is four, and the percentage of married couples interested in learning fertility control is about 70% in Taiwan, Thailand, Tunisia, Turkey and Korea, as shown in Table I. These facts indicate to us that in conducting educational activities in a family planning programme, it is realistic and practical to emphasize the influencing of married couples' fertility attitudes into action, that is, encourage them to accept and then continue the use of contraceptive methods.

*Table I. "Ideal" number of children and interest in learning fertility control**

<i>Country</i>	<i>Completed family size</i>	<i>"Ideal" family size</i>	<i>Interested in learning (%)</i>
Taiwan (1963)	5.5	3.9	66
Thailand (1964)	5.2	3.8	66
Tunisia (1964)	5.9	4.3	66
Turkey (1963)	5.8	3.5	68
Korea (1964)	5.4	4.2	73

* Data taken from Chapter 51 in *Family Planning and Population Programs*, by Bernard Berelson.

POSITIVE CHANGES IN ATTITUDE AND ACTION IN RELATION TO FAMILY PLANNING EDUCATIONAL PROGRAMMES

Experience in action programmes in Taiwan, 1963, and in Thailand, 1964-65, proved that educational activities were very helpful in influencing people's attitudes toward fertility control both directly and indirectly. Educational activities in both programmes were mainly

through home visits by field workers and through neighbourhood group meetings held by public health nurse supervisors. In both programmes mass media education was avoided for political reasons.

THE TAICHUNG PROGRAMME OF PREPREGNANCY HEALTH OF TAIWAN³

Eleven thousand four hundred and seventy-two homes (90% of the target) were successfully visited in five months by 18 field workers. Family planning education using flip books and displays of actual contraceptives was conducted during the home visits. The average number of homes visited each day by one worker was 6.5 houses. On the neighbourhood level, a total of 513 group meetings (53% of the target) were held in four months by nurse supervisors. Education using filmstrips, flip books and actual contraceptives as audio-visual aids was conducted during the meetings. For the four-month period, the average number of group meetings held each week was four.

The total number of contraceptive acceptors during the eight-month programme was 3,807. Seventy-two per cent of these chose the IUD. The total number of acceptors was 11% of the total married women between ages of 20-39 in the programme area (population 300,000).

Sample surveys before and after the action programme were conducted in the area. Attitudes of wives and husbands in approval of fertility control in the "before" survey were already as high as 89% and 70% respectively. The result of the "after" survey showed even higher percentages; despite the fact that the proportion of those approving of fertility control was close to the saturated situation in the "before" survey, 92% of wives and 80% of husbands approved of fertility control, as shown in Table II.

Table II. Per cent distribution of attitudes of wives and husbands toward fertility control*
(Surveys before and after the Action Programme, Taichung, Taiwan)

<i>Attitudes</i>	<i>Wife</i>		<i>Husband</i>	
	<i>1962</i>	<i>1963</i>	<i>1962</i>	<i>1963</i>
1. Approve strongly	34.5	70.0	33.6	39.5
2. Approve moderately	55.1	22.4	36.9	40.4
3. Cannot determine	1.4	3.6	1.0	0.9
4. Disapprove moderately	3.1	2.0	3.6	3.5
5. Disapprove strongly	5.1	1.1	3.6	1.1
6. Do not know	0.7	0.8	21.2	14.4
7. N.A.	0.1	0.0	0.1	0.2
Total	100.0	100.0	100.0	100.0

* Data from the University of Michigan Population Studies Center.

THE PHOTHARAM FAMILY HEALTH RESEARCH PROJECT OF THAILAND^{1, 5}

A total of 3,024 homes were visited by six field workers during the 10 months of the programme. The average number of homes visited each week by each field worker was 11. A total of 122 group meetings were held in the villages by public health nurse supervisors and medical officers, on an average of three each week. Twenty large-scale village meetings were arranged upon the initiative of the District Officer. Approximately 6,500 people attended these meetings over a two-month period.

During the 10-month programme, the total number of acceptors in the programme area was 1,395, of which 81% chose IUDs. This was 23% of the total married women between ages 20-44 for a population of 60,000.

Sample surveys before and after the action programme were also conducted at this project. Women's positive attitudes toward fertility control before the action programme were 68% and increased to 75% after the programme, as shown in Table III.

Table III. Per cent and cumulative per cent distributions of women's attitude toward fertility control* (Surveys before and after the Action Programme, Photharam Family Health Research Project, Thailand)

<i>Motivation class</i>	<i>1964</i>		<i>1965</i>	
	<i>%</i>	<i>Cumulative %</i>	<i>%</i>	<i>Cumulative %</i>
Highly motivated	39.7	39.7	43.0	43.0
Moderately motivated	6.2	45.9	13.1	56.1
Qualifiedly motivated	9.8	55.7	1.2	57.3
Potentially motivated	12.7	68.4	17.6	74.9
Not motivated	24.2	92.6	7.0	81.9
Inconsistent	7.4	100.0	18.1	100.0
Total	100.0		100.0	

* Data from the report by Amos H. Hawley.

Attitude change was observed among the women who disapproved of family planning at the survey before the action programme. The reasons given for change of attitude from disapproval to approval were that they had learned that contraception is not harmful to health, family planning is a good thing to do and a friend has used contraception satisfactorily.

The action programme also created a favourable change in attitudes toward extending a family planning programme to all of Thailand, as shown in Table IV.

Table IV. Per cent distributions of women's attitudes toward extending a family planning programme to all of Thailand, by education* (Surveys before and after the Action Programme, Photharam, Thailand)

<i>Years of school completed</i>	<i>1964</i>				<i>1965</i>			
	<i>Yes</i>	<i>No</i>	<i>Unde- cided</i>	<i>Total</i>	<i>Yes</i>	<i>No</i>	<i>Unde- cided</i>	<i>Total</i>
Total	57	10	33	100	91	4	5	100
No years	48	10	42	100	90	4	6	100
1-4 years	58	10	32	100	92	4	4	100
5 years and over	62	11	27	100	93	2	5	100

* Data from the report by Amos H. Hawley.

Over 90% of all women in the "after" survey felt that a similar programme should be extended to all of Thailand. The proportion before the programme was 57%.

The survey of attitudes of village leaders and school teachers (mostly men) conducted in 1966 in Photharam revealed that 79% of the respondents described the programme as "good". The reasons for their favourable attitudes toward fertility control were improvement of the family economic situation, better health through spacing of children and more advantages for each child, such as better education, in a family with fewer children.⁶ These reasons mentioned by the respondents had been emphasized by the speaker at the village meetings.

INFLUENCE BY INDIRECT SOURCE OF INFORMATION

Although the organized educational activities had a direct effect in influencing married couples to accept family planning methods, the most outstanding source of influence was the indirect effect of word-of-mouth communication.⁷ During the period of one year in the Taichung programme, 66% of all acceptors within the programme area came from the neighbourhoods where no home visits and group meetings were scheduled. Moreover, acceptors from outside Taichung accounted for 26% of all acceptors.

During the 10-month programme in Photharam, 59% of the total acceptors came through an indirect source of influence, and 62% of the total acceptances were from people living outside Photharam. The most remarkable example was the IUD clinic in Chulalongkorn Hospital in Bangkok. About 10,000 women came for IUD insertions within 10 months after the start of the clinic in January 1965. Here, no publicity was ever made except a short

period of education in the maternity ward at the outset of the programme and half an hour of education on the IUD in the waiting room before the regular clinic hour.

NEGATIVE CHANGES IN ATTITUDES

A change in attitudes from approval to disapproval of fertility control was observed after the action programmes. In the Photharam Programme of Thailand 2.5% of the former approvers shifted to disapproval at the 1965 survey. The main reason for this negative change was due to reports of pain, bleeding and other complications and discomforts associated with the IUD. At the 1966 survey of the attitudes of village leaders, 17% of the respondents described the programme as "bad". Their reasons were again due to complaints attributed to use of the IUD, such as pain, bleeding, general deterioration of health or fear of cancer.

The negative effect due to diffusion of news of complications related to the IUD method has been a problem in family planning programmes in many countries where IUDs are mainly used. This problem should be watched very carefully. The critical time was usually one month after the start of a new programme. In our experience in Taiwan and Thailand, sources of news were followed and studied thoroughly. Prompt action was taken on each occasion to make up for any development that discouraged women from visiting the clinics.

CONCLUDING REMARKS

Experience in two family planning action programmes in Taiwan and in Thailand in the past few years with well-organized and well-conducted educational activities has showed very successful results. The important factors which created favourable response in active acceptance and increased approval of family planning could be the following:

1. A high proportion of women were already interested in learning fertility control and the information, therefore, spread very quickly.

2. Well-organized and effective educational activities resulted in indirect diffusion as well as the direct communication. Services themselves at the clinics by doctors, nurses and midwives are very significant educational and influential factors to people. The attitudes of doctors and other personnel at clinics and in educational activities are of vital importance.

3. The IUD, as a new method in the area, attracted many women. Almost all women who came from outside the programme areas in Taiwan and in Thailand came for IUD insertions. IUD acceptors even inside the areas were 80% to 90%.

4. The active role of local health personnel was especially significant. Local nurses and midwives helped spread the information during routine activities both before and during the programmes. In fact, the first peak of acceptances in the graphs for both programmes is due to the work of local health personnel.

It is our hope that well-planned and well-organized efforts, which include educational activities, will help people to have fewer children and thereby bring the fertility rate down faster than the long and slow process of unplanned social phenomena.

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20. HEALTH EDUCATION IN FAMILY PLANNING PROGRAMMES

Jean Pinder

Health Education Consultant in Ghana

INTRODUCTION

Launching a successful family planning programme in a country necessitates as careful pre-planning of the health education aspects of the programme as is required of the clinical and logistical phases. During the pre-planning phase, the health educator has to work closely with the programme director, social scientist and other members of the administrative team. It is during this phase that studies should be developed and conducted to determine existing knowledge, attitudes and practices toward family planning within the various types of communities within the country. Findings from such studies form the basis on which the educational team plans its programme.

The major objectives of health education in a family planning programme are:

1. To create favourable public opinion prior to launching the programme.
2. To provide information regarding birth control methods and the location of clinics or other facilities where family planning advice may be obtained.
3. To motivate people to practise family planning.

The relation of pre-planning studies to various aspects of the health education programme will be discussed in the light of these objectives.

CREATING FAVOURABLE PUBLIC OPINION

In any population, there are invariably persons who, for one reason or another, have objections to family planning. These objections may be due to various kinds of beliefs including religious, that security in old age requires having many children, that contraception causes sterility, or that the use of contraceptive methods is unnatural. Those persons responsible for planning the educational aspects must have a knowledge of these prevailing beliefs, the attitudes of various groups of the population toward family planning, and a thorough understanding of social customs and taboos in order to direct early educational efforts either toward refuting false beliefs or toward neutralizing objections to the programme. Securing this kind of information can only be done through reliable surveys conducted under the direction of or with close guidance by a social scientist.

Objections to family planning are not limited to the uneducated segments of a population. They may also be found in those groups of the population whose support is necessary if the programme is to be generally accepted and if any degree of success is to be achieved. Some of these objectors may exist among government officials, clergymen, teachers, the medical profession and other opinion leaders. Bogue and Heiskanen, in a paper on communication for birth control, state, "People will not accept and try something with which they are unfamiliar until it has been 'legitimated' (endorsed or recommended) by some person or agency whose judgment they respect and trust." These authors go on to state that, "research has shown that persons differ widely in what they regard as a legitimating source. It may be an eminent scientific authority or it may be a neighbour, local minister, or a neighbourhood druggist."¹ Because of this wide diversity and because of cultural differences, it is important that in planning the programme, endorsement be sought from as broad a group of opinion leaders as possible.

Experience from a number of countries that have already established family planning programmes seems to indicate that by starting within a segment of the population that is already motivated to accept family planning, interest tends to be stimulated among other groups of the population. Bernard Berelson, former Director of Communications Research

for the Population Council, indicates that the basic strategy at the outset of a programme should be directed toward providing the information, services and supplies to those persons who are already interested in family planning. He further states that "peripheral attitudes will later change to conform to behaviour".²

COMMUNICATIONS—DISSEMINATION OF BIRTH CONTROL INFORMATION

The most effective channels of communication in a given population need to be explored. They may well vary from one country to another. For example, in an IUD study done in Lulliani, Pakistan, it was found that home visiting was an effective method in increasing acceptance rates among eligible couples. However, just "seeding" a population with devices did not give rise to a large-scale reaction through word-of-mouth communication.³ In contrast to this experience, a report of a study made in Taichung, Taiwan, stated, "the power of diffusion has been demonstrated for the population of a large city. A large proportion of the acceptors were not contacted directly by the programme but heard about it indirectly through diffusion.

(a) A large part of the diffusion takes place through the informal communication network of friends, relatives and neighbours.

(b) An important source of diffusion is the large number of public health personnel scattered through the area who spread information about the programme quite apart from their participation in it."⁴

In a summary of the Geneva Conference on Family Planning held in August 1965, Dr. Ronald Freedman reported, "the power of indirect diffusion in spreading information about family planning is being demonstrated in one study after another in various countries".⁵

Accepting the thesis that considerable information is transmitted through private, informal communication, the programme planner, in addition to creating communication channels, must motivate the person who has the means to transmit the information to others. There is little research available in regard to this technique; however, a direct communication effort is likely to stimulate discussion and offers the opportunity for the informed person to transmit his information. For example, newspaper articles, radio discussions, mailed information and so forth, may serve to initiate discussions among the normal channels of informal communication.

Primary target groups for information regarding birth control methods are: medical practitioners, public health workers, social workers, midwives (both trained and untrained), hospital staffs, agricultural personnel and other types of workers coming in contact with those groups of the population which may be considered as potential acceptors of family planning. Experiences reported from the Republic of Korea pointed out the importance of carefully instructing general practitioners in regard to the insertion of IUDs and in dealing with side effects. It was found there that if such instruction had not been given, the solution often used by the general practitioner to problems which arose was removal of the device.⁶

In the past, there has been a general belief that mass media could not be used in promoting family planning programmes. This belief has been refuted in many countries where radio, television, billboards, newspapers and cinemas have all been used successfully. Those countries which are attracting large numbers of the eligible population to participate in family planning are using a variety of methods to provide information to the public. Mass media techniques have proved to be quite effective for this purpose; however, the mass media have not, as a rule, motivated many people to take action. In most studies reported, word-of-mouth communication is most often given as the stimulus which prompts an acceptor to attend the family planning centre.

There is one particular group of the population in any community which usually requires special effort to reach and also special effort to motivate to participation in the programme. This group, often called the "hard-to-reach" group, usually does not belong to the organized community. They are seldom a part of the usual community organizations such as churches, clubs, civic groups, etc. In Latin American countries, many of these people would live in shanty towns of the major cities, such as the *callampas* of Santiago.

Every effort should be made to find local leaders from within these communities and to win their support. In so far as possible, information should be channelled through these

local leaders. People in such communities are often suspicious and are difficult to convince that "outsiders" are interested in providing a service that will benefit them. They doubt the underlying motives and the sincerity of people coming in from outside the community. In this type of situation, it is often helpful if family planning can be incorporated into another health service programme such as maternal and child health, and the health staff which is already accepted in the community utilized for family planning services. If possible, efforts should also be made to recruit field workers from within the community.

Another aspect of the total family planning programme which relates to all three of the objectives mentioned earlier, and to which the health education staff as well as other administrative staff members are required to devote considerable effort and attention, is training. All personnel actively engaged in the programme must not only have accurate technical information, but also must work at creating good public relations.

The training of field workers, supervisory staff and all others directly involved requires careful planning. Experience in various countries has shown that after an initial training period, it is advisable to bring personnel in periodically for refresher training and evaluation. These are the key people for disseminating information and for developing the necessary public support. Their responsibilities include education, public relations and the provision of general information regarding family planning.

The major responsibility for encouraging families to participate in family planning rests on the field workers. The success or failure of the programme will depend largely on the effectiveness of this particular group. It is, therefore, essential that careful attention be given to their selection and training. The qualifications of field workers have to be individually determined by countries. The kind of personnel available and to whom local people will respond must be taken into account. In some countries, it may be possible to use public health nurses or auxiliary public health nurses. In other countries, it may be necessary to recruit secondary school graduates, and in some instances educational levels may even be lower. In any event, training must be planned to suit the level of the field workers selected, and on the basis of the objectives and goals of the particular programme. If, for example, family planning is incorporated into the maternal and child health programme, the training of field workers must include a basic understanding of maternal and child health needs. Whereas, if family planning is part of a rural or community development programme, certain aspects of the training might vary considerably. Needless to say, training should include the use of suitable teaching aids.

MOTIVATING PEOPLE TO PRACTISE FAMILY PLANNING

In countries where family planning programmes have been started, it has been found that there exists a sizeable proportion of the eligible population already motivated to practise family planning. That is, they already have the desired number of children, or they feel that they cannot afford to have more children, or they wish to limit the size of their families.

Various studies made in regard to induced abortions indicate that in many Latin American countries, as in most other countries of the world, people try to limit their family size by one method or another. Francoise Hall reports on a study of Armijo and Monreal that in Santiago, an estimated 16% of all pregnancies end in an induced abortion. In Uruguay, the estimate is that there are three times as many provoked abortions as births. In a study of a group of women between 20 and 39 years of age in Lima, Peru, Hall revealed that the proportion of pregnancies ending in admitted provoked abortions, according to the economic status of the women, was as follows:

	%
Upper socio-economic group	1.8
Middle socio-economic group	3.4
Lower socio-economic group	1.5

Based on responses to the interview questions, it was suspected that in each group, the actual percentage of provoked abortions was considerably higher. The additional percentages of pregnancies ending in abortions that were suspected to have been provoked were:⁷

	%
Upper socio-economic group	5.4
Middle socio-economic group	2.9
Lower socio-economic group	2.3

Included in this study was the percentage of women exposed to pregnancy and using some type of contraceptive method. These figures were as follows:⁸

	%
Upper socio-economic group	68.3
Middle socio-economic group	55.1
Lower socio-economic group	38.3

It is quite likely that the higher usage in the upper and middle groups is due to greater opportunity to secure information about contraception than is available to the lower socio-economic group. However, from the various studies made, the evidence exists that there are many families who would practise contraception if the information and contraceptive supplies were available.

Studies made in Japan, India, Puerto Rico and the United Kingdom have indicated that the major reason given for wishing to practise contraception is the economic condition of the family. A further finding which has been reported from both Korea and Taiwan is that initially, the bulk of acceptors come from couples who wish to stop births rather than to space their children. There are indications, however, that a growing interest in child spacing is developing among younger couples.

If preliminary research in Latin American countries reveals similar attitudes, the economic factor and the family limitation factor might well be exploited in the approach to families to motivate acceptance of contraception. However, any motivational approach used must be based on findings in a given country. This emphasizes the importance of preliminary studies in regard to knowledge and attitudes.

In discussing motivation, it is important to mention the secondary school population as an important target group. The school offers opportunity for making young people aware of the population problems facing their country and the world. This information is readily incorporated into social studies courses, geography courses and civics courses. Obviously, science classes, biology, physiology and home economics courses provide opportunity for teaching the physiology of reproduction and sex education. Through utilizing opportunities for making young people aware of the population problem and by creating an understanding of the reproductive process, teachers have an excellent chance of developing a favourable attitude among the youth of the country toward the future acceptance of family planning.

CONCLUSION

The development of a sound health education programme in relation to family planning requires pre-planning studies, and the establishment of a well-integrated organization which is involved in all aspects of the total programme. The creation of good public relations and favourable public opinion is a responsibility of all staff members concerned. In order to achieve the objectives or goals established of lowering population growth rates, training of all participating staff, private physicians, teachers and other persons who might lend support to the programme is of primary importance and should be planned and conducted to meet the needs of the various groups concerned. Continuing evaluation of the health education aspects should be a part of the overall evaluation and will serve as a basis for any modifications which may be required.

Each country has to determine the methods which will be most effective in its own situation. However, the possibility of using various methods of communication should not be overlooked, as the countries presently experiencing considerable success in gaining acceptors of contraceptive methods are finding it is possible to use a large variety of communications media.

Success of the family planning programme depends to a great extent on the achievement of the objectives of the health education activities discussed. It is, therefore, urgent that in

initiating the programme, emphasis be placed on the development of an effective plan for health education throughout.

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21. THE IMPORTANCE OF SEX EDUCATION: SEX EDUCATION AT SCHOOL

T. Wickbom

Katrineholm Secondary School, Sweden

Sex education at school in a modern society has two functions:

1. It should impart knowledge of the facts of human sexual life, e.g. the structure and function of the sexual organs, puberty and menopause, as well as about venereal diseases, impotence, frigidity and sexual abnormalities. It should of course also impart knowledge about family planning.

2. Sex education should be the instrument that conveys to the next generation the norms, ethics and morals governing sexual life that exist, and which are as essential in every society.

Thus it may be said that sex education has two aspects: one biological, medical and hygienic, and one social, ethical and psychological. Of course this division must not be carried too far, but one should be aware of its existence. As a criticism against sex education in schools, it has sometimes been said that plants and animals manage their reproduction without education. To accept this as a guide to humans one must completely disregard the fact that man holds a unique position as a social being who can communicate information by verbal means from one generation to another. This information contains essential elements of human ethics and morals.

Every society discusses to what extent sex education in its widest form concerns the individual family, and to what extent the public sector of society is concerned. For us in Sweden, it is accepted that it is not a question of either/or, but both/and. As well as in every other kind of education, home and school must work together. Our knowledge of human psychical and physical functions increases so fast that the individual family cannot hope to keep up to date with the progress of research. Professional teachers of biology, hygiene, psychology and social science must each give young people the individual contributions they can offer. Of course, society must often try to reach the parents with advances in knowledge. In an industrialized society with a high standard of living, this happens partly by means of mass media such as the daily press, magazines, radio, television and specialized literature on the particular subject, and partly by voluntary spare-time education, such as study groups. Besides this, information is given to parents by doctors, family planning counselling bureaux and pamphlets from National Boards of Health or Education.

In some countries, as in France, schools have taken an interest in educating parents by arranging evening classes for them. Parents are taught sex education among other things. The reason for this is that schools are not allowed to give sex education but through the parents can reach young people with the necessary information.

The best thing, of course, would be for young people to receive suitable sex education in their homes from their own parents. Experience, however, shows that a satisfactory education of this sort puts the home to such a severe test that the task, as a rule, proves too difficult. Often the parents' knowledge is inadequate, their interest in this aspect of their children's education is insufficient, and their own reservations are frequently pronounced. When the parents cannot give young people the necessary guidance, it is believed in Sweden that the task belongs to the schools which, next to the homes, are the most suitable authority.

The reason for the parents' reservations is in most cases caused by the black-out that sexual life in large parts of the world has been subjected to during the last 100 years. The result of this black-out is that many parents still have difficulty in talking both with each other and with their children about sexual matters. An investigation on 300 women between

the ages of 20 and 36, published in Denmark in 1951 by Dr. Kirsten Auken, showed among other things that only 10% of these women had received sex education from their parents. Fifty per cent of them gave friends as the most common source of information. Knowing how such information is given it is no exaggeration to say that the present generation of mothers, at least in the Scandinavian countries, has received its sex education from rather obscure sources. It is not surprising that these mothers themselves have difficulties in giving their own children sex education in an adequate, warm and natural way. As to the information background of the fathers, I have not seen any relevant investigations, but it is probable that they received their information during adolescence from their friends, as did the girls.

The basic aim of sex education is to provide knowledge in a subject that is of the greatest importance in the personal development of students. One objective is to counteract undesirable sexual behaviour, such as sexual intercourse at too early an age. Another urgent task of such instruction is to create the necessary conditions for a harmonious sexual life.

Consequently, information about family planning must be one of the most important subjects and aims of sex education at school. Education in family planning must explain and lay the basis of the ethical and social point of view that it is better in our type of society for a child to be born and brought up in a complete home with a mother and a father. This does not mean that there should be any discrimination against homes where a single mother or a single father brings up children. We only believe that it is easier for a child to grow up to be a well-balanced individual if during childhood there is an emotional contact both with a man and a woman at home.

Besides this, education in family planning must contain items about contraception. The ethical reasons for contraception are as follows: In a modern society we consider that a family should not have more children than the woman's health and the family's economy can manage. It is worth pointing out that one can buy a high standard of living at the price of a lower number of children per family. On the other hand a mutually harmonious sexual life for persons who love each other is a source of the deepest communion and happiness.

The way to combine these two aspects together in real life is of course to use contraceptive methods. In Sweden these are nowadays commonly accepted, as well as information about them being available at school. The result is that among other things we have a positive tie-up—even if it is a weak one—between the incomes of the families and the number of children. With a little exaggeration it can consequently be said that the children in Sweden are generally not only welcome but really planned. Unfortunately, this does not usually apply to the first child of every family.

Sex education in the Swedish schools starts in the first school year. The scope of this initial school instruction is limited to how the sexes differ, where children come from, how they develop before birth, how they are born and in what way they depend on their mothers, fathers and homes.

By a suitable sex education adapted to these small children's ability to understand, one can lay an ethical basis which is as follows:

Children have the right to be born in complete homes, with parents who are willing to take care of them in the best way possible.

At the age of 12, instruction continues with biological aspects, such as the structure and function of the sexual organs, puberty, menstruation, night pollution, masturbation, conception, pregnancy, development of the foetus, determination of sex and twins and other matters. The instruction is given to ordinary classes with girls and boys together.

During the ninth school year (the final year of compulsory school) the most complete sexual education and instruction is given to the young people who are then about 16 years old.

Sex education is given chiefly in biology lessons, but according to recommendations from the National Board of Education, it is touched upon also in lessons on religion, social studies and other subjects in which questions of sex may arise naturally.

The following items are dealt with:

- Structure and function of the sexual organs
- Conception

Development of the foetus and pregnancy

Childbirth

Sex and youth. Moral considerations

Children born out of wedlock

Spontaneous and induced abortions. The Swedish law on abortion

Venereal diseases

Contraceptives

Sterilization

The climacteric or menopause

Sexual abnormalities

Moral and social aspects of sex

Welfare measures designed to help creation of a family

Welfare measures during pregnancy, confinement and nursing

Welfare measures for the care and training of children and adolescents

The necessity of sex education at home

Impotence

Frigidity

The pupils who continue with higher education are given a revision course and then more comprehensive information on the following items:

Moral and social aspects of sex

Sex hormones and their influence upon puberty, ovulation, menstruation, conception, pregnancy, menopause, etc. Pregnancy tests

Contraception

Venereal diseases

With these older pupils (13-19), contraception is dealt with from two aspects:

1. They are given information about the most important contraceptive methods which are the most acceptable to people in Sweden today.

2. They are given a chance to see the problem from a global point of view. The problem of the overpopulation of the earth and the possibilities of tackling this in different ways are discussed, and this includes family planning.

Sweden today has a very small increase in population (the birth rate is about 15 per 1,000 and the death rate about 11 per 1,000, with a consequent increase of about 4 per 1,000 per year). The reasons for family planning in Sweden are consequently in many respects different from those in so-called underdeveloped countries. However, we must give our young people a knowledge and understanding of global problems.

The moral and social aspects of sex are discussed intensely in Sweden today. A more conservative group with a clear religious anchorage considers that this subject must be dealt with so as to impose a certain moral opinion. This group considers that the aim of sex education is to give young people a code of morals according to which sexual intercourse must be limited to marriage. A more radical group on the other hand considers that education should be objective. It should, according to them, give an account of the different ethical and moral opinions that clash with each other in present-day Sweden, with the arguments for and against the different opinions that are put forward in public debate, but leave it to the young people themselves to make up their minds and make their own choice. They consider this to be the only truly democratic attitude.

In my opinion an item of this kind (moral and social aspects on sexuality) must be dealt with in rather different ways in different countries, depending on their culture, traditions and religion. In one country the communication of traditions to the next generation by indoctrination is right and natural. In another a non-indoctrinating education is more in accordance with current ideals and aims of education. The main thing is, in my opinion, that young people at school are confronted with these problems and not left without information.

22. THE IMPORTANCE OF SEX EDUCATION: ADULT EDUCATION AND RESPONSIBILITIES

Mary S. Calderone

Sex Information and Education Council of the US (SIECUS)

Different motivations for family planning are expressed by different people: some wish to balance numbers with food and other resources; some wish to hold down the numbers of economically deprived people; some wish to strengthen family life. My own belief has always been simply that "The right of a woman in the matter of her own body should once and for all be recognized as a right in its own right."¹ The recognition of this as a basic human right must inevitably stem from the changing status of woman wherever she emerges from chattel or appendage to the male, into personhood.

People also have different motivations for sex education of children and young people: some want to lower venereal disease or illegitimacy rates; some want to promote happier marriages; some want to promote "morality"—but again these ends should not be considered central. George Bernard Shaw once stated what might be accepted as a primary goal: "The right to know all there is to know about oneself is a natural human right." The connexion between the right to sovereignty over one's own body and the right to know all one wants to know about oneself as a sexual person, is clear.

How does one come to know oneself as a sexual person? Two concurrent and intricately related processes go on in the life of each individual: the maturation of the personality structure given at birth and the impact exerted on both personality structure and the maturation process itself by the cultural environment. Rainwater observes that one of Freud's most important contributions was to show that sex at any stage of life is never simply sex, a physical *act*, but is "a complex of feelings and behaviour built out of elements which extend genetically back into dim childhood experience, and cross-sectionally into other vital drives which the individual seeks to develop in importance and to protect from encroachment".³ It is this concept that permits, indeed compels us, as Gagnon² and Broderick³ show us, to recognize the sexuality of the child as present and valid from the moment of birth: he is a sexual being with sexual feelings, needs and drives—even though genital expression of this sexuality might be years away. Until we accept the sexuality of the child, we cannot begin to design or engineer the process by which that sexuality may be brought to full, responsible, expressive maturity.

Because the sex education of the child with which we are so concerned cannot be considered apart from the sexual attitudes and behaviour of his surrounding adults and culture, to speak of sex education as happening in the home *or* in the school, *or* at 5 or 10 or 15 years of age, is to create separations in place and time that in fact do not exist: *sex education is not a definable "event" but is an all-permeating continuum*, and we have no choice as to whether or not to do it, it is done. The choice we do have, is whether or not and how we shall intervene, to make this process a conscious one directed toward certain goals to be defined. As shown by Reiss, Rainwater, Christensen, Bernard and others,³ as between the many different sub-cultures in the USA, differences in attitudes and concepts about sexuality and acceptable sexual behaviour are of a high order. Marked differences also exist within each sub-culture as between its individual members, due to the varying ways in which each inborn personality structure has reacted to the impact of its own particular cultural milieu. We do not know how to predict the effects of a specific acculturational process on a given personality substrata. We do know that these effects are, for better or for worse and hit or miss, with near-irrevocability built into the child's personality.

Yet the word "built" is a misnomer, for it implies intentional and intelligent application of skills in design and construction. Too often in the USA today, the child's sexuality is crushed into him. Precociously emphasized eroticism, premature or brutalizing sexual experience, confusion of gender role and identity, hypocritical denial of straight sound knowledge about human sexual experience—these are obvious sources of trauma. More subtle but no less destructive in their causality are the still omnipresent and traditional association of erotic sexual pleasure with sin and evil even in marriage, and the assignment of full sexual expression only to the male. Of great importance is the almost universal interference with the process by which the child tests his awareness and experience of his bodily sexual self through the range of childhood and adolescent masturbatory activities. Most subtle and most devastating of all particularly to males, is the constant implication that sexual prowess and conquest rank with the ability to make money as the prime measure of success as a man.

Because masturbation is a well-nigh universal phenomenon of all age levels, questions about it must be answered by science in the manner usual for scientists: What, if any, is its role? Is it one way by which one comes to know one's self? Is it essential to the development of sexuality in the individual? Is it a way by which sexual tensions can be harmlessly released at critical points in the life of the individual—in adolescence, in adult life before marriage, after marriage during periods of illness or separation or with the termination of the marriage by divorce or death, or in such involuntarily celibate situations as prison? Or, if masturbation is *not* to be considered "normal" but pathological, then how is it to be classified? *Any* masturbation is dangerous, as we classify narcotics? *Some* masturbation is dangerous, as we classify cigarettes? *Too* much masturbation is dangerous, as we classify alcohol? And how much *is* too much in respect to it, and why? Or is it, perhaps, the use to which an individual puts masturbation that is "dangerous"—for fantasizing or as compensation or as a refuge against too heavy pressures, or as a substitute for unsuccessful heterosexual relationships? All of these are hard questions that must be answered: if masturbation is dangerous then science must devise non-damaging means to control it; if we are to be scientifically neutral about it then we should learn to consider it the business of the individual involved; if it is useful then obviously science should indicate how its usefulness can be safeguarded.

There are no case histories to validate any theory that masturbation *per se* can damage the individual, but there is much evidence that it is individuals who have been damaged in some way during the maturation process who may use masturbation in ways symptomatic of that damage: as an escape, as compensation, as a safety-valve, as a substitute for the unattainable. Because to try to suppress it usually succeeds only in creating or compounding problems, if the child is emotionally healthy and he or she masturbates in private should we not rejoice in the health and respect this privacy with regard to the other? If the child is emotionally unhealthy and he or she masturbates, should we not treat the first and still ignore the masturbation, in awareness that he needs something of his own that he *can* enjoy in the midst of his culture-induced misery?

For let us face it: no child comes into this world a prostitute, a narcotic addict, an alcoholic or a homosexual. No child is born neurotic or psychotic. All of these things *happen to him* as the result of the days of his life he passes amongst us adults.

If the goal of sex education can be accepted to be, *adults who will use their sexuality in mature, creative and responsible ways*, then the endless chain of adult-child-adult-child *et cetera* must be infringed upon at every point possible with efforts to make the process of personality and sex role-identity development a positive rather than a distortive one. Those who are the most conscious, the most educated, the most able, must take the initial responsibility at the very least for studying and analysing their own society's various sub-cultural milieus within which children receive their acculturation. Conscious intervention into the educational process must be directed, and correlated with the economic and educational inevitabilities of each society; to this end, adults must accept the responsibility for re-examining and reassessing their own attitudes and knowledge about sex and its role in life, and reappraising their own value systems in the light of new scientific knowledge and the requirements of their changing society.

Furthermore, religious leaders need to recognize that there are no special moralities that

apply to sexual behaviour: the moralities by which human beings are to guide their lives must be the same for *any* relationship—whether inter-racial, inter-religious, international, intersocial, interpersonal—or sexual. Perhaps the greatest “revolution” now taking place is that in the relationship between men and women. In any culture, the kind of sex education received by the children will depend upon the quality of this relationship, which in turn is a function of the changing roles of men and women, particularly of the latter wherever the change is rapid or marked. The questions to be asked and answered are: what is the measure of a *man*—what is the measure of a *woman*. In what terms does each society make these measurements—in money, ability to cheat, sexual prowess, fecundity, physical prowess in labour or war, as nameless units in the plots or successes of others—what *is* the measure of a man or a woman? Whatever measures a given society holds up before the eyes of its children as goals constitute their real sex education, and will determine the manner in which they use their eroticism in adult life.

Young people all over the world can be no different from ours in the USA—among them, as with us, there must surely be a layer of those who are spoiled, superficial, indolent and glutted to excess by the *things* that money buys. They must be discounted in the scheme of things, painful as it may be: except as they hold power over others, they can harm only themselves.

But all our countries share also an ever-increasing, ever-thickening bottom layer of have-nots—deprived, uneducated, desperate people. Them we cannot discount—and the layer in the centre of the human sandwich consisting of the educated, driving, ambitious, seeking ones—must not only carry the two parasitic outer layers, but must begin to reach them ideologically as well, to open doors for them, to help them move out of their traps, to give them visions and hope as deterrents to explosion. Technological and industrial development, and population control, vital as they are, are not enough; something more needs to be served: the fierce drive of people for a better inner as well as outer life. The only way people can be helped towards the hope that they must have is by aiding them to develop, each one, a sense of his own individual identity and worth, a sense that is always closely tied in to the individual's self-concept as boy or girl, man or woman. That is why sex education—real sex education, based on the truths of human sexuality, not merely information on the mechanics of reproduction—is vital to every country as it looks to the future of its people in a world of increasing stress. If you know who you are as man or woman, and feel successful in the role, you can bear great amounts of stress or deprivation with equanimity.

In the USA, the voice of our young people are being heard denouncing the adult world for its two-faced cowardice: we blatantly and corruptly use sex as a commercial expedient while we refuse to answer our children's honest questions about a life process that we all have in common, that is fundamental to the state of our well-being, that is an integral part of our inmost selves, that underlies our most important social structure and that gives us our most powerfully experienced moments of being alive. “You may inquire and learn about any aspect of man's behaviour except this,” we say. “You must be moral negatively, in a vacuum, by *not* doing, *not* knowing, *not* experiencing.” Man will not progress towards his fullest evolution in ignorance, emptiness, vacuum.

The *revolution of rising expectations* cannot succeed unless it is concurrently accompanied by a *revolution of rising responsibility*. Responsible parenthood cannot be achieved on a broad scale unless responsible sexuality precedes it. And, before both, must come the most important revolution of all: the *revolution of the rising sense of self*, to which sexuality is integral.

It would be simple if, at this moment, I could give you a complete course outline of a sex education programme from 5 to 15 years. In actuality, although I understand that this existed in Sweden for some years, our Swedish friends are now saying that this is not enough—courses, lectures, books, no matter how carefully constructed, are only the bare bones. So powerful is the challenge of our young people to put flesh on these bones that I venture here to put into words, to try to define, what our adult world is faced with doing.

We must once and for all cease measuring sexuality itself in terms of morality. Human beings may use their sexuality in immoral or amoral ways—but sexuality itself cannot be judged: it simply exists and is there as a part of every human being at every age. Once this

is understood, it is how a person uses his sexuality that then can become subject to judgment. Obviously we have to be taught how to use any of our faculties, and the teaching-learning process is always most productive when it is in terms of use rather than non-use. But, as regards sex, we are still so trapped in the net that equates genital expression of pleasurable sex with sin, even in marriage, that it is not possible for us to face with equanimity any kind of physical expression of sex in the young at all, at any age, and we have similar discomfort in contemplating sexual expression in older people.

In an era that places a high value on the rational scientific approach to all life questions, can we continue to deal with this core area of man's life in mythological, non-rational terms? I think not. But does this mean that we simply set free the sexual urge to express itself without let or hindrance? Again I think not, for this would itself be non-rational. What then is our approach to be?

To put it in simplest terms, I should like to see it based on the concept that truth about man's sexuality and his sexual behaviour is as sacred as any other truth. The difficulties and differences arise relative to establishing just what *is* truth about sex, and by what methods we can arrive at it. The pioneer researchers, Masters and Johnson, have brought us immeasurably closer to scientific truth about the nature of human sexual response as a physiological process, but they are the first to proclaim the need for equivalent research in the psycho-social aspects of human sexuality. The one root question that at present most needs study is: *how, when and to what degree (if any), are genital expressions of sex (and which of these), to be regarded and treated as integral to the psychosexual development of the individual? Can his sexuality develop and fulfil itself in vacuo? Must he not do in order to be?* It galls us to contemplate this and throws our churches into turmoil—the very notion that experience at the physical level may well be an essential part of the evolution of the individual. It is almost impossible for most of us to contemplate this.

Shall we be totally permissive? No, for this alienates our young from us. What they want, I think, is composure about sex and sexual behaviour—the same kind of rational composure that permits and facilitates the study of any new area in our lives—oceanography, digital computers, space physiology.

For in a very real sense, this part of us that we think of as old *is* new to us. Like the side of the moon never before looked upon by man, it was there all the time, but we knew it not because we could not encompass a vision of it. If we and our young people are to involve ourselves together in this voyage of discovery—call it sex education if you will—we must match them in honesty, passion for truth and willingness to look with new eyes, and to count well lost the blind old fears and shibboleths as we shed them, as does the moulting cicada his successively constricting shells, left behind one by one in his relentless drive towards full maturity.

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23. THE ROLE OF UNIVERSITIES AND MEDICAL SCHOOLS

J. Arias

Central American Research Institute for Industry, Guatemala

The rapid growth in the population of Latin America, characterized by its lack of organization and its higher incidence among those strata of the population of lowest cultural, social and economic level, has during recent years confronted the countries of this continent with the necessity for measures dealing with the demographic problem. Above all, in those countries faced with an excessive rate of growth, the seriousness of the situation has brought with it a responsibility, both for the individual and for society, which cannot be ignored. Of the various institutions which can help resolve this problem, there can be no doubt that the university is the most important.

This responsibility has been recognized by more than one university centre in Latin America, and declarations and activities could be cited which show a realistic and thoughtful approach to the solution of the population problem. Centres, institutes, commissions, etc., have been set up for study and research, as an initial contribution to the problem, and their work has begun to multiply to a degree unthinkable only five years ago. It was our intention to include in this paper more concrete information based on activity in the universities, in order to illustrate their varying degrees of participation. Unfortunately the idea had to be abandoned owing to shortage of time and the rapidity with which such participation is changing. This paper, then, in the hope of stimulating discussion, is limited to describing the main role the universities can play in solving the demographic problem in its regional context.

We can be sure that the work of Latin American universities will become clear in this conference through the reports we receive from the distinguished participants.

We all know the difficulties to be faced, in varying degrees, when initiating population and family limitation programmes in Latin America. Obstacles arise at different points as a natural result of the conflict between the way the problem is posed, on the one hand, and the possible solutions, on the other. Frequently heard is the argument that the population density of the region is still low, that natural resources are enormous and hence the over-population problem is erroneous, even going to the extreme of declaring that what is needed are sufficient hands to work these resources. One can be sure that those who reason so have not made the slightest effort to quantify the problem and work out, if only roughly, the enormous financial resources needed to train the population and put within their reach the economic and physical means which could speed social and economic development, even to the point of making up the ground lost.

On the other hand, the solutions proposed have often been neither the most satisfactory nor the most effective for the idiosyncracies of our peoples, who not only differ from one country to another, but even within the same country. The proposal of solutions which do violence to the convictions and moral principles of our people quite often lead to an attitude of resistance, even among those who recognize the magnitude and severity of the problem.

Anyone who makes a preliminary study of the population problem or questions related to it, without going further, is surprised at the complexity of the situation which, besides the fundamental biological and social aspects, includes those of economic, cultural, psychological, religious, moral, legal and technological significance, to mention just a few. Such complexity and interrelation of diverse factors makes an interdisciplinary approach the only one capable of framing realistic and human solutions. This provides further reasons why the

universities, as the leading cultural institutions in our countries, should take a realistic position in this matter.

It seems likely that the conflict referred to, which at first sight seems centred on the opposition between resources and necessities, actually presents serious problems in its formulation, study and solution, for lack of adequate conceptual structures capable of relating the results of increased national research. Such findings are often inconsistent owing to the variety and complexity of the variables governing human behaviour, both individual and collective.

Our populations, engaged in the conquest of under-development, find themselves enmeshed in a series of programmes requiring structural changes of greater or lesser degree, and which must be undertaken at short notice if they are to be of benefit. A stage of modernization is taking place which does not affect equally all the activities of a nation, resulting in lags which aggravate even further the uncertainty in which people today live. Typical is the advance made in public health and medicine, which has appreciably reduced mortality and morbidity, in contrast with the slow progress in other sectors which gave birth to them. The same can be said of other sectors, such as the development of science and technology in different activities without the corresponding development of educational programmes. Our people are at a cross-roads; on the one hand is the pressure of traditional values and an unchanging way of life; on the other hand the pressure of new values and the changed situations they have brought into being. As a result, social and cultural surveys often receive unexpectedly contradictory and ambiguous answers—a true reflection of the inner conflicts with which we live. This is why conceptual structures which accord with the present situation and direction of humanity are needed.

In this transitional period it is the university, as the highest cultural institution in our countries, which, despite difficulties, must take the lead in guiding the cultural transition through which our countries have to pass in order to develop successfully.

The university in Latin America has been characterized by a more active participation in national affairs than is traditional to these institutions in other parts of the world. This is not the moment to analyse the reasons, nor the benefits or otherwise of such participation, but it is certain that the Latin American university, if the generic term may be applied, can make good use of its position to influence the making of national policies. It should be clear that this is a reference to national policy and not to the party policies which certainly have on occasion done much harm to the university. The university as it stands is not well equipped to create a national policy, outside of the field of higher education, but it can engage its moral and intellectual force, offering opinion and arousing interest in such a way that policy is guided towards speeded social, cultural and economic development. Its central position and its relations with organizations creating and carrying out national policy allow it to cooperate effectively from various angles. Examples could be given in which the university's support has had deep repercussions in national development.

Recent years have seen the universities redouble their efforts to break out from their traditional moulds, frequently an "ivory tower" attitude, and involve themselves with all sectors of society in full awareness of real and effective needs. Unfortunately this attitude is often interpreted and carried out in a demagogic way, pushing the university into activities which are really beyond its function, and not infrequently duplicating functions outside of its sphere and for which it lacks adequate resources, so that the inevitable failure reflects unfavourably on the institution and its future programmes.

The Fourth General Conference of Universities held in Tokyo in 1965, by the International University Association, in discussing the topic "the contribution of higher education to cultural and economic development" emphasized that education, besides being a consumption cost, is a key long-term investment leading to the development of human resources, and gives the society a better return than it can hope from investment in materials and industry, and that higher education and research are at the apex of such investment. The recognition of this by governments has brought increases in higher education investment which in turn has created in the universities a greater responsibility to the community to which they belong and which they must serve, trying to return this aid with interest. In few fields can the university do as much as in that which is the central concern of this VIIIth

International Conference, which has not exaggerated in equating the problem of increased population growth with what is perhaps the main factor shaping our present society and its immediate future, and which may determine its form between now and the end of the century.

The university's concern for the problems of the community leads to action in three traditional fields: (a) Teaching, (b) Research and (c) Extension courses.

As regards teaching, whatever position the university or its school of medicine may adopt in the face of the population problem and its possible regulation, it is obliged not only to give its graduates the opportunity of understanding and discussing the problem, but also to prepare them to face and resolve the situations which may arise in their respective professions. This is not the place to discuss teaching details; however, some observations will be of value whatever the approach taken. As regards the problem in its broad aspect, it is important that at the level of general education, whatever this may be, courses should offer some idea at least of the demographic problem at its various levels (world-wide, continental, regional, community and family) and the complexity resulting from the many factors arising. In this way, the future professional in every branch can be given a basic idea of what is involved. Although it may be difficult at present to undertake specialized studies in demography in all universities, it is possible to recommend that each profession include suitable courses dealing with those aspects which have most bearing on it, in order to encourage participation in study and research on the problem. Courses in biology can assist by giving a better understanding of the physiology of reproduction and the development and evolution of animal populations, especially the human one.

In its specific aspect, the problem has generally been faced from the viewpoint of medical participation and, to a lesser extent, from social and economic considerations, and this has resulted in a certain lack of balance of the forces within the university. There is no doubt that from the practical viewpoint, such an attitude is defensible, but if the university is to play its role in this essentially interdisciplinary problem, it must achieve a better balance, or lose by default to the medical sector which, fully alive to the situation, has taken the initiative both inside and outside the university.

However, while this gap in university education is being remedied, efforts must continue to train medical personnel and assistants to promote family planning with the object of protecting the family and its health, and to give such workers, a clear understanding of what they are doing and what it implies for the country.

In regard to research, the university must take the initiative by encouraging, guiding and carrying out surveys and investigations on population development, and its causes and effects, such as the interrelation of demographic factors with cultural, economic and social. Only with such a knowledge of the environment can the work be adapted to local circumstances. On the other hand, applying indiscriminately the experience of other countries is to risk the failure of whatever family planning programmes it has been possible to set up. This makes it necessary to carry out preliminary studies to find out in which sectors of the population it would be wisest to begin. What must be known are the fertility features of these sectors, their value systems, the organization and structure of the family nucleus, and the cultural, sociological, economic, psychological, moral, religious, etc., factors needed as the basis for a serious diagnosis of the situation. Such material is also an important reference when later on a measure of the magnitude and significance of the changes brought about is required to evaluate programmes—this being the only way they can be accommodated to the changing social nuclei in a period of demographic transition.

A fundamental part of any family planning programme must be research, not only in those aspects already referred to but in everything related to the method used, such as the degree of efficiency and results. Such research can be carried out in close contact with the medical personnel and assistants, and the student body, so as to familiarize them with the problems of the community which they will meet sooner or later. Only by systematic interdisciplinary research will it be possible to formulate the conceptual structures which we have referred to and within which the facts brought to light by surveys can find their place.

The university, and especially the school of medicine, must also lead scientific research into phenomena related to the physiology of reproduction, to achieve a better understanding of the facts and to develop new techniques.

The university extension, which like research is not dominant in the Latin American university, can be effectively used not only to offer advice and services, but also to allow professors and students to maintain close and continuous contact with the actual problems of the community and the family. The extension services should also be used to disseminate all relevant material for the creation of a clear collective consciousness regarding the magnitude of the demographic problem, its implications and possible corrective measures.

By means of this brief summary of some of the functions the university can successfully fulfil in this field, it can be readily seen that this institution will play an important and sometimes decisive role in the formulation, study and solution of the demographic problem which clouds with uncertainty the immediate future. The university in Latin America, in spite of the conflicts in which it sometimes finds itself, has the advantage of its great stability and permanency, which makes its contribution more valuable and lasting than that of most national institutions. The faith that we have in the role of the university suggests that in every country it will be able to fulfil it. The university must contribute in the national context and, in close cooperation with public and private organizations, offer abundantly its valuable contribution and moral support to all programmes which lead to the betterment of the community.

Lastly, to these traditional functions must be added, as profoundly significant, the conservation and continuous reinterpretation of our scientific and cultural heritage, so that it becomes the conscience of the nation guarding man from becoming the victim of his own progress. From this point of view, the university's contribution to this problem with which we are all concerned, could be decisive.

RAPPORTEUR'S SUMMARY

The questions and comments which came up in the discussion period during this session related chiefly to sex education and, to a lesser degree, to actual family planning programmes.

Arising out of Dr. Calderone's paper, one questioner (Dr. Saxton, Uganda) wanted the speaker to explain what she told university students when invited to speak on sex, and especially what was her reaction when university students demanded that contraceptives be provided by their student health service. In reply, Dr. Calderone said that she was of the view that universities should not provide students with contraceptives because sex is a private matter. But, she added, universities should provide counselling services on sex education and contraception for the benefit of those seeking such help.

In reply to a question from Dr. H. Mendoza Hoyos, Bogota, Colombia, Dr. Calderone replied that she was not a theologian but a Quaker, and that she approached the subject of sex education as a physician.

Dr. Calderone was also asked if there was any relationship between sexual maturity and motherhood (Dr. Baldessari, Argentina). Dr. Calderone pointed out that a girl can become a mother even at nine or ten years of age, but this was not sexual precocity but reproductive precocity and that sexuality and reproductive capacity were two different processes.

A question (Mrs. N. Suwondo, Indonesia) was directed to Dr. Wickbom as to whether there was any relationship between the extensive spread of sex education in Sweden and the large number of extra-marital relations in that country. Dr. Wickbom in his reply explained that this impression about Sweden was incorrect. The real situation was that pre-marital relations had the sanction of custom over a long period of about 500 years during most of which time, society was generally rural. But as far as relations outside of marriage were concerned, they were probably not more frequent or numerous in Sweden than in other countries.

The discussion moved on to the subject of education for family planning and one commentator (Dr. Marshall T. Meyer, Rabbi, Argentina) felt that the role of the churches and religious leaders had been almost neglected in the discussions. He felt that large numbers of people were still under the suggestive influence of religion and enquired about the official position of organized religion in African and Asian nations. Dr. Calderone answered that on the Board of her organization they had a Rabbi, a Protestant minister and two Catholic priests. The Roman Catholic Church, she added, was deeply involved in questions regarding sexual attitudes and in family planning. Mr. George Cadbury, dealing with the point regarding religious attitudes in Asia and Africa, explained that there were no religious barriers to family planning and in fact, religious leaders in many instances, were helping in the promotion of family planning.

Referring to the paper presented by Dr. Jorge Arias, a commentator (Dr. Carlos A. Rodriguez, El Salvador) said he could not agree with the statement that the growth of universities was accelerated due to increasing population with a consequent deterioration in educational levels. He averred that in Latin America, it was neglect of universities that had led to deterioration rather than population increase, and he made a plea for raising the levels of universities even if this involved almost a superhuman effort.

Dr. Arias in reply pointed out that if populations grow very rapidly, the available resources become quite insufficient in actual practice. It is a universal problem, he said, that a rapid acceleration in numbers leads to shortages in many directions—in teachers, in classrooms, in equipment of all sorts and a deterioration in standards becomes apparent. Dr. Arias added that, apart from tackling the basic problem of population growth, new educational techniques also have to be devised to meet the situation, such as, for example, television educational programmes.

Another aspect of the subject presented in Dr. Arias's paper was brought out by a com-

...entator (Professor Karim, UAR) who referred in particular to the needs of developing countries. He was of the view that family planning programmes can well be assisted by universities through providing training of various types. For example, doctors were badly needed for family planning work and training for these should be extended. Again, university graduates and undergraduates could be got together in summer camps for special short training, and then they could go out to different areas to collect demographic data of various types which would be useful in furthering the family planning programme.

Turning to the paper given by Dr. J. Y. Peng, a questioner (Professor Reuben Hill, USA) desired to discuss further the effectiveness of educational programmes in bringing about changed attitudes towards the size of families and family planning. Dr. Peng had demonstrated that favourable changes occurred in Thailand and Taichung, but the real issue was: how far did these carry into actual behaviour as against mere attitudes? The Thailand study, for instance, showed a relatively less favourable response in attitudes, but in actual acceptance of family planning methods 35% of women had become family planning practitioners as against only 19% in Taichung where initial attitudes were more favourable. How could this be explained?

Secondly, while Dr. Peng's paper had covered the first months in Taichung, the programme has continued for three years since then. What was the cumulative percentage committed to contraceptive use after three years? Was it substantially higher than 19% of eligible women? Also, were women of low priority being attracted to contraception as yet?

Dr. Peng, in a detailed reply, pointed out that the number of available clinics, the duration of the programme, the speed of coverage, and the cost of contraceptives, were some of the factors which accounted for the differences. In the Thailand study, there were six clinics as against nine in Taichung. Also, the intensive programme spread within four months in Thailand as against eight in Taichung. As regards cost, the Thailand study provided everything free, whereas in Taichung there was a charge for the IUD. Again, in Thailand the IUD was a completely new device and the women were very interested in it, whereas in Taichung, the Ota Ring was already well-known and popular.

Referring to the second question, Dr. Peng explained that there was a survey in Taichung eight months later, to see the after-effects of the intensive programme. The educational programme had stopped, although the clinics continued. It was found that, after three years, 40% of women were covered and that fertility rates had lowered significantly. Furthermore, women belonging to the lower income groups were coming to the clinics and in fact, these now form the important target group.

After the questions and comments reported above, each of the appointed discussants spoke briefly

Dr. G. Fricke (Chile) referred to the need for birth control to help in successfully advancing programmes of social and economic development. He pointed out further that, since birth control was necessarily connected with sexuality, sex education was an essential part of health programmes and should be carried out as an integrated activity by parents and schools. It had been repeatedly said that this type of education was important for adolescents. This was true, of course, but it was also necessary that education should begin from the time the pre-schooler began asking questions. The child should have adequate preparation so that, as an adolescent, he could get complete information, including that on family planning. If today's adults are asked the question: have you imparted sex education to your children, very few would be able to answer that they had done so. Parents generally did not know how to handle this matter.

Dr. Fricke went on to say that Teacher Training Schools should provide for teaching in these subjects and university level teaching institutes should have a complete curriculum in sex education. Recent surveys carried out in Santiago, said Dr. Fricke, showed a quite remarkable ignorance on the part of teachers, and they needed both the scientific knowledge and the skill to teach the subject in a simple and natural manner.

Dr. Sloan Wayland (USA) who followed, said he would take a slightly different position from his colleagues. He said, even if we reach a plateau, there would still be a need for sex education. He felt that it was important for schools to convey some of the basic facts regarding population trends and growth, and thus pave the way to a better understanding of family

planning. With such teaching and with the aid of suitable exhibits, etc., substantial progress could be made towards effecting social changes and making family planning a more universal practice.

Mrs. Elise Ottesen-Jensen (Sweden), who was the third discussant in this session, summed up by saying that the truth was more wonderful than any story and that sex education should start very early and at home, when the child began to ask: where do I come from? Mrs. Ottesen-Jensen referred to her long experience in taking thousands of classes, and she said she felt sorry that she had to do it, and that the parents could not handle the subject, for, she emphasized, the parents had truly wonderful opportunities of contacts with their children. She recalled an incident where, after one class that she had conducted, a 14-year-old came up to her and told her: "I wish you were my mother."

Teachers should, of course, help in this important work and especially where children of 14 to 15 years of age were concerned; they should speak to them as friends and helpers. Mrs. Ottesen-Jensen went on to say that parents were afraid to do this and they themselves needed educating. In the course of her work, she explained, "I have children in the day classes and then I take parents in the evening." She found that the parents were very thankful for these opportunities.

One point that was stressed by Mrs. Ottesen-Jensen was that parents and teachers should both say the same things.

Mrs. Ottesen-Jensen ended by referring to the comment about Swedish youth. They were wonderful people, she declared. In all countries it was difficult for the youth of today and yet their good points were not spoken of. A very complicated culture had been built up in today's world, for which we adults were responsible, and it was the youth who had to live in this difficult world we had made. We must understand them and help them, concluded Mrs. Ottesen-Jensen.

Session 6

THE WORLD WIDE PROBLEM OF ABORTION

24. ABORTION IN THE FAR EAST

G. Nozue

*Department of Obstetrics and Gynaecology, Japanese Red Cross
Central Hospital, Tokyo*

INTRODUCTION

In the Far East the population is increasing rapidly, and to maintain and promote family welfare, it must be emphasized that a moderate fertility rate has to be achieved to enable social and economic development to take place. From the viewpoint of individual family life, and considering maternal, foetal and social requirements, there are many problems to be solved with regard to family planning and therapeutic abortions. I would like to present data concerning the trends of induced abortions in the Far East, especially in Japan, and leave the conclusions to my readers.

EFFECTIVE CONTRACEPTIVES

In Korea, according to Kim,¹ the condom was once the most popular method in rural areas, but of late the IUD has been gaining popularity and an effort is now being made to introduce it on a national scale.

Gynaecologists practising in all parts of the country have been given IUD training, and their clinics have been designated as places where couples desiring to try this new method of contraception can go, and where the woman can be fitted with an IUD on a payment basis.

In Hong Kong, according to Dr. Daphne Chun,² the popularity of the IUD as a measure of fertility control is confirmed by the substantial increase in attendances at IUD clinics. Insertions at IUD clinics numbered 3,000 monthly from January to April 1965 on average, or five times the number for December 1964. This shows the increase in popularity of the IUD in Hong Kong.

The situation in Japan is a little different from that in other Asian countries. Condoms are used in around 58.9% of cases and IUDs in only 6.3%.³ This is probably due to the prohibition of IUDs and orals by the Ministry of Welfare.

ACCIDENTAL PREGNANCY AND ITS OUTCOME

Even though the IUD is effective and reliable, it is not infallible and accidental pregnancies cannot be avoided. They occurred in 182 cases (around 2%) out of 20,000 in Dr. Chun's clinic. In Taiwan, the annual accidental pregnancy rate reported from the Taiwan Population Studies Centre was between 2.5% and 8%. It is of considerable interest to find out the outcome of these accidental pregnancies. As can be anticipated, most of these pregnancies are terminated by induced abortion. For instance, such abortions amounted to between 62% and 78% of the total in Taiwan¹ and 30% in Hong Kong,² where it is strictly prohibited by law. In a survey conducted in Japan,³ of a total of 15,885 cases of abortion covered by the survey, 11% to 14% were performed because accidental pregnancies occurred.

LIBERALIZATION OF LAWS PROHIBITING INDUCED ABORTION

Despite illegality, an upward trend in the practice of induced abortion has been observed in recent years compared with previous figures for Korea, according to Dr. Sung-Bong Hong.⁴ The induced abortion ratios for each age group from 1960 to 1964 are almost double those found in the preceding five-year period. More drastic changes occurred in Japan in 1948 when the Japanese Diet passed its Eugenic Protection Law authorizing induced abortion under certain indications to ensure the mother's welfare, providing the operation was done by qualified doctors. At the same time, the law authorized the Japanese Medical Association to designate doctors who were qualified to perform this operation.

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In fact, this designation is entrusted to a committee with members from each prefectural medical association and is decided on a basis of the personality and professional skill of the doctors concerned, as well as on the adequacy of the place where the operations will be performed. The details of the law are as follows: it can be classified in three parts: (1) sterilization (2) artificial termination of pregnancy and (3) family planning.

By this law, the artificial termination of pregnancy is defined as the removal of the foetus and its appendages from the mother before the foetus has attained its extra-uterine viability. In the section on artificial termination of pregnancy, three points are stressed, namely (1) only a designated doctor can perform this operation, (2) the patient's and spouse's written consent is required, and (3) the designated doctor is authorized to perform the operation only under certain indications, and he has to report the number of operated cases to the prefectural governor concerned through the Japanese Association for Maternal Welfare.

Indications allowing therapeutic abortion are: (1) when the patient or husband has psychiatric lesions or hereditary deformities (2) when pregnancy or delivery threatens to injure the health of the mother because of her physical or financial conditions and (3) where a patient has been made pregnant as a result of certified rape, or threats or violence were used which she was unable to resist, or if she was unconscious. A designated doctor can perform therapeutic abortion only when he judges that his patient conforms to one of the indications stated above.

NUMBER OF CASES REPORTED

The frequency of legal abortions in Japan is shown in Table I: its peak came in 1955, with a fairly rapid decrease thereafter. On the other hand, the frequency of induced abortions in Korea is steadily increasing, and an estimate for the whole city of Seoul in 1963 would be around 50,000-60,000,⁸ which is about half the total number of live births reported in that year.

Table I. Number of abortions in Japan⁷

Year	Live births	Number of therapeutic abortions reported
1949	2,696,638	246,104
1950	2,337,507	489,111
1951	2,137,689	638,350
1952	2,005,162	798,193
1953	1,868,040	1,068,066
1954	1,769,580	1,143,059
1955	1,730,692	1,170,143
1956	1,665,278	1,159,288
1957	1,566,713	1,122,316
1958	1,653,469	1,128,231
1959	1,626,088	1,098,853
1960	1,606,041	1,063,256
1961	1,589,372	1,035,329
1962	1,618,616	985,351
1963	1,659,521	955,092
1964	1,714,709	878,748
1965	1,818,429	843,248

REASONS FOR THE TERMINATION OF PREGNANCIES

In order to find out the reasons for induced abortion in Japan, the Japanese Association for Maternal Welfare undertook a national survey in 1965, mailing questionnaires to all the designated doctors.³ The reasons given for induced abortions are shown in Table II.

Table II. Reasons for termination of pregnancy⁵
Result of 1965 survey

	<i>Cases</i>	<i>%</i>
1. Medical reasons	4,211	26.5
2. Socio-economic reasons (excluding category 3)	10,034	63.2
3. Pregnancy by unauthorized union	1,516	9.5
4. Fear for foetal abnormality	78	0.5
5. Pregnancy by rape	46	0.3
Total	15,885	100

An analysis of the socio-economic reasons heading shows the following: illness of husband, 124 cases (0.8%); housing problems, 360 cases (2.3%); impairing of domestic business, 524 cases (3.3%); too many children already, 1,496 cases (9.4%); having too many young children to cope with another at present, 2,501 cases (15.7%); poverty, 2,799 cases (17.6%); fear of difficult delivery, 346 cases (2.2%); too early pregnancy 362 cases (2.3%); opposition by mother or father-in-law, 89 cases (0.6%); the desire to raise the family standard of living, 337 cases (2.1%); no desire for children, 441 cases (2.8%); contraceptive failures, 655 cases (4.1%).

Table III. Contraceptive use by patients who received induced abortion
(an analysis of the categories 1 and 2 in Table II)

	<i>Category 1</i> <i>Medical</i> <i>reasons</i> <i>%</i>	<i>Category 2</i> <i>socio-economical</i> <i>reasons</i> <i>%</i>
Contraceptives always used	14.4	11.0
Contraceptives sometimes used	46.6	45.2
No contraceptives used	30.3	35.3
Unknown	8.6	8.5

This table shows that there is much room left in Japan for spreading family planning practice to avoid unnecessary pregnancies.

CRITICISM OF THE EUGENIC PROTECTION LAW

People from religious and other pressure groups are endeavouring to change this law because of the large number of abortions and because they feel the rights of the foetus are not given due consideration. However, most people are of the opinion that the prohibition of induced abortion is not sensible because it would be driven into the back streets and performed under insanitary conditions. At this point it is useful to consider information about the attitude of unmarried young females towards induced abortion in Japan. In response to a questionnaire 48 college students wrote their personal views about the matter, which are shown in Table IV.

Table IV. Attitude of unmarried young females

Induced abortion should be regarded as a kind of family planning	2
The present law is quite reasonable	9
The law should not necessarily be changed, but the number of the abortions must be lowered	1
The law should be changed to prohibit induced abortions, except for medical indications	24
No views	12
	—
	48

This shows that some people oppose liberal attitudes to abortion. It should be noted that most unwanted pregnancies are terminated by induced abortion for purely socio-economic reasons (see Table II).

MEDICAL AND PSYCHOLOGICAL SIDE EFFECTS

The medical side effects of induced abortion are divided into two parts, the direct effects and the after-effects. The direct effects refer to those that occur immediately after and/or during the operation, such as perforation of the uterus, cervical lacerations, etc.; the incidence of these should be very low, if the operation is done carefully. In case they do occur, heavy bleeding is unavoidable and the life of the patient can only be saved by immediate blood transfusion or surgical intervention. Accordingly, the operation should be done in a well-equipped institution with no hindrances from the law. Consequently, when one considers the medical effects of induced abortion, one should consider it in two categories—the criminal and the legal abortion. As for criminal abortions, it is highly likely that most of them are more or less injurious to the patient, although it is quite difficult to get detailed information on this, and I must therefore restrict this report to the medical effect of legal abortion. The direct injuries experienced in Japan are tabulated in Table V.

Table V. Direct injuries due to induced abortion

Year	Source of information	Maternal mortality %	Direct injuries %
1950	Japanese Obstetrics and Gynaecological Society	0·21	1·07
1951	Tohoku District for the above organization	—	2·6
1954	Nagano Prefecture	0·087	0·12
1954	Japanese Association for Maternal Welfare	0·007	3·8

As seen in the table, the maternal mortality rate has decreased year by year.

As regards the psychological effects of induced abortion, the *Manichi* daily newspaper conducted surveys in 1965 through questionnaires, and 35·2% of those who had had an abortion answered that they felt sorry for the embryos, 28·1% of them felt guilty, 4·3% were afraid of possible sterility and 18% were quite indifferent.

As for the after-effects of induced abortion, namely, infertility, menstrual disorders, ectopic pregnancy, spontaneous abortion or abnormal delivery, the Medical Committee members of the Japanese Family Planning Federation have performed statistical studies on them.⁸

According to Matsumoto, however, no appreciable connection was demonstrated between induced abortion and menstrual disorders. Sawasaki failed to find any noticeable relationship between induced abortion and subsequent ectopic pregnancy. On the other hand, Moriyama and Hirokama were successful in detecting a significant connection between the artificial termination of pregnancy and spontaneous abortions, including habitual abortions. They compared the numbers of artificial terminations of pregnancy in the past history of 848 cases of spontaneous abortions and 622 cases of habitual abortion with that of 5,867 cases of normal delivery as controls, and confirmed that the former had many more artificial terminations. This means that induced abortion in the past is often responsible for subsequent spontaneous abortion, including habitual abortions.

Furusawa also examined the effect of artificial termination of pregnancy on subsequent full term deliveries, and arrived at the same conclusion.

SUMMARY

1. In Korea and Taiwan the number of induced abortions are increasing steadily, despite the fact that they are prohibited by law, whereas in Japan, where the law was liberalized almost 20 years ago the number of abortions are now on the decrease. However, large

numbers of pregnancies are still terminated by induced abortion and still greater efforts are needed to promote family planning.

2. An analysis of the medical effects of induced abortion has been made, both of direct effects and after-effects.

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25. ABORTION IN EUROPE

F. Novak

Department of Obstetrics and Gynaecology, Ljubljana University

INTRODUCTION

Regardless of the social systems of her countries, Europe has a relatively small yearly increment of population: Europe's population will double in 115 years compared with 27 years in Latin America.¹ Western Europe was industrialized and urbanized slowly when contagious and other diseases were still raging and when the mortality of women in childbirth, as well as that of children, was considerable. For this reason, population pressure as a social problem was unknown to Europe. Nevertheless, the motivation of individual women for family planning has always been very strong. It has been caused by industrialization and the employment of women, i.e. the change in their social position (see Table II, page 136).

EFFECTIVE CONTRACEPTION

Most people use primitive methods of contraception and abortion. Relatively few people use modern methods of birth control; their number, however, has been increasing rapidly during recent years. In the countries with a long tradition of birth control, the actual contraceptive practices of the general population are the condom and coitus interruptus. In other countries the most popular methods are coitus interruptus, condom and abortion.

Great changes have occurred in Europe in the last few years since oral contraception began to spread very rapidly. In some economically developed countries an enormous increase in the use of oral contraceptives has been observed since 1963. In 1965 a decrease in the birth rate could already be observed, as well as a decrease in the number of women resorting to abortion. Most probably both were caused by the use of this method of contraception. This does not mean that people are practising contraception more frequently now, but it does mean that they are practising it more effectively. Oral contraception seems to be able to replace abortion, but it cannot, of course, replace motivation. For women who are weakly motivated, and naturally they are as numerous in Europe as elsewhere, we have at our disposal intra-uterine devices, which have been quickly gaining ground in Europe in the last few years. Although some gynaecologists have strong reservations about the IUD, they give them to women tired of using other contraceptive methods, as well as to those who have had several induced abortions.

In socialist countries, as a rule primitive and traditional methods of birth control are used. In some of them, the principal method of family planning is legalized abortion. Although gynaecologists are fighting against this, extensive experience has enabled some of them to come to the opinion that until an ideal contraceptive is developed, termination of pregnancy in the first six weeks, if performed with suction in cases where traditional contraceptives fail, is perhaps less harmful and less tiring for the woman than the continual taking of pills or the wearing of an IUD for a period of years.

In Europe, contraception is used in order to keep the woman in good health and to free her from fear in sexual relations, but not in order to reduce the birth rate. Should we want the latter, then abortion is the most effective method for it; this has been shown by the experiences in the socialist countries of Eastern Europe in the last 10 years. However, a reduced birth-rate was not, of course, their intention.

LIBERAL LAWS

In Europe, all countries have legal regulations concerning abortion, but regulations concerning contraception only exist in the countries that forbid it or want to render it difficult.

Considering the laws by themselves, we do not get an accurate picture. As a matter of fact, laws are very severe in some countries, but they are often not enforced as severely. Most people live regardless of the laws of religion and of regulations which were made to suit the demographic desires of governments. Whenever a policy of power required a large number of births, regulations became very severe. This is proved by Mussolini's and Hitler's legislation, as well as by that of the Quisling regime of Vichy. In 1942 in France a law was issued that declared abortion to be a crime committed not only on the embryo but also against society, the State and the race, and in 1943 in Paris a washerwoman accused of 26 abortions was executed.

In the last few decades many European countries, among them all the Scandinavian and most socialist countries, have liberalized considerably their abortion laws. Several countries, among them the United Kingdom, France and Holland, are preparing new regulations concerning abortion and contraception respectively. In Europe it has become quite evident that a public system that admits the right to health of its citizens, bears in mind their wants, and tries to organize their lives well, cannot persist in the old attitudes.

In some socialist countries, in which women's motivation was strong and the abortion laws very liberal, there is a weaker interest in contraception and an exceedingly rapid decrease in the birth-rate. We can see that some countries have lately resorted to restrictions, sometimes very drastic ones. In Rumania, for instance, where the birth rate of 24.2 per 1,000 in 1956 fell to 14.6 per 1,000 in 1965, the liberal abortion laws were repealed, the punishments for illegal abortion made more severe and divorce rendered more difficult.

In most socialist countries, women are advised against abortion. All over the world the abortionists disregard this, and many women are surprised to find how easily a clandestine abortion can be obtained.

MEDICAL AND PSYCHOLOGICAL EFFECTS

The conclusions drawn from data concerning the health consequences of abortion which we find in professional literature, are very different because we often try to compare things that cannot be compared. Thus, we enumerate the data of the past together with that of the present, criminal abortions are compared with legal ones, and we do not take into account that in some countries legal abortions are performed strictly for medical indications, whereas in others 90% are performed for social indications. Furthermore, we do not distinguish between the methods used.

In recent years, not only has contraception made good progress but also good results have been obtained in the abortion field; this is a consequence of great advances made by gynaecologists in the socialist countries. It is only necessary to mention the improvements in operative techniques. Today, the following methods are predominantly used: (a) the classical abortion with dilatation with Hegar dilators, ovum forceps and curette; (b) dilatation with Hegar dilators and suction; (c) dilatation with electric vibrating dilator and suction. The last two methods, in the hands of an experienced gynaecologist, are by far the best known today.

The dangerous effects of abortion have been considerably reduced under certain conditions. The death-rate after abortion, which depends on the medical standard of a country not only in legal, but also in criminal abortions, is decreasing quickly in Europe. At the gynaecological clinic of Basel,² mortality after abortion amounted to 20 per 1,000 (4490/81) in the years 1921-1946, but only to 1.3 per 1,000 (7092/9) in the years 1947-1961.

In France,³ 75% of all abortions are performed by unskilled persons. At the Institute for Legal Medicine in Paris, there were 116 autopsies of women having died after abortion in 1945, but only 31 in 1958.

The best results, however, in the planned reduction of the death-rate after abortion have been obtained in the socialist countries. In Czechoslovakia the medical data concerning legal

Table 1. Cernoeh's table⁵—deaths due to abortion

Year	1957	1958	1959	1960	1961	1962	1963
Illicit abortion	21	19	10	10	12	9	14
Legal abortion	8	4	4	2	1	2	0

Table II

Country	Abortion	Contraception	% of active women ¹⁴ 1955-1964		Per capita income ¹⁵ *		Population estimates in thousands		Crude birth rate	Annual rate of increase ¹³	
			each census		1953	1964	mid-1937 ¹⁰ mid-1963 ¹¹			1963 ¹²	Year
			Age	%	\$	\$	mid-1937 ¹⁰	mid-1963 ¹¹	1963 ¹²	Year	%
Albania	No data.	No data.	All ages	45.7	—	—	1,030	1,762	39.1	1960	3.2
Austria	Few abortions for medical indication, which is permitted. Many abortions for pseudo-medical indication in private consulting rooms. Yearly 200,000-300,000 criminal abortions.	Religious and political opposition. Pills on prescription. Black market contraceptives.	14 and more	44.5	471	1,033	6,755	7,172	18.8	1961	0.2
Belgium	Severe laws. Abortion is tolerated to save woman's life. 30,000-200,000 illicit abortions yearly.	FPA, though laws forbid contraception propaganda.	14 and more	25.5	839	1,462	8,346	9,290	17.1	1961	0.5
Bulgaria	Liberal abortion laws. Legal abortions are sometimes performed even at sixth months (girls up to 14 years). Births : legal abortions = 1 : 1. 1% illicit abortions.	Contraception free, but weakly developed: coitus interruptus and condom. No up-to-date contraceptives. Their import permitted since the end of the year 1966.	16 and more	62.2	—	—	6,196	8,678	16.4	1956	0.8
Czechoslovakia	Liberal abortion laws. In 1963 71,000 permitted interruptions on 236,000 births, and 29,000 spontaneous abortions and 10,000 illicit abortions yearly.	Contraception is propagated by public health service. All contraceptives manufactured.	—	—	—	—	14,429	23,951	16.9	1961	1.0
Denmark	Liberal abortion laws. In 1958 52 permitted abortions on 1,000 births.	Government participation in FPA activities.	15 and more	36.5	964	1,684	3,749	4,684	17.6	1960	0.6
Finland	Abortion permitted for medical indication. 30,000 criminal abortions—80,000 births yearly.	FPA with government support.	15 and more	48.5	—	923	3,626	4,543	18.1	1960	1.0
France	Severe anti-abortion laws. Few permitted therapeutic abortions. About 400,000-1,200,000 criminal abortions—800,000 births.	Contraception propaganda forbidden. FPA membership society. On 1st December 1965 a draft bill was adopted, repealing the 1920 law banning contraception.	15 and more	36.2	861	1,579	41,200	47,853	18.2	1962	1.1
Germany: East	Abortion permitted for medical indication. 60,000 illicit abortions yearly.	Government support FPA.	—	—	—	—	—	17,158	—	1964	0.5
Germany: West	Abortions permitted for therapeutic indication, but they are not numerous. Criminal abortions : births = 1 : 1.	FPA not very active. Opposition from the medical profession, still very strong. Substantial manufacture of contraceptives.	15 and more	41.1	812	1,766	—	57,607	18.5	1961	1.2
Greece	Abortion forbidden, but tolerated for medical indication. Criminal abortions are very numerous.	No national FP organization. Some medical research and support. Contraceptive drugs prohibited for contraception, but allowed for therapy.	15 and more	35.5	—	450	6,973	8,480	17.5	1961	1.0
Hungary	Exceedingly liberal abortion laws. In 1961. 170,000 legal abortions on 140,400 births, and 33,600 spontaneous and illicit abortions.	Contraceptives given by public health service. Shortage of contraceptives, import restrictions. Home-made IUD from fishing line.	16 and more	43.4	—	—	9,100	10,088	13.1	1960	0.7
Iceland		A social institute offers advice via maternity hospital.	—	—	—	—	117	185	25.9	—	—
Ireland	Abortion forbidden. Very few abortions.	Legal restrictions. No organized FP.	15 and more	28.5	416	895	2,948	2,841	22.9	1961	0.6

Table II (cont).

Country	Abortion	Contraception	% of active women ¹⁴ 1955-1964		Per capita income ^{15,16}		Population estimates in thousands		Crude birth rate 1963 ¹³	Annual rate of increase ¹³	
			Age	%	1953 \$	1964 \$	mid-1937 ¹⁰	mid-1963 ¹¹		Year	%
Italy	Severe laws. Few therapeutic abortions permitted. 650,000-900,000 criminal abortions yearly - 900,000 births.	Legal restrictions, but FPA has seven centres. All contraceptives available.	14 and more	24.9	494	1,032	42,372	50,498	19.0	1961	0.6
Luxembourg		Family planning movement. Education of adults.	15 and more	27.2	1,032	1,737	299	326	15.7	1960	0.6
Netherlands	Rare abortions for medical indications are tolerated.	Legal restrictions. FPA with 200,000 individual members and 42 clinics. Law change expected.	15 and more	22.6	780	1,431	8,598	11,967	20.9	1960	1.4
Norway	Liberal abortion law.	Family planning is available in some public health clinics. No really national activity.	15 and more	23.8	1,078	1,882	2,919	3,639	17.5	1960	0.9
Poland	Liberal abortion law. In 1964, 133,525 legal abortions, and 67,066 spontaneous and illicit abortions - 563,000 births.	FPA with government support.	15 and more	58.4	—	—	34,359	30,691	19.0	1960	1.8
Portugal	Very few abortions for medical indication.	Legal restrictions. Contraceptives available. Private FP advice available. No organized activities.	15 and more	17.0	206	418	7,416	9,037	23.5	1960	0.5
Rumania	Law of widely permitted abortion repealed in 1966. Abortion now permitted for medical indication, eugenic indication, if woman is over 45 years, if she has borne and provides for four children.	In 1966, a legal restriction of abortion. Contraceptives supplied by public health service.	14 and more	70.2	—	—	15,512	18,813	15.7	1956	1.2
Spain	Abortion forbidden even with medical indication.	Legal restrictions. No organized FP.	15 and more	17.7	—	545	25,043	31,077	21.5	1960	0.8
Sweden	Liberal abortion law.	FPA with government support. Govt. doctors give FP advice. Govt. gives aid overseas.	15 and more	32.7	1,190	2,095	6,276	7,604	14.8	1960	0.6
Switzerland	Abortion permitted for medical indication. In some cantons very liberal. It is performed for extensive medical indications, in great numbers for foreign women as well.	FP not openly organized. Local movement in Lausanne and Geneva. Private advice, commercial distribution of contraceptives. Numerous sterilizations of women, particularly 2-36 hours after birth.	15 and more	35.3	1,220	2,071	4,180	5,770	19.1	1960	1.4
United Kingdom	Severe regulations of the year 1861. Observance not severe. Abortion is tolerated for medical indications. Law change in preparation. 10% of all pregnancies end in criminal abortion.	FPA since 1930. Clinics since 1921. Now over 500 clinics.	15 and more	35.3	832	1,698	47,289	53,812	18.4	1961	0.5
U.S.S.R.	1920 abortion free. 1924-1936 liberal abortion laws. 1936-1955 abortion for so-called social indications forbidden. Since 1955: liberal abortion law.	Organized propaganda of contraception by public health service. Oral contraceptives and IUD not spread. Contraceptives are supplied free of charge. Many women use abortion instead of contraception.	All ages	41.5	—	—	170,468 (mid-1939)	224,764	21.2	1959	0.5
Yugoslavia	Since 1951 no punishment for aborting women; only abortionists are punished. 1952: liberal abortion law. 1960: liberalization increased, but still restrictions: commissions, permission for social and personal reasons only up to three months, commissions call attention to contraception.	Public health service propagates and supplies contraceptives. All contraceptives are used. Contraceptives manufactured.	All ages	31.1	—	550	15,172	19,065	21.4	1961	1.1

and other abortions were most carefully collected, accurately studied and the necessary measures quickly taken. Before the Second World War they had about 300,000 abortions yearly, which corresponded approximately to the number of births.⁴ Several hundreds of women died from it. In the post-War years too, more than 100 women died yearly owing to the consequences of criminal abortions.

In the years between 1958 and 1963, out of 491,000 legal abortions, only 13 women died; these were because of incorrect medical indications, death during the intervention owing to anaesthesia, complications during hysterotomy, sterilization, etc. In Czechoslovakia, there were no deaths among 140,000 cases of legal abortion in the years 1963 and 1964.

In the countries with good health services we also notice fewer complications. In this field too, Czechoslovakia seems to take the lead.^{5,6} The abortions are performed in hospitals only and women must also remain in bed for some days. In Yugoslavia, Pavlic⁷ obtained good results with women remaining in bed the number of days corresponding to that of weeks of pregnancy. As soon as all the measures recommended by Czech gynaecologists are not observed, more complications occur.

According to Gheorghiu,⁸ there is an increase in ectopic pregnancies in Rumania. I have been told of the same phenomenon by Polish gynaecologists. In Yugoslavia, where a great number of abortions are performed on out-patients, an increase in ectopic pregnancies has been noticed as well.

Psychiatrists pay astonishingly little attention to the mental consequences of abortion, though in some countries as many as 90% of therapeutic abortions are performed for psychiatric indications.

Psychical states and the behaviour of women, and also of men, which occur when it seems that the request for abortion will not be successful disappear like magic when the abortion is performed.

After abortion, disturbances are more likely to occur if the husband has persuaded his wife to undergo an abortion against her own wishes. Ideas of guilt and self-reproach may occur if sterility results, or through the death of previous children, particularly if sterilization also occurs.

In criminal abortions, made in full awareness of the risks, women feel completely on their own. As the woman who has undergone an abortion is actually a criminal in the eyes of the law in some countries, such an abortion compels her and her family to concealment and hypocrisy. In Switzerland,⁹ it has been shown that the woman who is particularly prone to get into difficulties is the maternally responsible and religiously inclined person. In Poland, however, where religion is also an important factor, psychological complications are said to be rare.

In the countries where legal abortion is possible, disturbances may occur if the husband underestimates his wife's sacrifice in undergoing the abortion.

Bad psychological consequences of abortion are also due to the fact that on announcing that conception has taken place one does not think at first of the woman's bearing her child but of her aborting it. Maybe this is one of the principal reasons why in countries with widely permitted abortion the birth rate is decreasing so quickly.

CONCLUSION

In Europe, economic and social development and the consequent improvement in living conditions have produced a stronger motivation to practise birth control than could be achieved by any propaganda. Contraception is universal. In economically developed countries with laws preventing contraception, there are more abortions, regardless of legality. It is these laws that decide how many women will die from abortion. Thus, the task that governments, the IPPF and the health services are confronted with is clear. Legislation should not ignore the opinion, prevalent in Europe, that unwanted pregnancies should not occur. The law should make it possible for women to be healthier, and not for abortionists to get richer. To the health service the law should give strong support, in order that it may develop the necessary capacities for promoting contraception, which should become everywhere not only free, but even compulsorily stimulated. Besides this support for contraception only a few legal measures are necessary to make sure that the contraceptives are of good quality and

that there is no health risk for people using them. Contraceptive devices should be improved and made accessible to all people.

Preventive medicine everywhere always makes slow progress, so it needs to be made compulsory. Contraception is the preventive par excellence, as it fights the greatest epidemic of all times that is always on the increase. This epidemic is mass abortion, which threatens an enormous number of women. Not to ban contraception, or even to tolerate it, is not sufficient. Much more is wanted. That is why it is absolutely impossible for me to understand the rather inactive attitude shown until recently by the World Health Organization towards this problem.

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26. ABORTION IN THE NEAR EAST

I. R. Nazer

Jordan Family Planning and Protection Association

NEAR EAST

Besides the Arab countries, it includes Afghanistan, Iran, Sudan and North Africa (North of Sahara). The majority of the population are Moslems with a Christian minority.

ATTITUDES TOWARDS ABORTION

Attitude of the law

The laws in this area, especially in the Arab countries, are derived basically from the Ottoman and French laws. With a few exceptions that will be pointed out, the attitude towards abortion is very similar. These laws are repressive, but are not strictly enforced. For example, not a single prosecution for illegal abortion has been brought into court for the last 15 years in the Jerusalem District, although the several abortionists practising in the area are well known.

It is thanks to our permissive laws that induced abortions can be performed for those who are desperate in hospitals and surgeries, rather than in the back streets.

Jordan and Lebanon. Leniency is shown to a woman that aborts herself to protect her reputation and family honour. This leniency is also granted to the person who aborts one of his descendants or relatives up to the third degree. Yet this law does not mention termination of pregnancy on medical grounds, when continuation of pregnancy or labour would endanger the health of the mother.

Thus reputation and family honour are considered mitigating circumstances and this is a survival from feudal attitudes, but the health of the mother and foetus are not considered a sufficient justification.

Egypt and Iran. Here abortion is not forbidden if performed on medical grounds to save the life of the mother from danger by continuation of pregnancy or labour.

There is no differentiation between early and late abortion, even after fertilization, nor between legal or illegal pregnancy as compared with Jordanian Law.

Sudan. The Penal Law is very similar to that of Egypt.

Syria. This is very similar to Jordan, but there the mitigating circumstances mentioned do not apply.

North Africa. In Morocco and Algeria abortion is not allowed at all for any reason. The law there is still the French one.

In Tunisia a major breakthrough occurred in July 1965, whereby the right for termination of pregnancy was allowed in government hospitals and authorized clinics in the following circumstances:

- (a) If the parents have five living children.
- (b) If the health of the mother may be endangered by the continuation of pregnancy.
- (c) If a mother fitted with an IUD gets pregnant.

This is not specified in the amended law, but is officially allowed.

Religious attitude

It is known that abortion is forbidden by both Islam and Christianity; yet in a recent statement made by the Grand Mufti of Jordan (1964), he said: "The jurists have stated that it is permissible to take medicine for abortion, so long as the embryo is still unformed in the human shape. The period of this unformed state is given as 120 days. The jurists think that during this period, the embryo or the foetus is not yet a human being."

Thus the Moslem religion, which is very flexible, is far more liberal than the civil legislation. Also it is more progressive than the report of the British Council of Churches on Human Reproduction (1962), which suggested that "in the absence of more precise knowledge, nidation may most conveniently be assumed to be the point at which biological life becomes human life."

Individual, moral and social attitudes

Whereas women in the West would keep very quiet about illegal abortion, and keep it highly secret, in contrast our women speak openly about it. Most of their friends and relatives do know where and when they are having abortions.

A guilty conscience has never been an issue for those that have procured an induced abortion, which is similar to Sir Dugald Baird's findings in Aberdeen.

Attitude of the medical profession

In many hospitals and general practitioners surgeries, abortions are performed, usually without anaesthesia. Pharmacists stock many brands of abortifacient drugs, which they sell to anybody without prescription on request.

One of our leading gynaecologists undertakes abortions at one of the big medical centres for any married mother who asks for it, as long as her husband accompanies her. I must emphasize the fact that this colleague believes that any mother or couple should have the right to decide the future of an unexpected pregnancy and to terminate it, if they cannot afford to cope with it. This is the socio-economic consideration for the termination of pregnancy that is accepted by many countries.

The Medical Code of the General Medical Council in Jordan which has been recently revised does not mention abortion.

PUBLIC HEALTH AND ILLEGAL ABORTION

Illegal abortion in our part of the world is mostly resorted to by the middle and upper class as compared to the West, especially in the USA, where it is mainly resorted to by the lower income groups. The latter in our part of the world accept unwanted pregnancy as they are unable to face the financial implications of its termination. Thus even if it is not cheaper financially in the long run, traditional, philosophical and social attitudes condition people to accept unwanted pregnancies as being inevitable.

It is worth questioning whether illegal abortion is a social problem in our region from the public health point of view. Many colleagues have been asked personally by me, both in Jordan and neighbouring countries, to give me information and their views about illegal abortion; but nothing has enabled me to come to definite conclusions. Statistics all over the area are misleading and cannot give a definite picture. Abortion cases are unspecified and rarely scrutinized; but the general trend of opinion is that abortion is still not a social problem, at least from the general public health point of view.

In 1964, I attempted a crude estimate of abortion cases at the Government Hospital in Jerusalem; abortion cases contributed to 31.7% of the total admissions to the Gynaecology and Obstetric Department. At least 90% of these cases were induced abortions or criminal incomplete abortions.

Recently, I analysed the incidence of abortion between private patients in my clinic, and mothers attending the family planning clinic in Jerusalem. 1,000 cases in each category were analysed and the result was:

Table I

	<i>Private patients</i>	<i>F.P. clinic</i>
Cases with unspecified abortion	147	371
Cases that admitted illegal abortion	78	77
Total	225	455
Average incidence of abortion (unspecified)	22.5%	45.5%
Incidence of illegal abortion	34.7%	18.5%

Thus illegal abortion made up 34.7% of all cases of abortion in private patients and 18.5% in family planning clinic patients.

The difference, I think is attributable to the fact that the first category are mostly middle and high income group patients, and the second are mostly from the low income group, and as I said before, illegal abortion is mostly resorted to by the middle and high income groups in our country.

The Near East is a rapidly developing area, and as a result our moral codes and way of life are changing to meet the rapid changes in society.

Our region is one where the threat of over-population is getting much attention and in some countries official recognition (Egypt and Tunisia). On the other hand an educated middle class is emerging as an important sector of our community. These two groups are the ones mostly subject to the financial pressures of our changing society. They are the ones that are not ready to lower their standard of living, which is often threatened by unwanted pregnancies. Here there is a conflict between the law, which protects potential life and the mother or the family who wish to get rid of an unwanted accidental pregnancy. When this category of people face this situation, they are usually determined and desperate to terminate pregnancy by induced abortion. The place for the termination depends upon their financial state, and varies from well-known hospitals, general practitioners' surgeries and local midwives, to back street abortionists. Most of the last group usually end up in emergency admissions with incomplete or septic abortions, to the free government hospitals.

MEASURES TO PROTECT MOTHERS FROM UNWANTED PREGNANCY AND CONSEQUENTLY ILLEGAL ABORTION

1. Widespread knowledge of human reproduction for present and future mothers and fathers at schools, clubs, factories, army camps, government hospitals and maternal and child health centres.

2. Public knowledge of the dangers of induced abortion.

3. An effective increase in family planning services is a much better remedy than repressive laws for combating illegal abortion.

4. Pressure upon Government Public Health Services:

(a) To integrate family planning in its services as a preventive measure for the health of both mother and child.

(b) To accept the World Health Organization definition of health: which is a "State of complete physical, mental and social well-being" and not merely the absence of disease or infirmity.

SUMMARY

Unfortunately, unwanted pregnancy is perhaps the only field of medicine where prevention is rarely attempted. Some governmental efforts in this field are directed not to this as a personal family issue; but to consideration of the population problem.

As alteration in the laws regarding abortion are not expected, so in this revolution in personal and official attitudes towards contraception and family planning lies the only hope for a solution of the abortion problem.

27. ABORTION IN LATIN AMERICA

R. Armijo

Pan American Health Organization, Mexico

INTRODUCTION

Abortion has been a matter of human concern since an early era.¹ The most remote indications go back to around 4,500 B.C., when a Chinese emperor issued the first abortive prescription known. In Greece in the fifth century B.C., Hypocrates condemned abortion in his famous Oath. Greek philosophers and the ruling classes of Rome discussed the problem frankly. Since those ancient times, clandestine abortion has existed and nowadays it has evidenced an upward trend to the point of becoming a major health problem, particularly in Latin America.²

THE SITUATION IN LATIN AMERICA

The studies undertaken in Chile in 1961³ based on household probability samples, involving interviews with nearly 4,000 women aged 20-49 in three geographical areas, disclosed that practically one out of every four women admitted from one to 35 induced abortions. It was also found that a third of the Santiago abortions (pop. 2.7 million) resulted in hospital admission, which provided one of the methods of approach to make an estimate of the real number, nearly 50,000, occurring in the city.

Other relevant findings of the study are:

The highest incidence rates were found in the 20-34 year age group.

High rates were found for married women, those having up to three children alive, and for the low income groups.

In 50% of cases the operator was a graduate midwife.

Economic reasons were claimed by almost half the women.

Less than 10% opposed family limitation on religious grounds.

A study of abortion as a hospital problem⁴ disclosed that it accounted for 8.1% of all admissions throughout the country and that the shortage of obstetrical beds was seriously aggravated by the large proportion of bed space being used by abortion cases, which accounted for 27.3% of admissions in obstetrical services and 29.4% of bed-days. Curettage accounted for 35% of the wide variety of surgery carried out in Emergency Departments in Santiago, where abortion alone accounted for 41.6% of admissions and 26.7% of the total blood volume dispensed.

In a random sample of households in Rio de Janeiro (1963), of the 1,585 women aged 20-25 who had had at least one live birth, 10% admitted from one induced abortion upwards.⁵

In Buenos Aires, interviews involving 600 female patients aged 35-49 who attended non-obstetrical or psychiatric clinics in 1964, disclosed that 25% of all pregnancies had terminated in induced abortions.⁶ 1,721 patients aged 25-49 years were interviewed.⁷ 532 married women admitted having had 1,356 children and 658 abortions, of which 510 had been induced, that is, 25.3% of pregnancies had terminated in induced abortion.

The lowest reported incidence comes from Lima,⁸ where 500 women aged 20-39 were interviewed. Less than 5% of their pregnancies had been terminated by induced abortion. However, the total abortion rate seemed high and was thought to include many unadmitted provoked abortions. The author concludes that this is a means of fertility control, especially

in the upper and middle class and that abortion is resorted to mainly by women over 30 who had already three to four children.

Costa Rica reported 42,964 hospital discharges from abortion,⁹ accounting for 12% of all obstetrical discharges in 1964. It ranks in third place amongst all causes of admission, after normal delivery and diarrhoea, accounting for 14% of intra-hospital maternal deaths; for 40% of blood dispensed in hospitals. The Programme of Comparative Fertility Surveys undertaken by CELADE in 1964 should be mentioned¹⁰ as it shows a frequency of miscarriage ranging from 9% in Bogota to 16% in Buenos Aires. In Costa Rica, interviews of 2,132 women aged 20-50 years disclosed an incidence of 119 abortions per each 1,000 pregnancies.

In Mexico, a random sample of 1,000 sexually active women was interviewed,¹¹ of whom 307 admitted having experienced at least one abortion (30.7%), accounting for a total of 797 induced abortions. 46.2% of them claimed economic reasons; curettage and the introduction of a sound were the most frequent methods used; in 34% of cases the operator was a doctor and in 19.6%, an amateur midwife.

A study in Honduras,¹² involved 602 abortion cases admitted (1962-63) to the Social Security Hospital. These women had experienced 667 abortions, accounting for 17.5% of admissions in the obstetrical ward and for 47% of blood dispensed by the Blood Bank.

Reports from Colombia,¹³ finally, show that of the most recent pregnancies of the women interviewed, 20%, terminated in an abortion or still birth. Abortion appears, next to delivery, as the most frequent cause of hospital admission. Some striking features are pointed out, such as the problem of masked infanticide. Children between six months and four years are often allowed to die when attacked by any disease, particularly diarrhoea. Mention is made of mothers who object to their children being treated or who were upset when curative measures proved to be successful. The overall social and economic framework described in the paper seems applicable to most of Latin America, as characterized by a faulty distribution of the national income (in Colombia 20% of families receive 60% of income); 64.2% of the agricultural land belongs to 3.6% of the population, while 4.2% of the land is owned by 56% of the people; the average family consists of 6.7 members of which 25% of the adults are illiterate and of the remainder only 10% finished primary school.

The data summarized above are sufficient to conclude that abortion is a major health problem in Latin America, where deep social changes are taking place. Women are resorting mostly to abortion in order to limit the size of their families, because of the economic struggle, ignorance of birth control methods, conjugal problems, prejudices and the pressure of the Catholic church.

LIBERAL LAWS

Liberal abortion laws which permit prompt operation without administrative delays have made possible an overall reduction in maternal mortality in Eastern Europe. Latin America appears to be far behind this situation, since voluntary abortion is regarded as a crime, with severe penalties for both the woman and the operator, ranging from two months to 15 years imprisonment. In some countries only the operator is punished. Reporting is compulsory in Argentina, where all cases admitted are referred to a special criminal ward. As a result of this, doctors are reluctant to report cases in order to avoid wasting time in criminal courts. In the majority of countries, substantiation of a case requires witnesses, a futile situation which makes the overall procedure ineffectual.

Therapeutic abortion is in general accepted with a number of restrictions, and no policies have been determined. In some countries (Peru, Brazil), even the use of contraceptives is unlawful.

However, the interviewing of nearly 4,000 women in Chile disclosed that three out of every four were in favour of legalizing abortion and of family planning. Leading lawyers also advocate modification of the rather archaic legislation. The weight of the Catholic church seems to have been over-estimated. In Candelaria, a rural community in Colombia characterized by their strong religious feelings, only 4% of the women failed to use contraceptives because of fear of the church.

Therefore it may be concluded that the ground is ready for major legal changes, provided a proper administrative machine will ensure a smooth operation.

EFFECTIVE CONTRACEPTION

A follow-up study of 2,300 women with IUDs started in 1959 in Santiago, Chile,¹¹ found a pregnancy rate of 3.7 per 100 women-years. In June 1966 nearly 50,000 women were using crals, and there was a large number for whom private doctors prescribed.

It is worth mentioning that the number of admissions for abortions declined in Santiago in 1965, as shown in Table I, in contrast with the situation described prior to that year.¹² If the wide use of contraceptives results in a reduction of undesired pregnancies and of provoked abortions, a second survey of a random sample of women should provide the answer, a study which is being undertaken at the present moment.

Table I. Trend of abortion according to hospital admissions, per health areas, urban Santiago, 1961-1965

Area	Number of admissions per abortion				
	1961	1962	1963	1964	1965
East	4,545	4,228	3,853	4,296	3,850
Central	2,698	3,387	3,623	4,215	3,522
South	4,978	4,883	5,737	6,228	5,822
North	3,372	3,929	4,059	4,090	4,301
West	4,781	3,828	4,749	5,417	5,898
Total	20,374	20,255	22,021	24,291	23,393

The study on the epidemiology of induced abortion mentioned before,³ made a substantial impact on the National Health Service in Chile. A number of activities were launched prior to 1965, when a nation-wide programme was started officially.¹³ In January 1964, the Chilean Committee of Family Protection became legally constituted as a private agency, one of its aims being the prevention of abortion. That year the Committee started to expand clinical facilities in Santiago and throughout the country. One of the striking recent events is the decline in birth-rates observed in Santiago (Table II), parallel to that mentioned above with respect to admissions for abortion, a fact which strongly suggests that contraception may account for these changes.

Table II. Trend of birth-rate in urban Santiago, 1962-1965 (rates per 1,000 pop.)

Health zone	1962		1963		1964		1965	
	Live births	Rate	Live births	Rate	Live births	Rate	Live births	Rate
Eastern	12,757	32.8	12,903	31.6	13,312	27.6	13,398	26.3
Central	14,838	32.9	14,095	31.1	13,375	26.6	13,007	25.5
North	15,232	37.7	14,854	35.7	14,499	30.8	14,109	28.6
South	21,280	41.6	22,104	40.9	22,560	34.2	22,325	31.1
Western	17,906	41.1	17,690	39.7	17,628	34.3	17,027	32.8
Urban Santiago	82,013	36.7	81,646	35.9	81,374	31.1	79,866	29.1

Thus, our next endeavour is to determine whether effective contraception is really a good control measure to prevent abortion, ruling out whatever other variables might come into play.

MEDICAL AND PSYCHOLOGICAL EFFECTS

The review of 87 deaths from abortion in Santiago (1965) showed that 94% of cases correspond to women under 40. In 80 cases the cause of death was infection, and in 32 *C. perfringens*

was the specific agent. A survey of nine hospitals in Chile¹⁰ disclosed a case fatality rate of five per 1,000 for abortion, as compared with two per 1,000 for deliveries. Two per 1,000 of abortion cases were complicated by sepsis due to *C. perfringens*, with a case fatality rate of 65%.

Mention has been made to a number of disorders ascribed to abortion, such as: haemorrhage, renal failure, drug dangers, cardiac arrest, embolism, sterility and a number of serious psychological effects.

Data obtained from 1,322 cases of provoked abortion¹⁷ show that 31·6% of them required admission to hospital. On the assumption that admission is indicative of complications, associated factors were studied. The following factors were analysed: age, order of pregnancy, previous abortions, month of gestation, person producing the abortion and the method used, which might have some relation with the risk of complication, it being assumed that such risk may be measured by the hospitalization of the patient.

In general, it was noted that the probability of complications in provoked abortion carries a rate of 31·6%.

The age of the affected person did not seem to bear any relation to the risk of complication. Rates of hospitalization are similar before and after the age of 30.

The order of pregnancy with regard to abortion had some influence in the sense that, as parity progresses, the tendency to complications was also greater. Abortions corresponding to the tenth and following pregnancies, in which the smaller risk of complication appeared to be due to the accident of selection, form an exception.

The number of previous abortions was not an aggravating factor, since the greater risk falls on the first abortions. However, the smaller risk in abortions which follow the third, and especially the seventh to the tenth, may also be due to the selection of women who had numerous abortions and who, precisely because they had had no complications, continued the practice.

The month of gestation in which the abortion is provoked seemed to be one of the factors with more direct influence on complications. The later the interruption of pregnancy, the greater was the risk of complications.

The operator is another important factor associated with complications. The woman affected and the amateur produce the greater risk. The professional especially the doctor or graduate midwife, showed the lowest rates of hospitalization.

If the operator is considered with relation to the month of gestation, the same result is repeated for the first two months. In the third month it is the doctor who offers the least risk. For the following months information is not sufficient for reliable conclusions.

With respect to the method used the rubber tube presents the greatest risk and curettage the least. The rubber tube was the method most used by the amateur, followed by the midwife, with very different risk rates (45·9% for the amateur and 30·9% for the qualified midwife). It is also the means most employed in self-operation. The least used medicaments are preferred by the amateur and the self-operator. Other kinds are used in the home almost exclusively by the woman concerned.

While the doctor resorts almost exclusively to curettage to achieve abortion (risk 23·2%) the graduate midwife also uses it in a high proportion of cases and with a minimum risk (11·8%).

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28. ABORTION IN NORTH AMERICA

E. W. Overstreet

*Department of Obstetrics and Gynaecology, University of California
School of Medicine, San Francisco*

The problem of abortion in North America is like an iceberg. A small, visible portion of it—therapeutic abortion—is well-recognized and freely discussed. Indeed certain aspects of therapeutic abortion are being rather hotly debated in the USA at the present time. But the much larger and much more deadly portion of the iceberg—illegal, criminal abortion—still lies semi-concealed, scarcely touched by the advances of modern science or the progress of modern society. Guttmacher¹ has called illegal abortion “. . . the only great pandemic disease which remains unrecognized and untreated by modern medicine”.

In North America if we look first at the sociologic aspects of therapeutic abortion we shall gain some insight and proper background for examining its shady brother. In taking this look I shall speak principally of the USA. Although Mexico is geographically a part of the continent, it belongs more properly to Latin America, by virtue of its cultural background, its language, its majority religion, and its economic status. Canada's abortion practices parallel those of the USA.^{2,3} But in a relatively large and wealthy land, with a sparsely-scattered population of only 20,000,000, the influence of population pressure is negligible in comparison to that felt by the 200,000,000 inhabitants of its southern neighbour.

In the USA there is no national registration or reporting of therapeutic abortions. Estimates of their total number are arrived at in a sampling fashion from various published hospital figures. These indicate that about 5,000 to 9,000 therapeutic abortions are performed annually, roughly one per 480 births.^{4,5} But the practices of individual hospitals vary widely. Except for the Catholic hospitals, where no therapeutic abortions are permitted, incidences run from one per 4,000 births up to one per 35 births.

These legal abortions are performed under the 50 separate laws of the 50 states. The great majority of them permit abortion *only* when “the same is necessary to preserve the life of the mother”.⁴ Courts have construed this to include remote as well as imminent risk of maternal death, and even this interpretation has been stretched to the utmost. But at present only six states specify preservation of maternal *health* as a justification for therapeutic abortion.

Under these statutes the burden of proof of medical necessity often rests upon the physician. Earlier he sought protection by individual consultations with colleagues. But the past few decades have brought increasing use of a voluntary system of hospital therapeutic abortion committees for adjudication of proposed cases.⁶

Certain other trends are notable. Progressively fewer therapeutic abortions are performed for specific medical diseases. By contrast, increasing numbers are performed for psychiatric indications—with the appellation of “suicidal risk” serving to satisfy the legal requirements. This has brought about a disquieting type of “back-door” legal abortion; the suicidal-risk tag is increasingly being attached to patients seeking abortion of an anomalous foetus, or a pregnancy resulting from rape, or even for socio-economic reasons alone.

Curious physician attitudes are apparent. Therapeutic abortions are performed two to three times more often among private, upper economic patients than among indigent, ward patients. The unmarried woman meets more committee resistance to therapeutic abortion than the married woman with the same medical indication—an evidence of the strong persistence in the USA of our narrow Puritan ethic. But our ethical ambivalence is also evident, for it is common practice for reputable but sympathetic physicians to refer patients to illegal,

criminal abortionists—despite the fact that such referral is an equal violation of the abortion laws.

In sum, the practice of therapeutic abortion in the USA is a hodge-podge of inconsistencies, hypocrisies, archaic laws, religious conflict, and above all, rapidly changing cultural patterns. But some hopeful trends are discernible. Throughout the country there is a growing clamour for liberalization of our abortion laws. This movement has been highlighted by recent legal controversy in California which was triggered by the Rubella epidemic of 1964–65.⁷ It had become common practice among reputable California physicians to accomplish therapeutic abortion for Rubella—on the assumption that the state's abortion law, written in 1872, had been rendered obsolete by newer medical knowledge. When the State Board of Medical Examiners filed disciplinary charges against nine such physicians, the resulting public furore illuminated current public attitudes about therapeutic abortion and abortion in general. And California's 20,000,000 people are fairly representative of the other nine-tenths of our population.

A statewide sampling poll in July 1966⁸ revealed that only 9% of people want actual repeal of the abortion laws. Other polls in the USA confirm that at most only 10% to 20% of our people favour permitting unrestricted abortion. Among 913 California specialist obstetrician-gynaecologists only 34% desired removal of all legal strictures on abortion.⁷ This somewhat higher figure undoubtedly reflects the fundamental opposition of physicians to *any* statutory regulation of strictly medical matters. At any rate, as we look at the overall abortion problem in the USA it is most important to bear in mind the majority view, which opposes—at least in public expressions—wide-open, “elective” abortion.

But the specifics of statutory restrictions are another matter. Ample evidence shows that the great majority of citizens and physicians today approve much broader indications than solely the preservation of maternal life. They would also include preservation of maternal *health*, material risk of significant foetal abnormality, and pregnancy resulting from forcible rape or incest. Estimates of how such liberalization might affect the incidence of therapeutic abortion in the USA are largely speculative, but a reasonable guess would be a rise from the present 8,000-odd annually to perhaps 25,000 or 30,000.

An unhappy complicating factor in the USA is the attitude of the Roman Catholic hierarchy. Representing only 20% to 25% of the population, it vigorously opposes the type of abortion law liberalization described above, in the face of majority desire for it. Indeed, opinion polls even indicate that among the rank and file of Catholic adherents about 45% are actually in favour of such liberalization.^{8,9} And Richard Cardinal Cushing, Roman Catholic Archbishop of Boston, has said, “Catholics do not need support of law to be faithful to their own religious convictions and they do not seek to impose by law their moral views on other members of society.” Despite such pronouncements, the opposition of the unheeding Catholic hierarchy is the prime obstacle today to modernization and liberalization of the abortion laws of the USA.

These, in brief, are the ways in which Americans think and talk about abortion. What do they actually do? What about illegal, criminal abortion in the USA? Estimates made in various ways place the number of illegal abortions at somewhere between 300,000 and 2,000,000 annually; a safe figure to talk about is about 1,000,000 per year. One out of every four to five pregnancies is interrupted by resort to illegal abortion. This results in about 3,000 to 4,000 deaths annually, mostly from among those abortions done by non-physicians or self-induced. More important, as other causes of maternal death come increasingly under control, more and more states are finding that illegal abortion has become the greatest single cause of maternal death. In the USA at present it accounts for about 45% of all maternal deaths.¹

What sort of factors bring about these horrendous statistics? They do not derive primarily from adolescents or other unmarried women, for at least 60% of illegal abortions are performed on married women, and about half of the subjects are in the age group 25 to 35. It is quite clear that the principal motivation for illegal abortions in the USA is socio-economic in nature. Over 60% of women who seek them already have a family of two or more children, and they simply find that they cannot face the psychologic, social, or economic impact of another child.

Two aspects of this situation are immediately apparent. Firstly, in view of current public attitudes no presently feasible manipulation of our abortion laws can possibly reduce significantly the number of illegal abortions. Even if statute liberalization raised legal therapeutic abortions to as high as 40,000 yearly this would scarcely scratch the surface of our 1,000,000 annual illegal abortions. Secondly, it is equally evident that a large segment of our population makes unsatisfactory use of contraceptive knowledge or is unfamiliar with it. Sociologic studies have shown that certain socio-economic groups fail to plan ahead in any way in health matters; they take action only when impelled to by a health crisis—such as a pregnancy. So we find that the use of contraception has been ignored by many of our women who later seek illegal abortion for an unwanted pregnancy.

In addition, a revolution is currently taking place in the sexual mores of adolescents in the USA. The incidence of premarital coitus is rapidly rising among this group. This has resulted in a rapidly rising illegitimacy rate. Twenty-five years ago the official rate for illegitimate births was 7.1 per 1,000 single women of child-bearing age (15 to 44). At present it is 23.4 per 1,000.¹⁰

The increasing number of illegal abortions among our young unmarried women undoubtedly points to an even higher illegitimate pregnancy rate. Our adult citizenry, still inhibited by vestiges of our Puritan heritage, has failed so far to recognize, much less remedy, this mounting problem. For example, we are still so hamstrung by the Puritan ethic in California that our official state textbook for the teaching of human biology in our public schools omits any mention of the human reproductive tract, and illustrations of the human body are innocent of genitalia. The conflict over moral codes between youth and parents in the USA not infrequently leads adolescents actually to seek illegitimate pregnancy in order to force parental permission for marriage or to punish hostile parents.

These are some of the obstacles to the effective application of contraceptive knowledge to the problem of illegal abortion in the USA. Yet to many of us this is the *only* possible solution. In the USA access to birth control information and supplies is not by any means universal as yet. Fortunately, the federal government has very recently been persuaded to recognize that such access is the health right of every woman, and that its provision is a governmental public health duty. So federally financed family planning programmes are rapidly developing. Not too many years ago the prescribing of contraception was largely for medical or quasi-medical reasons; today our public accepts the propriety of its purely elective use by any women who wishes to limit her family. But this acceptance does not yet extend to the unmarried adolescent, and at present there is increasing public controversy about this aspect in the USA. Perhaps the example recently set by Denmark—in providing, by parliamentary order, contraceptives to girls from age 15 up, *without* parental consent—will speed up our own thinking along these lines.

Koya showed in Japan that properly available family planning programmes could materially decrease illegal abortions.¹¹ But access to such services on every street corner of the USA would still not solve the problem. For one thing, continued research must provide us with better birth control methods which can offset the inherent undependability and intermittent disinterest of many of our women. More than that, extensive public education is needed: first, adequate instruction in our grammar schools and high schools—not only about human reproduction, but also about human sexual function, and specifically about contraceptive methods; second, a general education programme which thoroughly informs the public about all aspects of birth control, including that of abortion. The objective must obviously be the prevention of unwanted pregnancies before they become illegal abortions.

But to my mind, simply informing the public, solely along these lines, does not go far enough. Unbridled population expansion, the world's number one desperate problem, plays a major role in the abortion problem. We must not be content with simply informing people. It is our human duty to bend every effort to *persuading* all people, everywhere on earth, of the personal stake which each person has in the imperative necessity to limit human pregnancies.

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RAPPORTEUR'S SUMMARY

The discussion emphasized that it is necessary in discussing the abortion problem to decide to differentiate between illegal, i.e. criminal abortions and their consequences or about the legalized abortion system. One must also clarify whether the general fight against abortion is directed against all abortions or only against illegal abortions.

It was stressed that the IPPF and the panel of this Session was not concerned with the merits of any abortion system whether legal or illegal, but it was necessary to discuss the world-wide problem of abortion, because abortion is perhaps the most widely used method of birth control in the world today, and presumably will continue to be so until more effective contraceptive methods are brought into use.

From the discussion as from the speaker's information, there appear to be three main types of abortion legislation in the world:

1. That forbidding induced abortion—in the Near East, Southern Europe, some Western European countries and South America
2. That permitting abortion on medical grounds—in the Scandinavian countries, some Far Eastern countries and Turkey
3. That permitting abortion on social grounds under the so-called liberal or free laws—in Japan and the Eastern European countries.

The participants of the discussion demonstrated—with several examples—that the number of induced abortions, i.e. the abortions actually performed, generally bore little relation to the type of legislation in force. In countries with some hundred thousands or millions of illegal abortions, the number of criminal and convicted cases are only 10 or 20 per annum. It was also demonstrated that strictly juridical practice could not reduce the number of abortions. The experience of some countries shows that the most severe anti-abortion legislation only makes induced abortions more difficult and more expensive; and at the same time they are performed mostly by para-medical or lay personnel under poor health conditions involving a greater danger to the mother's life and health.

In addition further information was given on abortion practice in some countries, on which the speaker's papers did not contain much information. Details were given concerning the abortion situation in Brazil as a general guide to Latin America. It is estimated that in 1964 1,450,000 cases of abortion were performed, caused by the lack of adequate contraceptive methods and education on family planning. Based upon sample surveys, it seems that Brazilian women would like to have better contraceptives and new legislation. The South Korean experience showed that a developed family planning programme which is based on the IUD, can decrease the number of illegal abortions. The speakers described the effect of the liberalization of the abortion law on two countries. In Sweden the number of legalized abortions last year was the highest up to the present, i.e. 7,500 cases. In the same year it was estimated that there were about 10,000 illegal abortions. In Yugoslavia the number of legalized induced abortions is decreasing year by year, and in the speaker's opinion the reason for this is the development of the family planning movement and the availability of better and more effective contraceptive techniques.

Two members of WHO staff expounded the World Health Organization's activity in the field of the abortion problem. One side of this problem is mainly investigational; as an example, the organization is sponsoring a retrospective study in Brazil; and the other is relevant as part of the general WHO maternal and child-welfare work.

It was also stressed that well prepared and statistically established demographic studies on the world abortion situation were necessary. The first initiative came from Europe, where, within the framework of the IPPF Europe and Near East Region, a Research Commission worked out a plan on comparable studies on fertility, family planning and the birth control

situation, and which also is considering how to obtain better knowledge of the abortion situation. In Latin America, CELADE is planning to undertake an analytical study, based on past investigations on the abortion situation.

Very interesting situation reports were received on the Greek and Indian abortion problem, in the light of the general family planning programmes.

A question on the effect of the religious, especially Catholic, attitude to abortion practice was answered by experiences in Chile. In this country, based on sample surveys, no substantial difference in the attitude towards family planning and/or abortion was shown between religious and non-religious women.

It was pointed out that the number of illegal abortions was not decreasing with the spreading of the use of oral contraceptives as had been observed in some developed countries, e.g. in the USA and Australia. The reasons for this are not yet clear but the panel's opinion was the perhaps different socio-economic or cultural population groups are using the effective contraceptive methods: these were the same groups who protected themselves before almost as effectively. Those who resort to illegal abortions are those who in the past, as in the present, do not use contraception. Therefore it is possible that in the short run the abortion rate will not go down when other effective contraceptive methods come into use but it will decrease in time when the whole population has accepted these methods.

The necessity for the study of abortion in its genetical-biological aspects was pointed out, especially in the field of spontaneous abortions. The purpose of these investigations will be to find out the cause of spontaneous abortion and to work out methods for its reduction. It would also be necessary to determine more clearly the difference between induced and spontaneous abortions.

In summing up, it was stressed that abortion is today, a very widely used method of controlling family size, but it cannot be recommended as a method of family planning because of its harmful effects on the life and health of the women who undergo it and their future children. Large numbers of abortions can only be stopped by the widespread use of effective contraceptive methods and by the increase of education in family planning.

Session 7

SURVEY AND STATUS OF IPPF FAMILY PLANNING PROGRAMMES

29. AFRICA REPORT

S. Mwathi

Family Planning Association of Kenya

O. Adeniyi-Jones

Family Planning Council of Nigeria

As, for IPPF organizational reasons, Africa north of the Sahara is included in the Europe and Near East Region, this report will deal with the countries south of the Sahara with which the IPPF is presently concerned. Although the stage has not yet been reached when it is feasible to set up a fully constituted African Region, or regions, a regional office has been established in Nairobi for East Africa, and it is hoped soon to establish a similar office in West Africa, and to encourage the maximum exchange of information and practical experience between each of these offices. As family planning associations become increasingly established throughout Africa it will be possible to decide what the best form of regional structure will be.

Demographically, Africa south of the Sahara is characterized by generally very high fertility and high mortality, with a particularly high infant mortality rate. There is, however, a general tendency for the death rate to decline steadily and the prospect is that the growth rate will in the near future continue to be not less than between 2.5% and 3% per annum.

In spite of this there is in many African countries little general concern with the rate of population growth; and the fact that infant mortality rates are still very high in many countries disinclines parents, particularly in rural areas, to accept the desirability of having smaller families.

However, in the large towns such factors as lack of housing, the increasing cost of living, and diminishing support available from extended family groups, and a fall in infantile mortality all conspire, as has been the case elsewhere, to encourage parents to seek help to plan the size and spacing of their families. There is therefore in most countries an existing individual need for family planning facilities in the towns for health and family economic reasons, and in some parts of some countries, for instance, in my country Kenya, this need is also felt in the rural areas. Although those concerned with planning the economic development of African countries may clearly appreciate the economic disadvantages of too rapid population growth rates, and this understanding has been publicly emphasized by the Government of Kenya, there is not generally in Africa a sufficient public acceptance of the economic advantages of slowing down growth rates such as to enable governments to adopt national programmes for economic reasons.

In a number of countries, however, a considerable body of opinion recognizes that family planning should be an element in any national maternal and child health service. Unfortunately in most countries such services are not fully developed outside the towns.

In these circumstances the IPPF's aim must be to try and promote the establishment of indigenous family planning associations wherever there is a recognized demand, both to assist individuals who feel the need for help, and so as to establish a climate of opinion which will enable governments to accept a proper responsibility for family planning.

In countries where for one reason or another it is not yet possible to form national associations, help can be given often to individual doctors, to hospitals and universities who may be anxious to provide services. In all countries there is a great need to train personnel and to ensure that family planning is included in the curriculum of doctors and para-medical personnel.

In Africa, as in this continent of South America, many towns are growing at an unprecedented rate, with consequential intolerable pressure on existing social services, housing and employment opportunities. Many of the problems discussed here yesterday are African problems too.

In 1964, at a Regional IPPF Conference in London, Mr. Ndisi, the Chairman of the Kenya Family Planning Association, stressed the tragedy of neglected children in the growing towns. In both Nairobi and Lagos, whose populations have more than trebled in the last decade, all the disastrous consequences of the breakdown of traditional ways of life associated with a too rapid invasion of people from the country to the towns are apparent today. In such circumstances parents need all the help that society can give them, and the health services need to be re-orientated and strengthened to meet the new classes of problems that arise.

Turning more specifically to East and Central Africa the position broadly is that the IPPF has Family Planning Associations in Kenya, Uganda, Tanzania and Rhodesia and gives assistance to individuals or institutions in Malawi, Zambia, Botswana and the Congo. Contact has also been established with interested persons in Ethiopia. As already mentioned, a regional office has been set up in Nairobi with Dr. McAllan in charge, and it is the intention to provide training and other centralized services in Nairobi for the whole area. The Government of Kenya has proclaimed the need for family planning in Kenya and is anxious that our Family Planning Association should play a leading role in training personnel and in providing services. The response from some of the rural areas has been most encouraging but we are most anxious to ensure that while expanding as rapidly as possible we maintain the quality of the services offered.

In Uganda and Tanzania the foundations are being built for expansion and the aim is to increase the number of trained personnel and to enlarge indigenous participation.

The Rhodesian association has been in existence for ten years and has very considerably expanded the scope of its activities in the last few years.

Though by no means an African territory, the Indian Ocean island of Mauritius must be mentioned here. Mauritius presents a most striking example of over-population in relation to the availability of natural resources, and of the effect of too rapid growth rates on the possibility of economic development. In the past year, the government has launched a national programme to reduce the growth rate utilizing the IPPF Family Planning Association and a Roman Catholic Association to execute the programme which will be co-ordinated by the Ministry of Health. To assist this ambitious programme, a number of outside agencies have combined to augment the funds made available by the Mauritius Government. Thus, the IPPF is providing much of the recurrent cost of the FPA's programme, the Swedish Government is providing the contraceptives other than IUDs, which the Population Council is supplying, the UK Ministry of Overseas Development is meeting the cost of several members of the staff of the Mauritius Ministry of Health, and the Nuffield Foundation is assisting with the arrangement for an independent evaluation of the programme. It is hoped that this form of multilateral help may have wider application elsewhere in future.

In Central Africa contact has been made with interested individuals in Malawi, Zambia, Botswana and the Congo, and it is hoped that these will eventually lead to the formation of associations. In South Africa a family planning association has been in operation for 35 years and has recently considerably expanded its work.

I will now ask my friend, Dr. Adeniyi-Jones, the President of the Nigerian Family Planning Council, to be good enough to give some information about the West African scene.

In West Africa family planning activity has been largely confined to the English-speaking territories mainly because of the legal restrictions formerly inherited by the francophile countries from France. If, as seems probable, the law in France is modified to legalize contraception, it may be hoped that the interest now being shown in some former French West African territories will be enhanced.

Though no government in West Africa has yet made any statement in favour of family planning as forthright as Kenya or Mauritius, there is a general recognition that family planning facilities ought to be available, on a voluntary basis, for those who wish them. Family planning associations have been established in Nigeria, Sierra Leone, Liberia and Ghana. Most West Africans reject any idea of present over-population and few would yet

agree that it is even desirable to slow down the rate of growth. On the other hand many families, particularly townfolk, wish to plan the size and spacing of their families in the interest of maternal and child health and domestic economics. In many rural areas infantile mortality is still very high and this will have to be brought down before the idea of a small family norm will be widely accepted.

In Nigeria and Ghana the attitude of the universities and hospitals is generally co-operative and every effort will be made to co-ordinate the work of the associations with the training hospitals.

Recent political instability in several countries has to some extent hindered the expansion of the work of the young associations, but when the situation has been stabilized it is hoped to organize their activities on a national basis. In the meantime, the IPPF is ready to give help to individual institutions and doctors and there has been a welcome tendency in some areas for hospitals to group together to rationalize their supply requirements.

In Nigeria, the emphasis has been on the development of family planning services within the general health services of the urban areas. Thus in Lagos the multi-purpose health clinics have incorporated family planning facilities as an integral part of their wider maternal and child health services. In Eastern and Western Nigeria the need for education in family planning is accepted and it is hoped to introduce this into the maternal and child health programmes.

In Ghana, available demographic data may suggest the need for slowing down the growth rate and it is hoped that it may be possible to present the economic implications to the new government.

The revitalized association in Liberia has rightly stressed the extremely high infant mortality rate and the contribution proper spacing can make to the health of the family.

The Association in Sierra Leone is laying special stress on education and has been able to strengthen its staff with IPPF grants.

It is proposed to send a team consisting of a doctor, a trained midwife and an administrator to West Africa this year to advise the associations in all aspects of their organization and practice. Later on, other personnel may be sent to Nairobi for training by Dr. McAllan's team.

The immediate objectives in West Africa in the near future should be the establishment of the present associations on a sound administrative basis. When this has been achieved and personnel trained it should be possible with the help of the universities, mission hospitals and the local authorities to establish such a wide need for the services as to convince the governments of the case for incorporating those facilities into their health structure.

30. EUROPE AND NEAR EAST REGION REPORT

Joan Rettie

Europe and Near East Region IPPF

GENERAL TRENDS

The rapid change of attitude towards and increase in knowledge about family planning in the world can be markedly observed in the Europe and Near East Region of the IPPF.

EUROPE

The medical profession at university level is showing interest in every country in Europe.

Ministries of Health are openly admitting interest, acknowledging the abortion problem and seeking ways of co-operation with family planning associations.

There is a general tendency, particularly in Eastern Europe, towards creation of representative committees for family planning in which Ministries, professions and social welfare organizations participate at regional and national level to co-ordinate activities to promote contraception and sex education. Such committees, although functioning with government approval, are non-governmental in character and therefore have greater flexibility of action than fully governmental commissions.

Most important of all is the action being taken to repeal anti-contraception laws and to liberalize abortion laws. A new draft law will be put before the Dutch Parliament in 1967 which would replace the present anti-contraception laws. There is strong hope that this will be accepted. In Belgium, France and Italy official commissions are studying plans to take the same action. In both Belgium and Holland family planning clinics have been established in university hospitals. In France it is probable that the law of 1920 will be repealed in 1967, particularly since the Gaullists promised social welfare reforms during their new term of office. The Mouvement Français pour le Planning Familial now has 190 information centres. The government can no longer ignore the need for contraceptive advice.

In Britain the possibility of including social and economic reasons with medical reasons for giving contraceptive advice within the National Health Service are included in a new Bill before Parliament which already has governmental support. Until now the government has relied on the Family Planning Association to provide the necessary services through its 600 family planning centres. Some 575 of these are in maternal and child health centres and hospital premises loaned by local health authorities but it now seems that the government will give more support and co-operation. Another Bill to liberalize the abortion law is half-way through Parliament. This proposed law has aroused much emotional reaction and resistance, particularly from some sections of the medical profession. Public opinion, however, seems in the majority to be in favour of reform of the law.

In Denmark, since 1st October 1966, doctors and midwives are required by law to offer contraceptive advice to women after childbirth or abortion. A representative of the Danish Midwives Association proposed to the International Confederation of Midwives a resolution that instruction on family planning should be included in the education of midwives. This resolution was adopted by the International Confederation in September 1966. In Denmark and Sweden official commissions are studying the existing law on abortion. Public opinion is pressing for a relaxation of the present fairly strict laws. In Sweden, particularly, the fact that women have to apply to a commission causes delays and therefore many women resort to illegal abortion rather than face the distressing wait of several weeks. In both countries, however, illegal abortion rates are thought to be falling and in Denmark the legal abortion rate is much the same as it was 10 years ago but there are now 60,000 more women in the fertile age group—an indication of the more widespread use of contraceptives.

In the German Federal Republic where medical opinion was mainly hostile there has been a remarkable change. Advice centres are opening in a number of cities and leading gynaecologists are giving support. In Switzerland the Canton de Vaud has led the way in accepting family planning officially in the cantonal health service. There are even signs of interest in family planning in Spain and Portugal. In Greece it is hoped that a study recently completed will prove that the present low birth rate is due to illegal abortion and this may lead to a more favourable attitude towards contraception. In Turkey, after some initial set-backs, the Family Planning Association, in co-operation with the government, is embarking on more positive activities.

In Eastern Europe action is being taken to promote contraception quietly but systematically. Poland was the first country to establish country-wide contraceptive services and the reward is now being shown by a reduction in abortion rates. Yugoslavia and Czechoslovakia are making good progress and in Yugoslavia also abortion rates have stabilized and are even beginning to drop. Hungary and Bulgaria have more recently begun to be interested in establishing contraceptive facilities. In Rumania the abortion law has been made more restrictive and, as there is little evidence to show that contraceptives are available, it is to be feared that the result will be a rise in the number of illegal abortions. In the USSR oral contraceptives and intra-uterine devices are now being used but abortion rates, although these are not published, are still thought to be high.

NEAR EAST

In the Near East also the medical profession at university level is showing interest. Here too Ministries of Health are concerned from the health point of view and governments are showing interest, but they are suspicious of motives of outside agencies. In Egypt there is now government approval of the work of voluntary agencies. The various voluntary agencies have united to form a national federation. It is possible that the future pattern in the Near East may be the establishment of non-governmental representative and co-ordinating committees to encourage the inclusion of family planning facilities in existing health services, as in Eastern Europe.

In Jordan, where the voluntary association has always emphasized that the health and welfare of the family is its concern, the Association goes from strength to strength. Family planning clinics have been established in eight cities. The help of the Jordanian Women's Council has been invaluable. The Council loaned premises for the opening of the first centre and has supported the foundation of branches of the Jordan Family Planning and Protection Association throughout the country.

In Morocco family planning advice is being given in some maternity hospitals and health centres.

IPPF ACTIVITIES WITHIN THE REGION DURING 1966

Regional Council and Regional Executive Committee

The Regional Council is composed of representatives of the national member organizations of the IPPF in the Region. These representatives are elected by the national member organizations. Each full member organization has three representatives, each associate member two, and affiliates have one observer. The Regional Council held its biennial meeting in Copenhagen in 1966. The Regional Executive Committee is elected by the Council from members of the Council. The Council also elects the IPPF Vice-Presidents from the Region and regional representatives on the IPPF Management and Planning Committee, Governing Body and Medical Committee. The President, Vice-President, Treasurer and Secretary of the Region presented reports to the Regional Council and representatives of each member organization presented national reports. The Regional Executive Committee meets four times in the year. The Regional Office has moved into the former premises of the IPPF Central Office at 64 Sloane Street, London S.W.1, and this will make an increase of staff possible in order to deal more adequately with the demands made on the Regional Office.

Regional Medical Committee

The Regional Medical Committee held its biennial meeting in Copenhagen in July 1966. Each full member organization has two members on the Medical Committee, one of whom

is also a Regional Council member, and each associate member has one member on the Regional Medical Committee who is also a member of the Regional Council. During 1966 the Executive Group of the Regional Medical Committee formulated a statement of aims stressing the importance of the health aspects of family planning and the need for family planning to be incorporated in the teaching of medical schools. The Executive Group also planned the programme of the Fifth Regional Conference. A cytological study on the effects of the IUD on the endometrium was instituted. Those member organizations in the Region that had not yet formed national medical committees were encouraged to do so and to report on their activities.

Research Committee on family planning trends

This Committee, established to encourage comparative studies on family planning trends within the Region, met twice in 1966 to plan the co-ordination of such studies. Representatives of Hungary (Central Statistical Bureau), Britain (London School of Economics), Greece (Athens University), Belgium (Brussels University), Sweden (Swedish State Commission on Abortion) and Denmark (Copenhagen University and Danish State Commission on Sexual Enlightenment) attended the meetings.

The Hungarian study, directed by Dr. E. Szabady, has been completed and the preliminary report from the Central Statistical Bureau was presented as a paper to the Copenhagen Conference.

The Greek study, under the direction of Professor Valaoras of Athens University, is also finished.

The British study was started in October 1966 and is under the direction of Professor Glass of London University.

Conference

The main efforts of the Regional Office have been concentrated on the Fifth Regional Conference held in Copenhagen in July 1966. This has been fully reported in the IPP News and in a circular prepared by the Information Department of the IPPF.

The Conference was attended by some 450 participants from 50 countries. The Region was happy to welcome participants from Africa.

The theme of the Conference was Preventive Medicine and Family Planning. Professors of Obstetrics and Gynaecology from many countries participated.

Training

Emphasis has been given to training and the need to establish national training facilities for medical and para-medical personnel.

A training programme for doctors was arranged in Copenhagen after the Conference in co-operation with the Danish association and Copenhagen hospitals.

Short term training programmes were arranged by the Regional Office in London as set out on page 161.

Publicity and education

IPPF publications in English, French, German, Italian, Spanish and Arabic have been distributed to organizations and individuals. The Region sponsored the publication of the IPP News in Arabic. The Report of the 1964 Regional Conference is out of print, 1,000 copies were sold. The Report of the 1966 Conference has been published in English and will shortly be available also in French.

SUMMARY

Publicity given to the abortion problem and requests for training in contraceptive techniques by developing countries have led to awakening of the consciences of Ministries of Health and doctors in Europe. Experience in the Europe and Near East Region of the IPPF has shown that the establishment of contraceptive services cannot be a quick process, nor can a large-

IPPF Europe and Near East Regional Training Department, 1966

<i>Country</i>	<i>Doctors</i>	<i>Nurses/ Midwives</i>	<i>Social Workers</i>	<i>Psychologists</i>
Algeria	1			
Bulgaria	1			
Denmark		1		
Egypt	3		1	
France	4			
German Dem. Repub.	1			
German Fed. Repub.	1			
Hungary	1			
Iran	2			
Iraq	2			
Italy	6		2	
Jordan	3			
Kuwait	1			
Luxembourg	2			
Morocco	4		2	
Norway	2			
Poland	2			
Sweden	2		3	
Switzerland			2	
Turkey	1			
UK	7	3		
USSR	1			
Yugoslavia	3	2	1	2
Ghana	4			
India	15			
Lesotho	1			
Liberia	2			
Malawi	1			
Mauritius	3			
New Zealand	1			
Nigeria	6			
Pakistan	5			
Philippines	1			
Rhodesia	1			
St. Vincent	1			
Sierra Leone	1			
Singapore	1			
South Africa	3			
Tanzania	2			
Thailand	1			
Uganda	1			
USA	1			
Total	101	6	11	2

scale government programme succeed—it comes too close to government interference in the rights of the individual. On the other hand governments can no longer expect to get away with restrictive legislation; pressure of public opinion for freedom of the individual in family planning is now too strong. Probably the most successful procedure to adopt for the establishment of family planning services is: firstly the creation of a coordinating committee so that all those who are concerned in education, welfare and medical care are involved; secondly the establishment of training facilities for doctors and para-medical personnel preferably in hospitals and similar institutions; thirdly the manufacture or purchase of good quality contraceptives; fourthly clinical testing of contraceptives in selected hospitals and centres, even if the contraceptives have already been tested in other countries; finally the inclusion of family planning services in existing health services, or in the case of some countries, the provision of

additional services if the necessary health services do not exist. This procedure is the least likely to arouse antagonism or create problems. If the Near Eastern countries will adopt this procedure they may avoid the problems that now have to be surmounted in Europe. The Europe and Near East Region of the IPPF hopes by aiding national organizations, offering training facilities and the possibility of exchange of ideas and experience on medical and administrative problems, to help the establishment of family planning services in the Region.

31. INDIAN OCEAN REGION REPORT

Sylvia Fernando

Indian Ocean Region, IPPF

CEYLON

Planning presupposes interest in the future—the poor are usually so disillusioned about the present that the future does not interest them.

The bulk of the populations of Asia are poor as are the minorities in the slums of the Western world. The birth-rates in Asia are high as are birth-rates among the poor in the great industrial cities of developed nations.

The problem therefore is to induce poor families to plan for the future and in an area where planning touches the most intimate relationships in life. This aspect is often forgotten in the effort to spread family planning. The establishment of family planning clinics are usually regarded as the essential forerunner for the spread of family planning. It has only recently been realized that however efficient the service provided at a clinic, this effort would in great measure be wasted if a sufficient number were not motivated to attend it.

The most effective methods of motivating underdeveloped populations are being tested in various parts of the world. In Ceylon a Population Council project is about to be launched to study this problem.

In 1965 the Swedish Government on the basis of two pilot research projects suggested to the government that the Health Department could carry out an effective programme of family planning by using public health staff and offered assistance for this to be done. Ceylon is fortunate in possessing a network of health units which cover the entire island, each with a doctor, nurses, midwives and health inspectors allocated on a population basis.

Since 1953 the Family Planning Association has established clinics all over the island through the goodwill of successive Directors of Health Services and their staffs. The Prime Minister who came into power in 1965 had, as Minister of Agriculture in the 1940's, realized the need for family planning in Ceylon. He, together with his cabinet, agreed to accept the Swedish offer and the Minister of Health was empowered to launch a family planning programme in co-operation with Sweden and the FPA of Ceylon.

During 1966 the new programme of work took shape. The Minister appointed a committee to advise him. The Chairman is the Director of Health Services, other members are representatives from Sweden, the FPA, the Planning Secretariat, the Department of Health and such others as were found necessary to activate the programme.

The Department of Health is decentralized and works in 15 units under a Superintendent of Health Services (S.H.S.). Curative services and a number of health units on an area basis are grouped under one S.H.S. A Health Educator is appointed to each S.H.S. area. Up to October 1966 five of the S.H.S. units were taken up for development. This meant that 75% of the health personnel were trained and clinics established in all the important health institutions of the areas, numbering 84 in all. Attendance at these clinics is, however, disappointing because educational aspects have not received sufficient attention.

Education work has become more and more the province of the Family Planning Association, especially as we have long experience in securing the goodwill of the community leaders and obtaining the co-operation of the large number of government officials in any locality who normally work strictly within departmental limits, but whose support is necessary because they have the confidence of those whom a family planning programme seeks to serve.

The Ford Foundation has had discussions with the government regarding assistance for educational work.

The government has allocated a piece of land in a central location to the FPA of Ceylon

for building its headquarters. This building will have a hall for regular film shows and talks on family planning in addition to a clinic which will function daily.

The IPPF has allocated \$15,000 as seed money for the building fund.

The whole programme in Ceylon has been made possible because of the ground work prepared with IPPF support by the FPA of Ceylon. A method should be devised whereby governments requiring assistance in the field of family planning can draw directly from the wealth of experience and knowledge available within the IPPF.

INDIA

ORGANIZATION

Established in 1949, first as a Family Planning Committee and later, in 1950, as the Family Planning Association of India, the Association provided the first organized attempt to introduce family planning services in India.

The work of the Association is carried on through its headquarters at Bombay and branches in different parts of the country, of which there are 35 at present.

RELATIONSHIP WITH GOVERNMENT

When the government undertook the responsibility for promoting family planning as a part of the health services of the country under the first Five Year Plan, this was greatly welcomed by all those concerned with family planning work for it meant that this programme could be promoted in the country on the required scale, intensity and permanence. Furthermore, voluntary effort, instead of being discontinued, became more effective due to the financial grants and other help that the government decided to make available in pursuance of its positive policy of encouraging voluntary effort.

Thus, the cooperation between the governmental and the voluntary sector has been a feature of India's family planning programme. This takes place not only in the matter of providing grants but in providing technical advice and in the representation of voluntary workers on government committees. For instance, the President, Smt. Avabai B. Wadia, is a member of the Central Family Planning Council of the Government of India, and of the State Family Planning Board in Maharashtra State. Smt. Dhanvanthi Rama Rau continues to be a member of these bodies. In other states too, the presidents or other members of the FPAI branches are members of their respective State Family Planning Boards. Many of the leading workers of the FPAI are among those who have been appointed to serve in the government scheme of Honorary Family Planning Education Leaders at the institutional, regional and district levels who, in their individual capacity, help to promote the programme.

Where the Association receives government grants for running clinics and for other purposes, the work and the accountability patterns laid down by the government are followed. However, in keeping with its basically voluntary character, the Association initiates and conducts its own pilot projects also, with its own funds, for it believes that this is one of the most important functions of a non-governmental organization.

GRANTS

The total amount of government grants received by the Association as a whole comes to more than Rs. 10 lakhs (Rs. 1,000,000) each year. Donations from other sources, particularly the IPPF, have also been received. More than 250 persons are employed on a paid basis by the Association while the active voluntary workers, regular or occasional, are, of course, much greater in number, depending upon the type of activity. The membership of the Association is recruited through the branches.

BROADBASED PROGRAMME OF WORK

The Association carries on its activities on a four-fold basis, namely, conducting educational campaigns for communication and motivation for family planning, establishing clinical services (which may be static, mobile, or non-technical such as supply depots), training and orientation of personnel, and sociological, clinical and other research.

EDUCATIONAL ACTIVITIES

This work has been carried on by the FPAI on a sustained basis ever since the establishment of the Association, at different levels, and through all available media, by its voluntary workers assisted by its trained social workers. The Association has concentrated on the creation of public opinion in favour of the philosophy and practice of family planning; on conveying correct information, in simple language, on what exactly is meant by family planning and how it can benefit the family; and on arousing and sustaining a motivation among individual couples to adopt the regular practice of family planning. The communication media have been appropriately adapted to these aims. They range from organizing big conferences or mass meetings to small group talks in neighbourhood areas, and to person-to-person consultations for those who are likely to adopt family planning practices.

The Association has made its own audio-visual aids as well as fully utilizing all those offered by the Government. It has made two motivational films, thanks to funds made available by the IPPF. A three-reel film "In Your Hands" was made in 1959. Several hundred copies of it have been distributed through the government and other agencies, and it has been dubbed in several Indian languages. Several FPAs in foreign countries have also bought copies. A new 20-minute motivational film (in colour) was completed in January 1967 and is titled "Years of Promise". Filmstrips, cinema slides, posters, pamphlets, leaflets and exhibition materials have also been made by the Association. The holding of family planning exhibitions (independently, or as a part of larger exhibitions or fairs) and the opening of consultation booths at such gatherings has been regularly undertaken. Fifteen of the branches have been supplied with audio-visual aids by the government, consisting of projectors, generators and other accessories. But only about five mobile vans are being run by the Association, this being a very expensive item which is in short supply in India. However, some of the more active branches have arrangements with their respective state governments for the occasional use of government vehicles for family planning work.

The educational and publicity work of the Association cannot be easily set out statistically since it is varied and continuous, but two or three examples will be illustrative of the type of work undertaken.

For example, a well-equipped mobile clinic and education unit donated to the FPAI headquarters by the IPPF has been carrying out sustained educational and clinical work since 1962 in the extended suburbs of Greater Bombay, where family planning advice and services were otherwise not available. This unit is run on a grant from the Government of India, with a skeleton staff of one social worker, one driver-cum-projectionist and one cleaner. The unit now operates in 31 areas with a population amounting to over 500,000. During the year 1966, the unit held 80 mixed public meetings, 152 women's meetings and 88 men's meetings, with 133 film shows which covered about 100,000 people. When services were added to the educational work, a part-time doctor was also attached, as needed. The unit currently has an active case load of nearly 1,900 clients and is now concentrating more on service.

In 1964, the New Delhi branch of the FPAI initiated a new type of educational programme by setting up information centres at various governmental and commercial establishments. The experiment proved successful in increasing the case load of the branch clinic and also of other clinics around the 20 information centres run by the branch in different parts of New Delhi.

Recently, this branch has installed a well-designed literature stand at the "Super Bazaar" (a department store newly opened in the capital by the government to hold down prices). Thousands of pamphlets and cartoon booklets on family planning are being taken away every day from the information counter by those who come shopping. The (Old) Delhi branch also has a publicity van which carries out regular educational programmes.

The West Bengal branch of the FPAI also has an extensive publicity programme. It has, in 1966, arranged 111 film shows with lectures, with audiences numbering about 47,585 people. It also conducted a family planning publicity centre in the women's section of the big industrial exhibition held in Calcutta during February and March 1966, when thousands of persons were given information on family planning.

PUBLICATIONS

The Association publishes two periodicals from its headquarters—the *Journal of Family*

Welfare, a quarterly, which it has issued since 1956, and a monthly bulletin *Planned Parenthood* which has come out since 1952. These are distributed all over India and abroad and individual copies are sent to as many as 57 countries. Reports of conferences and seminars are also published whenever appropriate.

Several branches are also now publishing periodical bulletins—Bhavnagar branch publishes *Kutumb Niyojan* in Gujarati, New Delhi branch *Pariwar Kalyan* in Hindi, Jabalpur branch *Pariwar Niyojan Sandesh* in Hindi and Hyderabad branch *Kutumba Mitra* in Telegu and a *Newsletter* in English.

CLINICAL WORK

The headquarters and most of the branches are conducting clinics, either on a full-time or part-time basis, as well as running non-clinical and extension services. All these offer all the approved contraceptive methods, the latest being the IUD. In addition, vasectomy centres are being conducted in several places. Bhavnagar branch in particular, has done well in this direction, having performed 593 operations in 1965-66, the cumulative total since 1963 being 1,411.

In 1965-66, the New Delhi branch did 705 vasectomies. Where tubectomy is concerned, however, since hospitalization is required, it is usual for the FPAI workers to make referrals to government hospitals and help the women to get the tubectomy done in the hospital.

Whilst it is not possible to give complete figures of active cases in all the Association's clinics owing to incomplete returns from some of the branches, from the reports available it is estimated that about 60,000 new cases were dealt with during the year, with clinic attendances running into at least three times that figure.

This does not take account of the Punjab figures. In the Punjab, the Red Cross Society is a very strong and active body closely linked with the government, and the FPAI branch and the Red Cross Society have a unified set-up. Therefore, it is not easy to separate the FPAI work from the total programme. Effective family planning work by the Red Cross and FPAI branch working together, is being carried on in the Punjab through 22 urban and 61 rural clinics. The state government, along with the Red Cross and FPAI, held organized vasectomy and IUD campaigns and during 1965-66, 32,000 sterilization operations and 135,000 loop fittings were carried out, besides motivating 12,000 couples for adopting other contraceptive methods. Punjab State won the 1965-66 award for the highest number of IUD insertions per head of population.

Some of the FPAI clinics have, over the years, carried out trials of different contraceptive methods before they came into general use. For example, the headquarters' clinics did so in regard to spermicidal gel, foam tablets, and the IUD; as far as IUD is concerned, some other clinics also participated. Clinical work on orals also may be undertaken in the future.

INFERTILITY CLINICS

The headquarters at Bombay has, since 1952, conducted an infertility and sterility clinic (known as the Family Welfare Bureau) which has acquired an international reputation. Dr. V. N. Shirodkar, internationally known gynaecologist, is the Honorary Director and Dr. A. M. Phadke the Executive Director with a team of visiting honorary specialists. During 1965-66 the clinic attendance at the Family Welfare Bureau was nearly 10,000 and there were 616 new couples who came for investigation and treatment. During the year, 200 pregnancies were reported.

Besides the clinical and surgical work, the bureau has also undertaken studies on "genital tuberculosis", "action of Anovlar tablets in cases of functional sterility", "chemical method for the detection of the day of ovulation in women by urine examination", "occurrence of macrophage cells in the semen", "presence of autoantibodies against spermatogenic arrest", "effect of testosterone" and "effect of varicocele excision".

Some of the FPAI branches also are conducting infertility clinics. The New Delhi branch infertility clinic has reported 174 pregnancies during the year.

TRAINING

When the Association originally started work, it found that there were very few doctors who were sufficiently knowledgeable in the techniques of conception control and furthermore,

no type of personnel had studied the question of how to promote this work. Therefore, the Association arranged to train doctors, nurses, health visitors and social workers. This work was carried on from 1952 to 1961 in a more or less continuous manner, both by means of training courses at headquarters and by sending a touring training team to various other places in India to provide on-the-spot courses.

In this way, more than 250 doctors and about 650 other personnel received a brief training and orientation in conducting family planning work and a much-felt need was fulfilled. This work was discontinued soon after government training schemes came into operation, and the three central government training centres and 16 regional training centres run by the states began their work.

However, the headquarters and some of the branches have continued the system of in-service clinical training to those who request it. The branch at Hyderabad has, since 1962, undertaken to run a family welfare workers' training centre with an annual grant from the government, this being a government scheme entrusted to a voluntary organization.

Apart from training personnel who can take up clinical work, the Association has held many orientation camps under the pattern laid down by the government. It has also undertaken the orientation of a large number of lay and voluntary workers who can help to spread correct information about family planning.

SUPPLIES DEPARTMENT

The supplies department at headquarters, which has been under the personal supervision of one of the council members, Smt. Gulab Dalal, continues to meet the requirements of many welfare clinics (which include some governmental and municipal clinics) from all over the country, who find this a convenient centre to order stocks of different contraceptives. Now, however, supply sources are so much better organized both by government and private manufacturers than they were some years ago, that there is much less work for the FPAI supplies department. Nevertheless, during 1965-66, about Rs. 50,000 worth of contraceptives were sold and despatched to welfare clinics at clinical rates on a no-profit-no-loss basis.

SPECIAL SCHEMES

A number of pilot projects have been taken up by the Association. Currently, two such special schemes are being conducted by the headquarters, with grants provided by the IPPF, one centred at Bhayandar village and another known for short, as the "Victor Project".

The Bhayandar rural project undertaken by headquarters in a group of 14 villages with about 25,000 population, near Bombay, is an experiment in developing a community programme for family planning to ascertain some of the simple and effective ways of spreading family planning knowledge, to find out to what extent voluntary effort for family planning can be developed at the village level, and to make contraceptive supplies easily available to couples requiring them in the rural areas.

Excluding the childless couples, sub-fertility cases and others who did not require family planning services, the immediate target in the first two groups of villages comprised 861 couples. Of these 500, or 58%, adopted a method of family planning as a result of this project by 31st December 1966. However, if 62 previously sterilized cases are included, 61% of the target group is currently in the programme. Work is being continued and also extended in a planned manner to the third group of villages.

Victor project

Greater Bombay, which has a population of about 5 million, (that is, 1% of the country's total population), is one of the 47 most populous areas in India, selected for intensive family planning work. In view of this official decision, the FPAI headquarters has also decided to extend its work in Greater Bombay by undertaking a special project under the IPPF grant now being made available for the purpose. The work has already started in part, since September 1966 and is showing encouraging results.

CONFERENCES, SEMINARS, ETC.

Apart from the All India Conferences on family planning, and the IPPF regional and

World Conferences held in India, the latest international undertaking of the Association has been the XVII International Conference on the Family in New Delhi in December 1966 under the sponsorship of the International Union of Family Organizations to which the FPAI is affiliated.

The theme of the Conference was "Changing Family Patterns in Asia". Changes in marriage patterns and family relationships, population problems and the family, the new role of the Asian wife and mother, and the need for family life education, were the major topics discussed at plenary sessions and six sectional meetings.

NEPAL

The Association has been experiencing various difficulties in implementing family planning activities. Our country is very poor. Our resources are meagre but our efforts nevertheless are great. We do not know when these efforts will bring practical results. Much depends on the generous outlook of our parent body—the IPPF.

The story since the last report is very short but achievements in the field of family planning have been great because, since last year, His Majesty's Government, after much persuasion by our Family Planning Association, has taken up practical family planning work by starting several clinics. In a country like ours where poor economy, illiteracy, difficult intercommunications, etc., are great obstacles, implementation of our work faces genuine difficulties. But the greatest satisfaction for our Association is that our government has now eventually realized the importance of our efforts.

The population stands today at 10,298,400 (1966); there is a definite rise from the 1961 overall population which was 9,324,713. The Katmandu valley population has also risen from 459,990 to 515,600. The birth-rate is double the death-rate. After having studied these figures it is clear that we are also facing a population explosion. Therefore, the work of our Association has to be expanded considering the population rise and governmental work in family planning fields. This is not the time for our Association to feel that family planning has been taken over by the government and the Association need not exert further pressure. On the contrary our Association has now to play a very vital role to bring about coordination between the government and the people at large. A government-sponsored advisory board has been formed under the chairmanship of the Director of Health Services and in the committee our Association is well represented by three executive members. We are also concentrating our activities on motivation on a mass scale, besides running our own clinics. The Association will have to take a very active effort in publicizing the basic aim of the family planning movement, since our people are illiterate and are under the pressure of an orthodox religion. It is not an easy job to break this chain. Therefore, we are considering a massive programme to bring out literature; posters, books and other publicity means including audio-visual aids to explain the objects of the world-wide family planning movement.

Our Association is also taking the opportunity to participate in governmental and non-governmental meetings, wherever they are held, to explain these ideas in the simplest way.

Among the methods, the IUD has been widely introduced both in government and our clinics and a few individual doctors are also working with orals. The utility of foam tablets, diaphragm and other contraceptives are now diminished although we often advise these methods as an alternative measure in our clinics. The services in these clinics are rendered free. For want of funds this Association has to reserve its activities to Katmandu and a few other places. We do have an extensive plan to go into the rural areas as soon as required funds are available.

As mentioned earlier the volume of work and responsibility on this young Association has risen considerably; we need to expand our activities not only in urban areas but also to rural areas. Because of the acceptance of family planning work by the government, a great responsibility has fallen on our shoulders to bring about coordination to educate the mass and to make freely available suitable contraceptive methods.

PAKISTAN

The Government of Pakistan's Five Year Family Planning Scheme was approved on 1st June 1965 at a cost of Rs. 28 crores (280 million rupees). The Family Planning Council, a semi-

autonomous government body was instituted for implementation of the scheme. This 28 crore programme, which is perhaps the largest in this part of the world, is the direct result of the pioneering work of the Family Planning Association of Pakistan, and the President of Pakistan's personal interest in Pakistan's population explosion. The scheme did not go into full operation until after the emergency in September 1965 so that the total achievements of the year were compressed into a period of nine months. In spite of this the achievements are encouraging and it is expected that the target of a reduction in the birth-rate by 20% in five years will certainly be achieved.

The programme aims to reduce the present birth-rate from 50 per thousand to 40 per thousand. It has been phased from 65% to 100% of the population over the five year plan period. Thirty-three districts were covered by the programme during the first year of operation, i.e. June 1965–June 1966.

Recruitment of staff commenced in July 1966 and by the end of August the selected candidates had been trained and posted at their respective assignments. All this training needed a high degree of organization. Courses for training trainers were first held and later peripatetic teams, consisting of representatives of concerned disciplines (medical, administrative, motivational) imparted training at all levels in the field according to carefully prepared syllabi and curricula. Audio-visual aids were the most effective means of training employed.

The personnel manning the action programme during the first year of operation was as follows:

1. District Publicity-cum-Executive Officers 33.
2. Family Planning Supervisors/Thana Family Planning Officers 885.
3. Medical and para-medical personnel 1,178.
4. Dais 29,450.

Existing facilities in hospitals, dispensaries, health centres and child welfare centres have been utilized and IUD insertions are performed in all public institutions; 29 full-time urban family planning centres have been established; of these 18 centres are in West Pakistan and 11 in East Pakistan. Part-time clinics are located in 400 rural health institutions. In areas where there are no fixed facilities, family planning services have been provided by mobile teams.

Satisfactory arrangements have been made for the requisite supply of contraceptives. Foam tablets, IUDs and inserters are being manufactured in Pakistan. Other contraceptives such as spermicidal foam and condoms are imported.

During the nine-month period under report a total of 252,355 IUD insertions were done representing 189,266 couple years of protection. 36,327,567 units of conventional contraceptives were used representing 360,000 couple years of protection and 5,400 sterilizations were accomplished.

The programme has made a good start and already within one year of its inception, family planning has become a talking point.

The FPA of Pakistan continues to function within the limits prescribed by the government. Apart from its model clinics and part-time service clinics, the government has laid special emphasis on its activities in the fields of functional research and motivation/communication/publicity.

The FPA runs four model clinics, in Lahore, Karachi, Gandaria and Dacca. Our model clinic in Lahore is the oldest family planning clinic in Pakistan, and in the period June–November 1966 a total of 14,191 clients visited the clinic. Of these, 601 clients were fitted with the IUD and 112 clients took the Pill, while 22,191 units of conventional contraceptives were distributed. The clinic also offers training courses to doctors and para-medical personnel, infertility services, post natal and ante natal services and operates a well-baby clinic.

The total number of clients who attended the Karachi clinic during the January–December 1966 period was 8,051. The case breakdown is: 6,062 family limitation cases, 1,262 sterility, 64 marriage counselling, 565 family life education and 99 vasectomy.

Other clinics have similar services and equally good results.

Two mobile van clinics which were donated by our parent-body, the IPPF, have been utilized in rural areas since June 1965 in both wings of Pakistan. Their performance has been

satisfactory and the government, appreciating their utility, is now arranging to make available mobile units to all districts operating under the family planning scheme.

In the field of functional research the FPA is participating in the government's IUD study. The FPA has also conducted independent research in both wings of Pakistan on the role of the dai (local midwife) and the acceptance of the Pill. In addition they have in hand research projects in the following fields:

1. Follow-up of vasectomy clients.
2. Attendance analysis of Model Clinic Lahore clients.
3. Mobile van action and research scheme.
4. Clinical evaluation of the Ahmed device.
5. Clinical and statistical evaluation of the IUD cases attended to at the Model Clinic, Karachi.
6. Use of the satisfied family planning client as a prospective motivator.

A very important aspect of our motivational programme is the group and the individual counselling, offered by our motivation officers. In the year ending June 1966, the motivation officer in Lahore alone conducted a total of 37 meetings, which were attended by 2,929 people. Individual counselling was offered to 1,341 clients. The response to these meetings encouraged the FPA to hold an orientation course for voluntary motivators, who have each formed a little cell in their neighbourhood for the promotion of family planning.

The FPA of Pakistan has been particularly active in the field of mass media projects, which have been sustained by generous grants from the IPPF both in 1965 and 1966. The FPA designed an imaginative and comprehensive publicity campaign, highlighting the problems of Pakistan's population explosion and the urgent need for family planning. This campaign was implemented in both wings of Pakistan, through the press, a direct mail leaflet schedule, posters, brochures, meetings, pamphlets, flash-cards, kiosks, mobile exhibition, films, cinema slides, television and the radio. The FPA's role in this field received the appreciation and recognition of the Government of Pakistan. The FPA of Pakistan is represented on Government Family Planning Boards and publicity committees where it has its branches. Prototype designs prepared by the FPA for mass media projects have been utilized by the government in their publicity campaigns.

32. SOUTH EAST ASIA AND OCEANIA REGION REPORT

Constance Goh Kok Kee

South East Asia and Oceania Region, IPPF

Since the 7th IPPF Conference held in Singapore in February 1963, the general climate and acceptance of the principles and ideals of family planning has advanced beyond all expectations. The improved status of the concept of family planning, the official UN recognition and the spectre of famine in developing countries have so changed world opinion that there is seldom a day without articles appearing in newspapers and magazines, or talks over the radio and television, focusing attention on different facets of family planning and population problems.

A great debt is due to FAO, UNICEF, ECOSOC, ECAFE, WHO and other economic, demographic, social and medical agencies whose activities and publications have given much added weight to arguments for the incorporation of family planning services into active social and medical government programmes.

The increased interest and participation of the medical profession is another encouraging factor. Hitherto, except for a few welfare-conscious individuals, doctors often seemed to have been unaware of the significance of family planning as an important health measure.

Soon after the IPPF Conference in 1963 the Singapore Government allocated a site of 60,000 sq. ft. for the Singapore FPA to build a family planning centre. The building fund appeal launched by the Association succeeded in raising half of the cost, then the Ford Foundation generously donated the rest plus an additional grant for extension work.

It was at this Conference also, that regional delegates were first able to become acquainted with Dr. S. Gore who was later invited to act as the Regional Medical Consultant. Dr. Gore has now been requested to serve a further term.

The "closed door" policy in Burma, the hot war in Vietnam and the three-year confrontation with Indonesia have all retarded the programme, but there are prospects that in the coming years it may be possible to make up for the time lost.

The improved financial position of the IPPF through the generosity of the Victor Fund, SIDA, Ford Foundation and others, has given tremendous impetus and encouragement to all connected with family planning in the SEA and O Region.

BURMA

The FPA of Burma was formed in 1960, but in the circumstances which have since prevailed, it has unfortunately had to discontinue its activities.

The present government of Burma has severed almost all outside contacts and a socialistic state exists in which there is no free enterprise and all imports and sales are under very strict government regulations.

There has been no direct contact between the Regional Office and Burma since the present regime assumed office, and, in view of the present political climate, it may be some time before communication can be re-established.

However, it is hoped that the Medical Consultant might be able to pay a short visit by taking advantage of a 24-hour transit permit allowed to certain visitors.

Reports from the Ortho Pharmaceutical Co. indicate that supplies of contraceptives up to the permitted quota (£9,000 in 1965) have been allowed to enter the country.

THAILAND

In April 1966 the Thai Cabinet rejected the recommendation of the Research Council that family planning services should be started under the supervision, and with the assistance, of

the Ministry of Health. However, a Committee has been set up to make a study of contraceptives and to undertake clinical trials.

To avoid the risk of unwanted publicity, the Region has not set up any local family planning programme, but through the good offices of the Under-Secretary in the Ministry of Health, 45 medical and other professional personnel have been permitted to attend the training courses in Singapore and to provide a family planning service on their return.

Present centres of activity

1. The Thai FPA formed in 1955 has been active among government staff and armed services.

2. The government/Population Council family planning pilot project at Photheram has continued to function for the past four years.

3. Despite the lack of government recognition, family planning activity is gradually expanding in Bangkok and in a number of provincial hospitals:

Chulalongkorn Hospital (Red Cross)	Chantaburi Hospital
Vajira Hospital	Naval Group of Hospitals
Siriraj Hospital	Government Highways Department
McCormick Hospital, Cheingmai	

The government's attitude towards family planning is only likely to change when scientifically planned projects have demonstrated significant improvement in community health, welfare and economics.

WEST MALAYSIA

The period since the last IPPF Conference has been one of eventful progress for family planning in West Malaysia.

Overall attendances at the Federation of FPA's family planning service centres increased from 49,726 in 1963 to 118,437 in 1965.

Two successful family planning seminars, financed by the SEA and O Region, were held, one in Kuala Lumpur (1965) and the other in Penang (1966) both opened by the Chairman of the National Family Planning Board, the Rt. Hon. Enche Khir Johari, Minister of Education.

An almost unbelievable change has taken place in official attitude and thinking. In December 1965 the Malaysian Government adopted family planning as part of its national policy. A National Family Planning Board was inaugurated in June 1966, a nation-wide base-line attitude survey commenced in October, and the preliminary planning of the national service programme is well under way.

The Federation of FPA's immediate aims are to:

1. Co-operate fully with the National Family Planning Board.
2. Clarify and define what its short and long-term goals should be in the entirely new situation, so that it can be of the most help in the National Family Planning Programme.
3. Improve the existing standards of family planning training, education and service.

SINGAPORE

In 1965 the Singapore Government set up a Family Planning Population Board which in January 1966 officially assumed responsibility for the 29 family planning clinics hitherto run by the Singapore FPA in maternal and child health centres and the Maternity Hospital. This Association still runs three clinics in rented premises and has had the satisfaction not only of handing over the major part of its activity to the government, but also of doing so at a time when the birth-rate has already dropped from 45 per thousand in 1951 to 28.2 in 1966.

A post-partum insertion study is being conducted by the Obstetric-Gynaecological Department of the University of Singapore at the Kandang Kerbau Maternity Hospital, in collaboration with the Population Council.

The IPPF is providing a grant from the Victor Fund to support the first two years' operational cost of an extension of the existing cytology screening service in Singapore. Papanicolaou smears will be taken of all women attending family planning clinics (FPPB,

FPA and SEA and O) and training facilities for this type of service will also be available to associations in this area.

The new Family Planning Centre is now in use. The FPA occupies the ground floor, and the other two floors house the SEA and O Regional Office, Training Centre (laboratory, library, class-rooms and hostel for trainees) and an auditorium.

In January 1967 the FPPB organized a successful family planning Education Week and Exhibition which culminated with a medical seminar sponsored conjointly by the Board and the SEA and O Region.

SARAWAK

Sarawak has a population of 875,000 living in an area of 48,000 square miles and her economy is mainly dependent on timber, rubber, pepper and oil.

Road transport facilities are poor, but great improvements have been made by the military authorities during the confrontation.

In the past two years family planning services have progressed significantly in Kuching the capital, and Sibn, and there are smaller clinics in Miri, Simanggang, Seriki, Kapit and some satellite centres in scattered areas. A number of general practitioners and government medical officers are giving free professional service to the Association.

A mobile clinic has been very kindly donated by the Brush Foundation of Cleveland, Ohio, USA.

Future plans are to:

1. Expand and consolidate the work in the existing centres.
2. Very gradually increase the number of sub-centres and satellite clinics.

SABAH

Interested individual doctors and nurses continue to offer family planning advice in the course of their routine duties. The FPA of Sabah was organized in April 1967.

BRUNEI

There is no organized family planning activity in this small oil-rich state but it is hoped that it will soon be possible to explore potential avenues of development.

INDONESIA

The Family Planning Clinics project in Indonesia was started after the Delhi Conference and in 1962-3 eight trainees together with the newly appointed National Organizer (financed by regional funds) attended orientation courses in Singapore and a measure of liaison work was done, but various difficulties have hindered its progress. President Soekarno's view that Indonesia could well afford to support a much larger population was never questioned and is still considered by most to be the national policy.

During the confrontation IPPF funds for work in Indonesia had to be administered by the London Headquarters.

In 1964-5 Professor M. Tausk of the University of Utrecht and Dr. A. L. Southam of Columbia University aroused considerable interest in orals and IUDs.

During 1963-5 a number of medical seminars were held, a research division was established to undertake trials with orals and IUD and four delegates attended the IUD Conference in New York City.

The Medical Consultant spent five weeks in Indonesia in September 1966 and has reported that:

1. There are indications of improvement in the political climate.
2. The new administrators in the Ministries of Health and Social Affairs are turning their attention to family planning as a possible support measure to their programmes.
3. The rate of literacy is high.
4. There are women's organizations that could be used as a spearhead for family planning education and service.
5. Attitude towards religion and custom is generally tolerant and liberal.

A national seminar was organized in February 1967 to bring family planning groups together and to discuss the possibility of forming a National Organization. At the first plenary session an announcement was made by the Co-ordinating Minister of People's Welfare accepting in principle the philosophy of family planning and steps are now being taken to include family planning in the Government Development Programme.

The Co-ordinating Ministry of People's Welfare include the departments of Social Affairs, Health, Education, Religion and Labour.

SOUTH VIETNAM, LAOS AND CAMBODIA

South Vietnam, Laos and Cambodia have populations of 15, 2 and 6 million with an annual rate of increase of 2.2%, 3.2% and 3.2% respectively. These strategic countries have been involved directly or indirectly in conflict for nearly a decade and the need for any medical and social service is urgent.

There is very little family planning activity in these countries, but reconnaissance visits have been made by the Medical Consultant and hopeful contacts established.

There have been definite indications of interest from Laos and South Vietnam. Two trainees from each country have already received training in Singapore and are activating interest in their respective countries. It is expected that some form of prototype family planning service will commence this year.

The Laotian Minister of Health and Information and the Minister of Social Affairs have both signified their interest in family planning.

Although no longer under French rule, many of the colonial laws still remain in force, among which is the ban on contraceptive literature and supplies.

The scarcity of professional personnel in this area poses a major problem and whatever plans for the promotion of family planning action, provision must be made for assistance with personnel as well as finance.

PHILIPPINES

In 1961 the first attempt to provide family planning services was made under the auspices of the Philippine Federation of Christian Churches with financial assistance from the IPPF and it was not until 1963 that the SEA and O Region became actively associated with the Family Relation Centre, recently renamed Planned Parenthood Movement of the Philippines (Protestant) and more lately with the Family Planning Association of the Philippines (RC) which was formed in 1965.

In addition to the above, agencies like the World Neighbour, Family Workshop, Pathfinder Fund, Responsible Parenthood Association, various hospitals, certain universities such as Silliman and Central, and specialists in the University of the Philippines are actively concerned with different facets connected with family planning and population.

The general climate towards family planning has changed radically in the past two years, so much so that several government agencies have started or are planning to promote family planning activity:

1. The Manila Health Department offers family planning education in all 42 clinics at present, though only 18 have facilities for IUD insertion.
2. The Land Reform Council of the Philippines in Pampanga plan to set up a pilot study as a support measure to its development programme.
3. The Governor of Sorsogon has decided to introduce family planning into his province using a village as a pilot project.

In many instances former trainees have been instrumental in initiating and implementing new family planning activities.

There is more involvement of the general practitioner, and short-term local family planning training has been carried out at the Mary Johnston and St. Luke's Hospitals and in two other provincial chapters.

The leadership and support of the Press has been very significant and stimulating.

AUSTRALIA

Australia is not only underpopulated, but her already low birth-rate is still falling, a fact about which the government is much concerned.

Australia has the highest consumption of orals per capita of any country and some of her scientists are doing useful research in various fields.

Until lately the subject of family planning was almost completely ignored by the press, television and radio.

The fact that a recent edition of the Sydney University newspaper *Honi Soit* carried a supplement giving complete details of various contraceptive methods can be regarded as a major break-through. The Editor commented that the publication was an attempt to overcome ignorance that could lead to unwanted pregnancies and abortion.

Unfortunately, the FPA is not sufficiently broadly represented nor dispersed geographically to exert any major influence on official policy. However, it could broaden its influence by:

1. Enlisting greater participation of scientists and doctors.
2. Promoting an effective Information Service.
3. Raising funds to finance fellowships and specific research projects.

NEW ZEALAND

Being a developed and industrialized country with a high standard of living, the emphasis and approach in regard to family planning in New Zealand is directed almost entirely towards the individual family and the personal needs of each woman.

Although major government support is still withheld, progress is becoming easier since family planning is now more readily acceptable to the medical profession and the provision of clinics is recognized as a necessary service.

Sex education is regarded as an important part of family planning. A Family Life Education Council has been set up and the Education Department now provides full-time counsellors on secondary school staffs for consultation by pupils.

Choice, a FPA magazine and *Preparation for Family Living Programme* are now published regularly.

A sum of £250 from the New Zealand Appeal for Population Control, has been received for work in the Region.

Despite a density of 23 persons per square mile, the FPA is conscious of the type of population problems which arise in the case of the Maori and other mothers who have to adjust themselves to complex ways of city life. At the 1965 Annual Conference, the Maori Women's Welfare League requested official assistance for child-spacing for Maori mothers.

Future Plans:

1. To influence government to incorporate family planning as part of the maternal and child health programme.
2. To encourage doctors to promote family planning among the scattered population.
3. To rouse general interest to the urgency of world family planning and population control.

FII

For several years it has been pointed out that the country's Development Plan would be nullified if the population increase continued at the present rate of 3% per annum. So it is encouraging to note that on 25th November 1966, the *Fiji Times* reported that:

"The Family Planning Campaign is now beginning to show unmistakable results and it is clear that further development of these services on the lines already established will allow the natural increase to be reduced to 2% per annum within a period of five years.

"The need for family planning as an essential ingredient of the public health policy of a developing country is gradually becoming universally accepted.

"The FPA and the Medical Department work together in harmony. The Association's task is the provision of information on as widespread a scale as is possible, whilst the Medical Department is responsible for making the facilities available. Advice on family planning (with free choice of method) and supplies of material are available in all Government hospitals, health centres, dispensaries, clinics and nursing stations.

"A period of just over two years is perhaps too short a one upon which to make definite prognostications, but the numbers of births registered in both the Fijian and Indian populations in the last three years are consistently below the trend line of the previous seven years."

TRAINING
 South East Asia and Oceania Region Training Institute (1964 to April 1967)

<i>Country</i>	<i>Doctors</i>	<i>Social workers</i>	<i>Midwives</i>	<i>Nurses</i>	<i>Asst. nurses</i>	<i>Journalists and others</i>	<i>Total</i>
Thailand	26	3		16			45
Philippines	53	10		12		10	87
Fiji	5			1			6
New Zealand	1						1
Sarawak	1		2	6	2		13
W. Malaysia	16	3	10	22	2	15	68
Vietnam		2					2
Laos	1			1			2
Singapore	17	7	28	68	2	6	128
Indonesia	9	3		12		4	28
Turkey	2						2
Poland	1						1
Total	132	28	40	140	6	37	383

Since 1964 training has been a major regional activity and it is planned that during 1967 a certain amount of it will be undertaken locally in various member countries so that a greater number can be accommodated.

The programme is planned so as to develop a nucleus of leadership in each country who in turn will be responsible for large scale training programmes for their own national needs.

There is in this area a very great shortage of, and need for, skilled expertise in the various spheres connected with family planning, because it is now recognized that an effective family planning programme calls for an integration of many disciplines and skills, embracing demography, sociology, administration, legislation, medicine, surgery, welfare, communication, education, psychology, logistics of supply, evaluation and research.

Some of the ways by which this situation could perhaps be improved are outlined below.

I. Travelling Technical Advisory Team of experts with family planning experience:

- | | |
|-------------------------------|---|
| (1) Administrator-organizer. | (3) Communication expert. |
| (2) Sociologist or economist. | (4) Doctor (public health or pediatrics preferred). |

Objectives:

1. To organize a series of concentrated national Motivational-Teaching Workshops for top-level professional personnel in different countries (similar to those now being done by ECAFE on a regional basis) which could help create a more informed climate of opinion among strategic cadres.

2. To provide expert advice on existing programme and service.

3. To act as exploratory advisers where no family planning programme exists.

II. Provision of technical and professional assistance to help develop suitable educational and informational material for different levels of education to:

(1.) Introduce family planning at higher levels as a means whereby family planning projects or new associations might be promoted.

(2.) Disseminate knowledge or information about family planning to potential users at all levels.

III. Professional translation, publication and/or preparation of selected family planning articles, booklets, text-books, etc., into the appropriate major languages of S.E. Asia. Whilst there is a considerable reservoir of published material on population and family planning in English, unfortunately only a fraction of the population is conversant with it.

At present translations into the vernacular are confined solely to the simple motivational/educational leaflets.

IV. Official investigation into the ways and means whereby the introduction of family planning into Burma, Laos, Cambodia and Vietnam might be accelerated.

V. Provision of fellowships for:

1. Various workshops, family planning training courses, seminars, etc. (Chicago, Michigan).
2. Other forms of specialized training in family planning and related fields.
3. Family planning observation tours.

VI. Exploration of the possibilities of:

(1.) Harnessing and extending the use of television, cinema and other mass media as a means of educating and influencing large sectors of population, particularly through the production of more films and filmstrips, etc.

(2.) Forming a Family Planning Volunteer Corps to assist, on request, with programmes either in a consultative capacity or as qualified staff on the service side.

FUTURE REGIONAL PLANS

1. Set up a prototype family planning service programme to demonstrate the need for, and benefit of, family planning.
2. Decentralize training and establish national family planning training centres wherever possible.
3. Help create climate of opinion so that governments not yet committed will be encouraged to include family planning as part of their official policy-planning.
4. Use all available media to educate the public on matters connected with family planning and population control.

33. PROGRAMMES: WESTERN HEMISPHERE REGION REPORT

Luisa Pfau

*Western Hemisphere Region, IPPF;
Chilean Association for Protection of the Family*

GENERAL SUMMARY

During the year 1966, the pace of work and the unusual developments in the Western Hemisphere Region have been remarkable. The expansion of activities, the positive increase in general awareness and the establishment of new family planning associations are all effective barometers of the more favourable attitude in which we are working. Throughout the region newspapers and magazines are constantly publishing articles describing the social, medical and economic factors that justify and require family planning programmes. Although there are broad segments of the various countries that remain adamantly opposed for religious, political or nationalistic reasons, the softening of this resistance and the intelligent search for answers have permitted great expansion of family planning. Just a year ago, WHR was providing grants to FPAs in only 15 countries; today, 24 countries are under direct support.

New associations have been created in Argentina, Ecuador, Brazil, Colombia, Mexico, Panama, Costa Rica, El Salvador, Curaçao, St. Vincent and the Dominican Republic. There is great interest in Paraguay, Cuba, Nicaragua. It is indeed gratifying to report that the only countries in Latin America where no family planning organization exists, are: Paraguay, Bolivia and Peru. Although a group exists in Nicaragua, local difficulties have not permitted it to function.

The present state of family planning in our region as well as in the rest of the world, has been facilitated through the increasing funds made available for IPPF purposes by individuals, foundations and corporations in the USA. Planned Parenthood Federation of America has achieved goals through their own national campaign that are indeed gratifying. The growing interest in the international activity is, in no small measure, due to the volunteers and staff of PPFA. Not least of the successful ventures has been the Victor Fund, under the Chairmanship of General William H. Draper, Jr. Further evidence of PPFA's confidence in the parent organization—IPPF—has been their budgeting process for this year which establishes a firm principle of budgeting 50% of all funds raised to IPPF. However, the increasing programmes present financial requirements that demand even more funding than is presently possible.

Some of the leading programmes in the Americas are underscored below. Chile, a member country, continues to be in the forefront of family planning. Over and above their outstanding clinical programmes, the training facility under WHR support for the education of Latin American physicians continues to be greatly successful and was expanded over 1965, and will continue to expand in 1967.

As much a part of all programmes as training, is motivation and education. Under modest financing of the Region, the University of Chile's Experimental Film Unit in co-operation with the Chilean Association, prepared an excellent film on abortion. In black and white, 27 minutes long, Spanish sound track, it underscores the problem of abortion as it relates to a family situation and urges contraception as a prophylaxis. An appropriation was made to distribute the film as broadly as possible.

In view of the increasing number of family planning associations and the expansion of activities, it is most desirable to provide those organizations with continued service, technical assistance, educational materials, etc. Accomplishment of these objectives requires a professional staff. This year WHR's budget provides for three additional field workers, an information and education officer and a medical director. Candidates are being sought for these

vacancies, but great difficulty has been experienced in securing staff. One most promising step in the direction of staff expansion has been the employment of an Assistant Executive Director who is functioning most successfully. The staff is truly international, what with the Executive Director, an American; the Assistant, Brazilian; Field Director, Honduran; secretaries and clerical personnel, all bilingual and representative of Argentina, Uruguay, Cuba and the USA.

Expansion of all our programmes is imminent and continued strides forward will be made. During the past year, the associations in Honduras, Chile, Mexico and Brazil became IPPF associate members.

We regretfully record the death in 1966 of two members of our Executive Committee and Regional Council, Mrs. Margaret Sanger and Mr. Tom Griessemer. All of us who were privileged to have worked as colleagues and associates of these two individuals, know full well the dedication they felt to the movement and the pleasure they had in viewing present-day accomplishments.

NORTH AMERICA

Canada

The Family Planning Federation of Canada is organized on a local basis with a relatively weak central organization. There are eight action and five supporting members.

The most important single activity of the Family Planning Federation of Canada has been a concentrated effort to create a consensus that will ultimately result in the legalization of birth control—for it is still prohibited by federal statute. This objective is now in sight at last. The Federal Parliamentary Committee on Health and Welfare after hearing briefs from various organizations has recommended that the government take the matter of contraception from the Criminal Code of Canada and have it regulated where necessary by the Food and Drug Administration.

In spite of the fact that birth control is illegal in Canada, the Federal Government is not opposed to local government support of family planning activities. The Associations in British Columbia, Manitoba and Ontario have received provincial help. In Ontario five Public Health Units have incorporated family planning into their medical services. In Alberta, the Provincial Department of Welfare provides the cost of prescription supplies for people on their rolls. In a very discreet way the City of Calgary supports the family planning work in the City Health Department.

Through insurance schemes subsidized by the provincial government, doctors are paid for medical service, including contraception. In Quebec under the official plan for indigents, patients pay \$15.00 to each doctor for family planning services. Both Ministers of Family Welfare, the one in power and the one in opposition, have made public statements in favour of the principle of family planning. There are eight family planning centres in Quebec that have provided service to about 6,418 women in 1966 and information to many thousands for which there are no records available.

USA

After many years of controversy the State of Massachusetts, the last State of the Union which had restrictions on birth control, removed legal blocks to the dissemination of birth control information and sale of birth control devices. With the USA Supreme Court's ruling of June 1965 holding that the Connecticut State Law forbidding the use of contraceptives was unconstitutional as it violated the right to marital privacy, all legal impediments to birth control in the United States have been eliminated. The Planned Parenthood Federation of America has been engaged in a series of events this year to underscore the Fiftieth Anniversary of birth control in the United States and has designated the year 1966 as Margaret Sanger Year.

In Washington, D.C., the National Conference on Family Planning, Partners for Progress, was held on 5th and 6th May, 1966, the first formal event conducted in the year-long anniversary celebration. The participants included priests, nuns and rabbis, social and biological scientists, educators, business leaders, high USA and foreign officials, physicians, social workers, civil rights leaders, demographers, poverty fighters and family planning and population experts. At that Conference, Wilbur J. Cohen, Under Secretary of Health, Education and Welfare, stated that the Department was taking steps to carry out President Johnson's policy

statement on family planning, and that Secretary of HEW, John Gardner was to provide *forceful leadership* for the Department's activities in family planning and population. The government, through the Children's Bureau, the Bureau of Family Services, and the Office of Economic Opportunity is providing financial support of family planning programmes in the local communities. AID programmes abroad are being expanded.

The culmination of the year's activities took place in October when the Annual Meeting was held in New York. Highlights of that meeting were special panel discussions to bring to the attention of the delegates representing 150 affiliates of PPFA the increasing pace of activity experienced by IPPF through an international panel, and a panel presenting the seriousness of the food situation on the international scene.

The affiliates are receiving constantly increasing support from the USA Office of Economic Opportunity in demonstration programmes designed to bring family planning services to the impoverished groups of the United States. This year standardized reporting procedures were instituted to provide improved reports on birth control experiences gained with the increasing patient load served by the affiliates, now in excess of 350,000 per year.

CENTRAL AMERICA

Mexico

Although contraceptive services were begun here as early as 1925 by President Plutarco Elias Calles, it was only in 1965 that an effective national organization was formed, the Foundation for Population Studies (Fundación para Estudios de la Población) now a member of the IPPF. The government has no population policy, but allows the use of some public health facilities for family planning, and grants tax exemption to the Foundation. Besides the Foundation—which provided birth control to about 2,000 women last year and trained over 80 doctors, social workers and nurses—seven other institutions carry out medical or socio-economic research related to population and contraception.

Costa Rica

Services began in rural areas of the country as early as 1963. A full fledged family planning association—the Costa Rican Demographic Association (Asociación Demográfica Costarricense)—was organized last year, and has just been admitted to membership in the IPPF. The government is co-operative, and negotiations are advanced to secure a definitive government policy and the institution of a co-operative family planning programme between the government and the Association in all 97 public health centres. Birth control was given to nearly 7,000 women last year.

El Salvador

The Salvadorian Demographic Association (Asociación Demográfica Salvadoreña) was formed in 1962, but was only firmly established last year. It assists the Catholic Church in operating its "rhythm" clinics, and gave birth control help to some 7,000 women last year in its own 15 clinics. It also operates research projects in IUD acceptance, cancer detection, and the socio-economic conditions of pre-natal hospital patients. A Population Department has been established at the National University, and it is possible that the new government will support it. The Association, along with the Ministry of Health, the Medical School and the Population Council will sponsor a Regional Centre for the Training of Professional Personnel in Population Dynamics and Family Planning.

Guatemala

The Family Welfare Association (Asociación Pro-Bienestar de la Familia)—established in 1962—received legal status only two years ago. One of its seven family planning clinics is a pilot project of the Social Security Administration, and it is possible that this year the programme may be carried on co-operatively with the University and the Ministry of Public Health. Some 6,000 women have received birth control in the last two years.

Honduras

The Honduran Family Planning Association (Asociación Hondureña de Planificación de Familia) was established in 1961 by the Dean of the Medical School with the full moral

support of the government, and opened its first clinic in 1964. A year ago, family planning was included in the national health service programme, and contraceptive service has now been established in all public Maternal and Child Health Centres as well as the clinics of the Mobile Rural Health Service. Nearly 11,000 women received birth control last year at the 51 clinics and 29 health centres. The Association became a member of IPPF last year.

Nicaragua

The recently established Nicaraguan Family Planning Association is headed by the government's number two man in the Labour Department, and its Secretary is third in command with the Government Housing Corporation.

Panama

The Panamanian Planned Parenthood Society (Sociedad Panameña de Planeamiento de la Familia) was formed a little more than a year ago and just began supplying birth control clinical services last October (along with medical and para-medical training) in co-operation with the University of Panama.

SOUTH AMERICA

Argentina

A national family planning movement is developing very rapidly. Last August a national organization was formed—the Argentine Association for Protection of the Family (Asociación Argentina de Protección Familiar) from a meeting at the University of Cordoba with representatives of all the provinces. There are now 13 centres operating; and these are expected to be more than doubled by the end of this year.

Bolivia

Doctors are being trained to extend the birth control services now being carried on by individual physicians to the Indian population. But there is no formal organization in the country.

Brazil

A national organization—the Brazilian Family Welfare Association (Sociedade de Bem Estar Familiar no Brasil—BEMFAM) was organized a year and a half ago out of the National Gynaecological Congress of 1965. With 14 branches already in key Brazilian cities, all in association with the chairs of obstetrics and gynaecology of universities throughout the country, plans are under way to establish a network of 54 clinical facilities by the end of this year. The Brazilian Association became an IPPF member last year.

Chile

Contraceptive services were begun here in 1925, and broadened in 1955 by Dr. Jaime Zipper who developed the Zipper Ring (an intra-uterine device) in the Barros Luco Hospital. In 1962, the Association for Protection of the Family (Asociación Chilena de Protección de la Familia) was organized and family planning was incorporated in the National Health Service. It was not until last year, however, that family planning activities were openly and officially recognized by the government which then announced that it was properly integrated in the National Child and Maternal Health Services. Last year more than 58,000 women received contraceptives (predominantly the Pill and IUD) in the Association's 102 family planning centres. For 1967 the government is allocating US \$400,000 (2 million escudos) to provide contraceptive services to an additional 100,000 women. In addition the government has appointed two top-level Commissions to study and co-ordinate all family planning programmes. Chile has been an IPPF member since 1965.

Colombia

The Colombian Family Planning Association (Asociación Colombiana de Planificación de la Familia) was founded last year and works in close co-operation with the Division of Population Studies of the Colombian Association of Faculties of Medicine (Asociación Colombiana de Facultades de Medicina), sponsored by the seven medical schools of the

country and the top national health and education ministries of government. The Division runs 50 family planning centres and plans to extend this to 1,200 as integral parts of medical community service. The government granted US \$300,000 this year (5 million pesos) to enable training of 2,000 doctors, nurses, social workers and other para-medical personnel so as to extend family planning to all public health services in the country. The Association now has five centres of its own, and gave birth control help to over 6,500 patients last year. It plans to extend its clinical facilities and serve over 30,000 women this year. It has also trained 50 doctors in birth control techniques.

Ecuador

The Ecuadorian Association for the Welfare of the Family (Asociación Pro Bienestar de la Familia Ecuatoriana) began its active programmes last year, and has extended services to nine provinces. It gave birth control help to nearly 3,000 patients last year, and trained 52 professional personnel at the Centro de Estudios de la Reproducción.

Paraguay

A family planning programme, a joint enterprise of the Paraguayan Centre of Population Studies and the Medical and Gynaecological Departments of the Faculty of Medicine has just been inaugurated.

Peru

While organization of a private family planning association has just begun, Peru is the only South American country which by Presidential decree has organized a Population and Development Centre (1964) under the direction of a national council. Most of its activities are confined to research and education.

Uruguay

The Ministry of Public Health, the Faculty of Medicine of the National University and the Asociación Pro-Maternidad sponsor the Uruguayan Association of Family Planning (Asociación Uruguaya de Planificación Familiar) established in 1962. Some 3,500 women received contraceptive services last year in the Association's five family planning centres. About 1,800 women a week come to the centres for birth control, infertility treatment and cancer detection. Without fanfare, the government has been contributing financially to development of the Association's programme, and has provided space, furniture, materials and technical personnel for family planning clinics in the public hospitals and public health centres. One Association centre has been officially recognized as part of the National Health Service, and legislation has been proposed in Parliament by the Executive Branch to extend support for family planning.

Venezuela

The Venezuelan Association of Family Planning received legal recognition in January of this year; but a Population Division was established by the Ministry of Public Health as early as 1965. It organized a panel discussion on population at the National Public Health Congress last March recommending to the government the need for population planning. The Division is now developing a pilot birth control project in a Ministry of Public Health Centre using physicians trained under IPPF support.

THE CARIBBEAN

Barbados

The Barbados Family Planning Association, a member of IPPF, is financed by IPPF and the Barbadian Government. It is seeking to reach 60,000 women over the next three years.

Bermuda

A member of the IPPF, the Bermudan family planning programme is fully supported by the government. An intensive family planning programme was undertaken in 1960, and since that time the birth-rate has steadily fallen from 37 to 25 per 1,000.

Curaçao

Founded in 1965, the Foundation for Responsible Parenthood is financed by the government and the IPPF. It has excellent co-operative relationships with religious groups, labour, medical and business organizations.

Cuba

Contraception is now part of the National Medical Service of Cuba, where it is hoped to reach 50,000 women by the end of this year for reasons of maternal and child health. The Chairman of the IPPF Medical Committee was invited to lecture in contraceptive techniques to the Cuban doctors last year, and Cuban gynaecologists and demographers have received training at the IPPF centre in Chile and CELADE. IPPF is providing consultative and material assistance; and preliminary arrangements have been made with the Chilean Association and CELADE to conduct a two-week seminar in family planning, population and public health in Cuba.

Dominican Republic

The government has recently announced that it will include family planning in its Maternal and Child Health Programme. The Dominican Association for the Welfare of the Family (Asociación Dominicana Pro-Bienestar de la Familia) was organized last year and is planning a programme in co-operation with the government programme.

Grenada

The Grenada Planned Parenthood Association operates its own clinic and works in co-operation with private physicians. It is investigating the efficiency of a new IUD.

Jamaica

While the family planning movement started here in 1939, a national organization was not formed until 1956. It assisted about 30,000 women in 1965, and has worked in co-operation with the government which has now opened a family planning unit under the Health Ministry to introduce family planning into 50 government hospitals and health centres this year.

Puerto Rico

The family planning movement was initiated in 1925, and in 1940 became part of the National Health Programme. Because of political and religious pressures, the programme soon disappeared, however, as a public function of the Puerto Rican Government. In 1964 the Family Planning Association of Puerto Rico was officially organized, offering clinical and educational services and devoted to strengthening the programmes of the Health Department. At present, with a substantial grant from the USA Office of Economic Opportunity, the Association is expanding its activities on an island-wide basis in 60 cities—another 16 cities being covered by the Commonwealth Government. From August to January, the Association provided contraceptives to nearly 13,000 women. The Association is a member of IPPF.

St. Vincent

The St. Vincent Planned Parenthood Association was formed a little more than a year ago.

Trinidad and Tobago

The Family Planning Association, founded in 1960, is a member of IPPF. Over five years it has provided birth control to about 15,200 patients. There is some government encouragement through tax relief and duty free imports for birth control materials.

TRAINING ACTIVITIES

TRAINING OF LATIN AMERICAN MEDICAL AND PARA-MEDICAL PERSONNEL

The IPPF, Western Hemisphere Region, has trained 350 physicians, 24 social workers and 10 nurses in four family planning seminars and one training course in family planning during the five year period.

Three seminars have been held in the United States and Puerto Rico, and in 1966 a fourth seminar was held in Honduras, which was attended by 150 participants, and was specifically designed for Central America.

TRAINING PROGRAMME IN FAMILY PLANNING IN PUBLIC HEALTH, DEMOGRAPHY, SOCIOLOGICAL AND CLINICAL ASPECTS OF FAMILY PLANNING

This programme is sponsored by IPPF, WHR, the Chilean Association for the Protection of the Family and the Graduate School, Faculty of Medicine, University of Chile. It is conducted with the participation of the Latin-American Demographic Centre (CELADE); School of Hygiene, University of Chile; Institute of Physiology, University of Chile; University Obstetrical Department, J. J. Aguirre Hospital, University Gynaecological Departments; Latin-American Centre of Population and Family (CELAP) and the Department of Obstetrics, University Hospital, Catholic University.

Initiated in 1965, training 21 doctors that year, 45 additional physicians were trained in 1966, resulting in a total of 66 in its two-year history. The enormous impact of this training programme has been felt through Latin America. Plans for 1967 call for substantial expansion with the inclusion of social workers, nurses and midwives.

LOCAL TRAINING

Most of the Family Planning Associations are organizing their own national and regional seminars for training. Doctors already qualified, either at the four seminars previously indicated, or in Chile, are involved in local training programmes.

Also, experts from other countries, particularly Chile, Uruguay, Honduras and Colombia, and also the Director of the Margaret Sanger Research Bureau (a native of Argentina), have participated in national training programmes and attended national and regional meetings. Colombia was the site of two international conferences: the First Pan-American Assembly held in Cali, 1965, under the sponsorship of the American Assembly and the Workshop in Family Planning held in Popayan in 1966, under the sponsorship of the University of Chicago.

Local associations are involving the universities in the teaching of population and family planning matters in most of the countries.

34. WESTERN PACIFIC REGION REPORT

Chong Chin Lee
Western Pacific Region, IPPF

REGIONAL DATA FOR 1966

	<i>Population</i>	<i>Density per sq. kilometre</i>	<i>Birth rate per 1,000</i>	<i>Member association</i>
Hong Kong	3,785,000	3,710	24.9	Family Planning Association of Hong Kong (FPAHK)
Japan (estimated)	97,800,000	265	18.5	Planned Parenthood Federation of Japan (PPFJ)
Korea (South)	29,194,379	288	37.2	Planned Parenthood Federation of Korea (PPFK)
Okinawa	930,000	389	22.0	Family Planning Association of Okinawa (FPAO)

REGIONAL PROJECTS IN 1966

(a) The Annual Regional Seminar was held in April in Tokyo, organized by the Regional Office of the IPPF and the Planned Parenthood Federation of Japan. It was attended by 128 delegates representing 13 countries. The success of this Seminar owed much to the presence of Lady Rama Rau, President of the IPPF.

(b) The Regional Training Course for doctors was held in October in Seoul, Korea, organized by the Planned Parenthood Federation of Korea. Participants were: Hong Kong 1, Japan 1, Korea 10, Okinawa 1. The five-day course included observation in the field as well as lectures and discussions.

(c) The first Regional Training Course for leaders of family planning workers was held in November in Hong Kong organized by the Family Planning Association of Hong Kong. Participants were: Hong Kong 2, Japan 3, Korea 4, Okinawa 2. Opportunities for discussion of their own country's problems was of the greatest value to participants. It is planned to keep in touch with them by a special regional newsletter.

HONG KONG

Although there is still no official family planning policy in Hong Kong the government support the Family Planning Association both financially and with active co-operation from various Government Departments. (The government annual subvention is equivalent to US \$76,250, about half of the Association's expenditure.)

Activities of family planning association of Hong Kong in 1966

1. Three additional clinics were established bringing the total to 54 clinics, giving 66 IUD and 47 general sessions weekly.

2. Clinic attendance figures for 1966 were 69,957 equivalent to 16% of total married women 20-44 years.

3. After the initial success of IUD in 1964 and 1965, the insertion rate gradually declined and the removal rate increased giving a total of 53,783 IUD insertions and 15,670 known removals to date. (The insertion rate has now levelled off and the removal rate decreased.) There has been an increase in the use of orals, now 2,221 cases.

4. Thirty field workers conducted a follow-up programme, visiting 12,000 patients who had failed to return to the clinic over the past year. Of these, 6,000 were contacted personally and 3,000 of them have since returned to the clinic.

5. The birth rate dropped from 27.9 to 24.9 and the average age of the majority of the patients decreased.

Studies and research

(a) *Hong Kong triangle*, this IUD has now been approved by the Association after six months trial, for use in all clinics. The present expulsion and pregnancy figures indicate lower rates than for the Lippes loop C, previously used.

(b) *Post partum insertion*, financed by the Population Council; this has been in operation at one hospital since April. To date no cases of infection or pregnancy have been reported. (Average of 110 patients per month.)

(c) *Age specific birth-rate study*, financed by Population Studies Centre; over 10,000 birth records from hospitals and maternity homes were collected and classified. A preliminary report from the University of Michigan estimated that 50% of the drop in the birth-rate over the years 1961-5 (34.2-27.9) was attributable to family planning.

(d) *Evaluation of field worker methods*, undertaken in conjunction with the Church World Service; this study includes comparison of the effectiveness of interview techniques and analysis of patients' propensity for acceptance. A report will be available shortly.

JAPAN

The Japanese Government has promoted family planning programmes in co-operation with voluntary organizations since 1952.

The Planned Parenthood Federation of Japan is a national organization representing all family planning groups in Japan and does not operate any clinics of its own but concentrates on publicity, education and training. It was instrumental in influencing the government to adopt the Maternal and Child Health law passed in 1965 and family planning is now included in the general programme for maternal health. Family planning instruction and services are provided for various groups and individuals at 826 public health centres and 461 maternal and child health centres. In addition, under local government auspices, midwives and public health nurses make home visits and give group guidance; impoverished patients are provided with contraceptive supplies free of charge.

Although the birth rate in Japan was only 18.5 in 1965 (34.3 in 1947), the number of registered induced abortions was 800,000 indicating that the methods of birth control in use are not as successful as they should be and further action to replace abortion by more effective methods of contraception should continue, in order to safeguard maternal health. At present IUDs and orals are not in general use.

It was officially announced last November in Karachi, at the meeting of the Colombo Plan Consultative Committee, that Japan would be ready to assist Asian countries with their family planning programmes on request. Already the Japanese Government had sent five family planning nurses to India last September for two years at the request of the Indian Government. Following the Karachi meeting, requests for assistance were received from Pakistan and Malaya; further requests from other countries are anticipated in the near future.

Activities of the planned parenthood federation of Japan in 1966

1. The Committee on International Family Planning Co-operation was established in August by the Planned Parenthood Federation of Japan. An active part will be played by their Fund Raising Committee to raise funds in Japan to support this project.

2. The "All Japan Maternal and Child Health and Family Planning Convention" is held annually; 3,000 family planning workers attended for study and discussion.

3. Instruction courses for midwives and public health nurses are held bi-annually; 200 attended and qualified as family planning workers.

4. Training and Research Assemblies for family planning leaders and lecture meetings at local level are held throughout Japan annually; 50,000 people attended.

Studies and Research

(a) The study on induced abortion by the Medical Committee was completed and published in 1966.

(b) The two-year study on the IUD is proceeding and will be completed by the end of 1967.

KOREA (SOUTH)

The National Family Planning Programme was included in the Government Development Plan in 1961. Its aim is to reduce the natural increase rate to 2.0% by the end of 1971 (average rate 1955—60 = 2.88%, 1961—66 = 2.7%).

All family planning services are provided free through the Government Health Organization, using 2,200 full-time workers, with co-operation from 1,700 trained authorized private doctors.

The target set was 1,000,000 IUD insertions, 150,000 vasectomies, and 150,000 users of traditional contraceptives. Results in 1966 were 400,000 IUD insertions and 20,000 vasectomies performed at 1,700 clinics, bringing the cumulative total from late 1964 to 650,000 IUD insertions and 80,000 vasectomies.

The Planned Parenthood Federation of Korea supports the implementation of the national programme in all areas with particular regard to training, publicity and education, research and evaluation, and the pioneering of pilot projects.

*Activities of the planned parenthood federation of Korea in 1966**Training programmes at provincial level*

(a) In-service training for family planning workers; 392 attended at five centres.

(b) One-day seminars for authorized IUD and vasectomy doctors to assure effective utilization of newly established medical referral and mobile training service; they were conducted province wide; 885 attended.

(c) Midwife training programme under the auspices of the Korea Midwifery Association; they were conducted province wide; 539 attended.

Publicity and education

(a) A successful publicity programme was carried out in co-operation with the government and commercial radio stations, through newspapers and magazines, and by means of public meetings and special events. The results of 1966 National Survey showed that for the eligible people who had heard about the programme, sources of information were as follows: radio 54.4%, newspapers 22.2%, magazines 17.9%.

(b) Various educational materials were produced with the assistance of the Population Council. The *Newsletter* has now reached a circulation of 20,000.

Survey and research

The studies being conducted by or with the assistance of the Planned Parenthood Federation of Korea are:

(a) Urban Family Planning.

(b) Rural Family Planning.

(c) IUD Clinical Follow-up.

(d) Clinical Trials with Oral Contraceptives.

(e) Research on Male Sterilization.

(f) National Survey on Knowledge, Attitude and Practice.

(g) Family Planning and Fertility in Slum Areas, Seoul.

The special induced abortion study was completed in 1966 and the study of effectiveness and acceptability of orals to drop-out IUD cases was initiated by three medical colleges with financial support from the Population Council.

Pilot projects

(a) Referral System, established in 1965 by the Government and Planned Parenthood Federation of Korea in order to counteract any unfavourable effects of mass IUD and vasectomy application. 16,965 cases have been given medical care to date and the valuable experience gained will be applied to the general programme.

(b) Mobile Training Service, aimed at providing service in remote areas and guidance to rural doctors with limited experience. There are now 10 mobile clinics in operation, and the current total number of IUD insertions is 22,700, vasectomies 1,500 and 8,100 individual consultations. This project will be continued in 1967, emphasizing the training of local doctors.

(c) Five Demonstration and Training Clinics where research studies can be carried out are provided and operated by the Planned Parenthood Federation of Korea, which also provides general services at 11 stations where the government is not able to operate. The total results from these clinics are 4,230 IUD insertions, 250 vasectomies and 6,460 users of traditional contraceptives. They have trained 67 IUD and 27 vasectomy doctors, and 10 nurses. In addition 950 women have been trained in delivery care.

OKINAWA

This group of 50 islands has very limited resources and some 3,000 young people with no future at home are leaving for Japan annually. Although the birth rate has fallen substantially (40.2 in 1950, 21.4 in 1964), the majority of the people had no access to guidance on family planning due to poor transport communications and lack of doctors. The Family Planning Association was established in 1965 in an attempt to bring the benefits of family planning to these people, living under such adverse conditions. The Association's aims are to encourage planned pregnancies and discourage induced abortions.

Financed by private donations and assistance from the IPPF it has achieved much in a short space of time but, with increasing operational expenses, it is seeking government and other financial assistance which it urgently needs, and it hopes to be able to influence the government to pass new maternal and child health laws which will include legislation for family planning services.

The successful co-operation of the many groups concerned in the founding of the Association has already enabled it to provide practical family planning advice for 23,000 patients, with numbers increasing steadily.

Activities of the family planning association of Okinawa in 1966

1. Lectures and film shows for 700 members of Midwives Association, Nurses Training School, Women's Associations, etc.
2. Training Course for practical family planning instructors held in October, the first to be held in Okinawa; 121 instructors trained.
3. Publicity and educational programmes in various local communities.
4. Delegates sent to various seminars and conferences and training courses in the Western Pacific Region.

Session 8

TRAINING IN FAMILY PLANNING

35. TRAINING IN FAMILY PLANNING

D. Bhatia

Ministry of Health and Family Planning, New Delhi

INTRODUCTION

Training of personnel has been a very important component of the Indian family planning programme almost from its very inception. This was absolutely imperative because family planning as a programme was a relatively new concept without much to fall back upon in the currently existing training programmes, nor with any comparable experiences in other parts of the world to draw upon specifically for adaptation and application. Even as the mainstream of the programme proceeds, training in family planning has been a continuous process of postulation, trial, evaluation and refinement.

EARLY EFFORTS

When the programme was first launched in 1952-3 it was considered adequate if a service was provided through family planning clinics; either attached to existing hospitals and dispensaries or functioning independently. Staff sanctioned for these clinics were a doctor, a health visitor and a social worker. Community contact was rather limited. Training of workers was designed to meet the need of such a programme, and an appropriate curriculum was evolved and circulated to the states. Though the states were encouraged to develop their own training centres, and financial support was assured by the Government of India, the main resource was the Family Planning Training and Research Centre established in Bombay in late 1957. Many of the earlier administrators of the state programmes and others in the employ of the Central Government were trained in the Bombay centre. In 1960 a second training centre was set up by the Government of India in New Delhi, the precursor of the present Central Family Planning Institute. Simultaneously the All India Institute of Hygiene and Public Health, Calcutta, started teaching family planning to the students enrolled there for the different post-graduate diploma courses in public health.

CHANGE IN EMPHASIS

A major appraisal of the entire programme was undertaken in 1962.¹ The census of India, 1961, had shown no change in the birth-rate, whereas the death-rate had declined considerably. Research projects in different parts of the country had underlined the necessity of a community-based programme utilizing all the well-known principles of extension education like co-operative planning, involvement of community leaders, transference of responsibility and others. Health education as a major force in health programmes had been proved conclusively, especially in environmental sanitation, immunization and child rearing. All these contributed to a major change in the strategy of the national family planning programme. Three major areas of departure from the previous programme can be identified. Pre-eminent among these was the emphasis placed on the creation of a "group acceptance" of the small family norm in the community at large. This was considered essential to create a favourable social climate in which the programme could grow and flourish. As a corollary to this objective it was considered essential to involve the men of the community so that social change could be better effected.² To achieve these two objectives, which involved a sizeable component of community education, an elaborate organization was developed, and, consequently, training of personnel had to be modified to a very great extent. The revised programme was called the extended family planning programme. Early in 1965 after the Indian Council of Medical Research gave a favourable opinion, the intra-uterine device was included to reinforce the programme. This created fresh and additional training needs.

Progress in the implementation of the extended family planning programme varied among the 16 states (now 17) and eight union territories in the Indian Union. One of the limiting factors was that the implementation was tied up with the maintenance phase of the national malaria eradication programme. Recruitment to the infra-structure had to be from the personnel rendered surplus by the malaria programme. Of course it was understood that these persons would have to be re-oriented from fulfilling an executive role to a promotional one and from being a uni-purpose worker to a more generalized worker. Outside of this field, there were few personnel with any kind of training suitable for the programme and available for it. There were also differences in emphasis among the states—some favouring vasectomy in preference to the IUD. Early in 1966 a committee consisting of secretaries to some state governments with the Secretary to the Union Government as its chairman (the Mukerji Committee) was appointed to examine the present structure and recommend any modifications they considered necessary.³ This committee took the view that, now that there is a considerable amount of technical knowledge in the medical aspects of family planning, the success of the programme can be ensured by a sound and effective organization with emphasis on education of the community, and peripatetic services, based on static clinics.

ORGANIZATION

The present organization, therefore, is the one suggested when the extended family planning programme was launched, reinforced by the recommendations of the Mukerji Committee. The basic health worker who, earlier, was required to play an important role in the education of a community of 10,000 and to organize supplies, in addition to his role in the basic health services, has now been absolved of these responsibilities and is to serve as an informant in family planning in the small community. The Auxiliary Nurse-midwife (ANM) also operates in a community of 10,000 and functions as a maternal and child health and family planning worker insofar as the women in the community are concerned. At the 20,000 population level there is a male worker, the Health Assistant (family planning), HA(FP), who is responsible for all non-clinical aspects of the programme, and who is the only exclusive family planning worker at the lower echelons. At the intermediate stage of 40,000 population there is a Lady Health Visitor (LHV) to supervise the four ANMs. The existing staff of the primary health centre which is invariably located in an administrative unit known as the "block", has been strengthened by the addition of a medical officer, preferably a female doctor, a block extension educator, a records clerk, a storekeeper-cum-clerk-cum-accountant, each with specifically defined roles. Similarly there has been reinforcement of the staff at the district level. A district would have, on an average, 10 to 15 blocks and would cover a population anywhere from 1 to 4 millions. Added to the existing staff are: one district family planning (medical) officer, two or more medical officers, one health education information officer, two district extension educators, one statistical assistant, one administrative officer, two stores officers, one accountant and a number of supporting staff. In urban areas there will be one Centre for a 50,000 population consisting of two medical officers, two extension educators, two field workers and other supporting staff. Organization at the state headquarters has also been strengthened.

MAGNITUDE

Most of the staff appointed to these positions need to be trained. The magnitude of the training load for the country as a whole, computed on the basis of this organization would be approximately:

District family planning officers	355
Medical officers (district level)	1,005 or more
Health education information officers	335
District extension educators	670
Statisticians	24
Statistical assistant (district level)	335
Administrative officer (state and district)	349
Medical officer (PHC)	5,235
Medical officer (urban centre level)	1,811

Lady assistant surgeon (block)	5,235
Lady assistant (urban centre level)	1,811
Block extension educator	5,235
Urban extension educator	3,622
Records clerks	5,235
Storekeeper-cum-clerk	5,235
Sanitary inspectors (district and PHC)	5,570
Lady health visitors (1 for 40,000)	10,000
Field workers at urban centre level	1,811
Health assistants (FP) (1 for 20,000)	20,000
Auxiliary nurse midwives (1 for 10,000)	55,166
+ few urban centres, etc.	
Basic health workers (1 for 10,000)	40,000

In addition to this basic load, there is a large number of other workers at different levels in the hierarchy in the Health, Education and Development departments and of the voluntary agencies who need to be trained for longer or shorter periods and with differing areas of emphasis. For the purposes of this paper the strategy of training to be described will be limited to the categories mentioned above.

JOB ORIENTED TRAINING

The number of workers who would have to be trained was truly astronomical in comparison with the resources available. There was no chance of manning all these positions with fully trained persons, nor was there any prospect of giving these people a full professional training. It was not practicable to wait for persons with post-graduate qualifications at the higher echelons. Therefore it was decided that people should be recruited to the posts with the minimum qualifications commensurate with the need of each post, and who were easily available in the country, and to give them training which would enable them to perform the tasks expected of them. The training period perforce had to be of minimum duration, and the training itself oriented to the needs of the particular job, and with a good measure of field work. Gradually, it was envisaged that the better workers among those who had received the job-oriented training and were functioning in the field, would be given facilities for higher professional education in their particular specialities.

NATIONAL AND STATE TRAINING CENTRES

Resources available for providing this kind of training were the four Government of India institutions, namely, the All India Institute of Hygiene and Public Health, Calcutta, the Central Family Planning Institute, New Delhi, the Central Health Education Bureau, New Delhi and the Family Planning Training and Research Centre, Bombay. The Institute of Rural Health and Family Planning, Gandhigram, an institution maintained in Madras which had experimented with job-oriented training, was also included among the central training institutions. Obviously five training institutions could not serve the total needs of the entire country. Moreover, since large numbers of peripheral workers have to be trained in the local language and the training should preferably be in a station as close to the place of work as possible, it was decided to decentralize the facilities by establishing new training centres. As a first step in this process of decentralization it was decided to upgrade the existing family planning training centres in the states and to establish additional ones so that each of these could serve a population of 10 millions. In 1965 the Government of India offered to finance and maintain for a period of 10 years 44 such training centres distributed among the different states according to the 1961 census. A staffing pattern for these centres was also suggested. It included a principal (medical person with a post-graduate public health qualification), a medical lecturer-cum-demonstrator, a health education instructor, a social science instructor, a statistician and a public health nurse instructor, supported by ancillary professional and administrative staff. To date, only 29 training centres have been established, not all with the full complement of staff. The principal difficulty in this regard has been the problem of getting staff with the requisite qualifications and experience.

DISTRICT TRAINING CELL

Even when all these centres are established and in full function, it will take a little over three years to train only four categories of workers operating in the unit of 10 millions population—the medical officer (PHC), the lady assistant surgeon, the block extension educator, and the health assistant (family planning). It has accordingly been decided that the process of decentralization should be carried further to the district level so that the training of the other staff can be completed within a reasonable time. The Family Planning Programme Evaluation and Planning Committee⁴ has envisaged a district training cell with an additional health educator and a public health nurse. A health educator has been provided for each district by the Mukerji Committee and with the addition of a nurse, each district organization can take up the training of lady health visitors, ANMs, records clerks, sanitary inspectors, basic health workers and storekeepers-cum-clerks, through one or more primary health centres in the district.

Extension of the training facilities has brought in its wake the problem of training the teaching staff of these centres. On the basis of 44 training centres, 264 persons need to be trained with special emphasis on teaching methods and with the minimum amount of content material in the different aspects of family planning. Training staff, at the district, when appointed also need to be trained in training methodology.

OVERALL STRATEGY

Strategy and content of training have been discussed in various forums—in special groups, in the meetings of programme directors in the states and in workshops for teachers. The Family Planning Programme Evaluation and Planning Committee had one of its sub-groups discuss this problem in great detail. In 1964 faculties of three central training institutions actually involved in the training of family planning personnel met together and worked out detailed curricula for the district and block extension educators and guide-lines for the content of training of other workers. Progress in the implementation of the training programme was, once again, limited and varied with the states.

1966 WORKSHOP

With a view to giving it a further impetus, a workshop, unique in certain ways, was organized in 1966. Directors of the four central institutions and of the Institute of Rural Health and Family Planning met together for two days to sort out the technical problems involved in the training programme and to develop a strategy in keeping with the special skills and strengths obtaining in each institution. During the next three days the administrative medical officers in the states joined this group of teachers, discussed the strategy recommended by the teachers and came to certain specific conclusions. Recommendations of this workshop epitomize the current thinking on the training programmes and the plans for implementing them.⁶

The Central Family Planning Institute, Delhi, is given the responsibility of training the faculty members who are to man the 44 State Training Centres. The training curriculum is so arranged that in the minimum period the trainees develop the necessary skills and knowledge to enable them to design suitable training schedules in their own centres for various categories of field personnel.

The District Family Planning Officers and District Extension Educators are also given training at the five National Training Centres.

OTHER CATEGORIES OF HEALTH STAFF

Training of all other categories of district and block staff is left to the state family planning training centres and the district training cells as and when the latter start functioning.

Legislators and administrators and social leaders

It is in the interests of the programme that moulders of public policy at national state and local levels should be favourably disposed towards the programme and should appreciate the full implications of unfettered population growth. Short orientation programmes are arranged

for these important people. General administrators and heads of allied technical departments also need to be oriented towards the magnitude of the population problem as well as to its ramifications into all aspects of national development. Those in administrative charge of the programme in the states need to keep abreast of developments. Periodical meetings and seminars provide opportunities for extending knowledge, sharing experiences, interpreting government policy and for general professional growth and development. Responsibility for all these is vested with the Central Family Planning Institute. The state family planning organization with the help of the state family planning training centres is expected to carry out similar activities with state legislators and others within the state.

Nurses and doctors

A positive way of involving doctors and nurses in the programme, with full understanding of and conviction in it, is to integrate family planning with the basic course of instruction. With this end in view a series of seminars have been conducted.

RESEARCH

Research is the *sine qua non* of any programme in family planning, whether it is in the field of evolving and evaluating new contraceptives, or developing deeper knowledge in the biologies of human reproduction, or creating more effective methods of social communication and education. These and other facets require painstaking pure and applied research. Our thinking is that a training centre should itself engage in research and also be knowledgeable about the results of research projects in other parts of the country. Of course, this necessitates a clearing house where such information is collated and distributed promptly to all those needing it. Unless the findings are ploughed back into teaching it would be a waste of a great deal of effort and money.

Research has engaged the attention of administrators from the very beginning of the programme. Funds have been made available for research from the First Five Year Plan period (1951 to 1956) so as to enable us to draw our own benchmarks and to give form and structure to the programme. Research has embraced the three main areas in family planning—demography, communication and bio-medical.

Demographic

The Demographic Training and Research Centre, Bombay, was set up in 1956. The United Nations and the Sir Dorabji Tata Trust collaborated with the Government of India in establishing this centre. As its name implies it carries out both training and research. Till June 1966 207 persons from India and other countries were trained. The Centre has contributed a number of scientific papers on different aspects of demography.

The Demographic Advisory Committee of the Government of India periodically reviews the progress of demographic research in the country and gives grants for conducting research. In addition to the one in Bombay, there are eight demographic research centres, most of them located in universities. These centres are expected to serve as listening posts and assess any changes in fertility and population trends as a result of the family planning programme.

Communication

During the Second Five Year Plan a rural field study of population control was carried out in the Rural Health Unit and Training Centre, Singur of the All India Institute of Hygiene and Public Health. It opened up such great possibilities for field research in family planning, especially in the methods of approaching people, that the Government of India with the help of the Ford Foundation took up family planning communication research in a big way. The Family Planning Communication Research Committee was constituted with a view to advising and co-ordinating family planning communication research, and to giving grants for approved research projects. As of now, there are 16 communication research projects and they include such topics as programme operations, developing programmes in industries and large offices, hospital projects, training, nursing education, measurement, attitudes and others. Project staff meet together once a year when the experiences are pooled together.

Bio-medical

Bio-medical research includes research into the physiology of reproduction, mode of action of contraceptives, effects of the use of contraceptives, development of new contraceptives and the like. This work is co-ordinated and supported by the Indian Council of Medical Research through an advisory committee on the scientific aspects of family planning. Major research projects have been endowed in eight different institutions. In addition research grants are given to individual workers who desire to undertake work on any aspect of bio-medical research.

SUMMARY

In the course of this paper the major events leading to the present organizational structure for the programme have been mentioned. On the basis of this organization, more than 155,000 persons of different categories, directly involved in the programme, have to be trained. The strategy of training, whereby district officers and above will be trained at the five central institutions, and the others at the state training centres and district training cells has been described. In addition there are large numbers of officials and non-officials who are indirectly concerned with the national programme and require orientation. Importance of research in the programme in general, and training in particular, has been stressed. A reference has been made to the major areas of research.

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36. ADMINISTRATION OF A FAMILY PLANNING PROGRAMME

E. Adil

Family Planning Council, Government of Pakistan

Rapid population growth is no longer just a national problem; it is a threat faced by the entire world. Medical advances have controlled epidemics and minimized the effect of several diseases. With an increasing life span, the world population grows by leaps and bounds and in the next 25 years, we face a population explosion on a global basis. The problem is thus both grave and urgent. It is certainly not too early at this stage for people to learn to apply positive checks by voluntary practice of family planning as an alternative to what would be nature's cure for over-population: war, famine and pestilence. Man's instinct for self-preservation forewarns him and he acts to ward off prejudicial consequences with his intelligence and ability to exercise self-control. A consensus then develops and what were social taboos before become social necessities. The whole process is evolutionary and necessitates delicate handling lest the interregnum is unduly staggered or injured by lack of coherence and maturity of individual behaviour patterns inside the social group. It is precisely for this reason that we provide planning, programming, control and direction.

Recognizing the urgency and magnitude of the problem, several countries have launched national programmes of family planning. The scope of each programme is related to the peculiar circumstances of the nation. Generally, the essentials of a population programme are:

- (i) Education and motivation of the people;
- (ii) Services and supplies;
- (iii) Training of workers;
- (iv) Evaluation of results;
- (v) Research;
- (vi) Streamlined organization and administration.

A family planning movement is essentially an educational endeavour. The present problem is in fact a product of the value system characterizing cultures around the globe. In a predominantly agrarian economy children, especially sons, are generally considered as economic assets. Surviving sons are regarded as old age security by parents in the developing countries. Yet a shift is now taking place here from a purely agrarian to an industrial or semi-industrial economy. The increasing pressure on land has led to this change. Rural-urban migration opens horizons of higher standards of living by the demonstration effect of the new environment. Improved mobility of population between the urban and the rural areas fills the latter with new ideas. Such a change obviously necessitates adjustment of resources to meet the upsurge of new needs and requirements. It, therefore, seems logical and inevitable for nations to bring about a reorientation in their value system in relation to family size. The emphasis shifts from quantity to quality. It is recognized that a healthy and well trained progeny should be the ideal, but the ideal cannot be realized without means and means are limited. This promotes the desire for a limited family from the sub-conscious to the conscious. What is then needed is bold and influential leadership to break the conspiracy of silence and make "Family Planning" an open subject for discussion in society. The final step is to make facilities and material available to the masses as conveniently for them as possible. When President Ayub decided to launch the family planning movement in Pakistan he had to reckon with conservatism, prejudice, and ignorance. It was the courage of his conviction and the abiding faith of the people in his lead that overcame barriers which seemed almost insurmountable before. The Knowledge Attitude and Practice Studies being currently conducted in Pakistan by various research and evaluation units have shown that the majority of people have accepted

that to control the size of their family is desirable. However, they find it difficult to make their feelings public or to avoid the fear of derision if they are found inside a family planning clinic. This can be surmounted by an effective educational and motivational programme tailored to local conditions, cultural norms, levels of education and maturity of the target couples. In a country like ours where the literacy percentage is low, Press and written publicity cannot suffice. Motivation here must have an individual bias. It proceeds well by word of mouth, and the satisfied practitioner encourages the diffusion process. Accordingly, in Pakistan we have appointed about 35,000 local women (mostly midwives) as Family Planning Organizers to work directly on the target women at grass root level with whom they are already well familiar. The organizers have the same cultural and sociological background as their clients. They have been trained in methodology and the approach necessary to impart information on family planning; they sell conventional contraceptives, and motivate and refer cases for clinical contraception. People need to be guided and followed up. Group meetings of the male population are essential to create a favourable climate of public opinion. In woman-to-woman dissemination the appeal in physiological terms is effective but it must have a socio-economic slant to appeal to males. Supplies of conventional contraceptives through all possible channels right down to the villages and hamlets must maintain an uninterrupted flow. Arrangements for mobile clinical services have to be co-ordinated with the availability of a sufficient number of target women accepting them at a convenient date and place. All these functions need able and energetic young men at the supervisory level. They are the local administrators and kingpins of the action programme. We have over 1,200 of them, roughly one for every 30 organizers. Since it is not possible to have a sufficient number of whole-time medical personnel for family planning work we have involved nearly 1,500 on a part-time basis by building a system of monetary incentives for them on a piecework basis and making provision for their transport and camps in the outlying areas. Para-medical personnel are also utilized for IUD insertions. Medicines and instructions concerned with follow-up are given on the spot.

Mass media of communication cannot be ignored as they break through the psychological barriers of inhibition and make family planning an open subject. Proper coverage in the Press and carefully designed bill-boards, posters and pamphlets, help the people by arousing their interest in family planning. The majority of our people who are not literate may not be able to read the script but surely a new sign would not go unnoticed or unquestioned. In fact with the help of these signs the influential in the community can effectively persuade the others in their areas. In Pakistan we have been fully utilizing the mass media techniques; and the local flavour given to the communication materials makes them more acceptable.

All the efforts in the field of education, motivation and communication will go to waste if adequate services, both clinical and otherwise, are not developed alongside the family planning educational programme. It is not only important that the supplies of conventional contraceptives should be enough but it is also important that a choice of methods is offered to the people as "no single method will satisfy everyone".

It is not enough that adequate supplies are available to a client, but they must also be reliable. A satisfied client is perhaps the best publicity. We have, therefore, laid down a system of checks at all levels to ensure quality. Products before despatch to the main stores are checked at the National Research Institute of Family Planning. Samples are also sent by the districts to the National Research Institute of Family Planning for testing.

During the first year of the programme, half of the couple years of protection was achieved by over 250,000 IUD insertions, and the rest through conventional contraceptives and sterilizations. This achievement is by no means insignificant as it was in this year that the nation was at war. Since then the monthly rate of IUD insertions has gone up to over 50,000, the sale of conventional contraceptives to about 10 million units; and of vasectomies to over 4,000.

It may be of interest to this august gathering to know that before launching the mass IUD programme, extensive research studies were undertaken in the country by the National Research Institute of Family Planning and various other research groups to determine acceptability, effectiveness and side-effects of IUDs, among users in Pakistan. Their findings have proved beyond doubt that IUDs are an effective and safe contraceptive. The minor side-effects of IUDs noticed in a few cases and their treatments are currently being investigated

by the various research organizations. The results of the mass IUD programmes launched in other countries are also a subject of our study as we are constantly seeking to make further improvements in our programme. The large-scale use of IUDs by several countries in their national family planning programmes has prompted the Scientific Group of WHO to review world-wide experiences about this method. The findings of the Group have been published by WHO, as Technical Report No. 332. This Report should allay any undue fear about IUDs among those who still consider that the use of this foreign body for a long period would have untoward effects on users.

The successful operation of an action programme like ours largely depends on the efficiency and skill of the persons involved at various levels of its implementation. Hence, proper training of these persons is of great importance. The problem of initial training was overcome by employing high calibre training staff from universities, colleges and allied departments. These persons, before assuming actual responsibility of imparting training to the family planning personnel, were given necessary orientation and were provided with sets of audio-visual and instructional material for use in training the family planning officials on a peripatetic basis. Special in-service training courses are periodically arranged for the staff to further increase their effectiveness in the field.

An important aspect of organizing a family planning programme is to set monthly and annual goals in unambiguous terms. The targets should be realistic and fixed with due consideration for the seriousness of the problem *vis-à-vis* the availability of human and material resources. In Pakistan, we are not over-ambitious. We cannot overnight reach the birth-rate figures of the UK, or USA, which are 18·8/1000 and 21·2/1000 respectively. Our goal is to reduce the annual birth-rate from 50 to 40 per thousand live births by 1970. This we want to achieve by reaching all the 20 million fertile couples by then. Accordingly, targets have been worked out for each year which are again divided into monthly targets with specific district break-downs. By correlating the figures of clinical contraceptions and those of the sales of conventional contraceptives with estimated effect on the birth-rate we periodically measure how far we are proceeding towards our goal. Decentralization of administrative and financial responsibility down to the lowest level within a framework of ceilings, procedures and scales helps in efficiency and speed. This authority is delegated to autonomous bodies representing officials of the different departments concerned and is integrated with the set up of Basic Democracies in the country.

It is necessary that the administration is kept fully in the picture about progress of the implementation of the programme. This ensures that the bottlenecks, difficulties and slackness on the part of field workers are rectified. We have, therefore, developed an effective reporting system which enables us to get district returns on the actual sales of contraceptives, number of IUDs done and a list of current practical problems on a monthly basis. The position of staff strength for all the different disciplines is also reported monthly in addition to the other data.

It is also necessary to let the field staff know how well they are doing. A monthly news bulletin is therefore published by the Pakistan Family Planning Council so that all the workers in the field can know the overall progress and judge their own performance accordingly.

In an extensive and intensive programme like ours, there is a possibility that reporting may not fully reflect the strengths and weaknesses of field operations. It is therefore necessary that an independent evaluation of the programme should be undertaken to make on-the-spot checks and verification. This is done in Pakistan by two evaluation units, one in each province, directly responsible to the centre and independent of the machinery of the action programme. They have not only to check the physical achievements but also carry out field visits, sample surveys, interviews and other similar activities to judge how well the programme is progressing. They also verify the reported figures on a random basis.

There is a paramount need of a strong research effort to help the action programme attain its objectives. The programme in Pakistan is pragmatic and as such, research into the best methods of contraception, techniques of motivation, and education, publicity and training has to be continuously undertaken. However, due to shortage of resources, the research activities in developing countries are usually limited to short-term applied research.

We have a National Research Institute of Family Planning which is divided into the medical, biological, demographic and communication sections.

As the family planning programme impinges upon all facets of human life in a given community, it has to be multi-dimensional in scope and interdisciplinary in approach. This necessitates understanding, co-operation and co-ordination in the efforts of all allied government departments and voluntary agencies.

For this reason, a Family Planning Programme is treated as an administrative activity and has been entrusted to an autonomous organization with enough funds for implementation. At the centre, there is a Family Planning Council, with the Minister for Health as the Chairman and the Secretary of Health as the Vice-Chairman. The Family Planning Commissioner is the Secretary of the Family Planning Council and supervises the programme at a national level and is its principal executive. The functions of the Council are policy making, research and co-ordination. The actual implementation of the programme is the responsibility of the provinces. Each province has a Provincial Family Planning Board headed by the Provincial Minister for Health. The Secretary of the Provincial Board is the executive head of the programme in each province. At the district level, the programme is implemented by a District Family Planning Board. This Board has representatives of different departments on it and works under the Chairmanship of the Deputy Commissioner. A District Publicity-cum-Executive Officer of Family Planning is the Secretary of the Board and works as the chief executive of family planning in the district. Under him, are Family Planning Officers, one for each Thana in East Pakistan and one for the three Union Councils in West Pakistan. At the bottom of the hierarchy is the Village Dai, of 30,000 people in East Pakistan and 20,000 in West Pakistan.

The programme provides administrative and financial decentralization allowing each district Family Planning Board to implement the programme within the budgetary allocation provided for each district. It is because of the autonomy granted to the implementing agencies that we have been able to circumvent the delays and problems from which a mass activity can suffer.

The results so far obtained from the family planning programme in Pakistan have been extremely encouraging and they prove that the approach adopted by us is one of the best ways of effectively dealing with the population problem in developing countries. We are confident that we will not only achieve our targets but will exceed them. Our achievements in the field would ultimately help facilitate the efforts of the economists, social scientists and health leaders in bettering the conditions of our people. The monthly rate of IUD insertions is over 50,000 and that of the sale of conventional contraceptives in the region of ten million units.

37. THE ROLE OF PARA-MEDICAL PERSONNEL (1)

G. T. M. Cummins

Queen Elizabeth Hospital, Barbados

The statistical projections of demographers indicate that world population growth will lead to a doubling of numbers during the next 30 years. By contrast, it took many thousands of years for world population to grow to its present state.

The most effective methods of controlling increasing birth-rates have been assumed to require medical attention. The use of para-medical personnel in family planning programmes up to the establishment of the IUD and the Pill was progressing satisfactorily. Nurses had been trained for the purpose in several European countries such as England and Holland. In Barbados, we had nurses established and working satisfactorily. However, with the emergence of these two, the demand for medical supervision has risen rapidly. The desirability of this is obvious with the IUD where a device has got to be inserted into the uterus. It is less obvious with the Pill because the Pill can be serviced and sold without medical aid. However, the accumulation of present experience makes it daily more obvious that medical supervision is desirable for the Pill. For one thing, patients may have complications such as nausea, vomiting, weight gain, suppression of menses, break-through bleeding and thromboses. Moreover, there is still a lot that is unknown about the Pill and one must include the fear that complications so far unforeseen may make medical supervision even more necessary. Furthermore, if we consider the two methods, it can be shown that for the "control" of masses, usually poor, usually illiterate, usually poorly motivated, the IUD is a better answer. And yet, automatically, it seems to demand more medical personnel.

It, therefore, seems essential that we should examine the problems of supply and demand of doctors, and, moreover, the problems of supplying their services in the specialized field of family planning. In doing so, several factors in the history of medicine and of medical education have got to be considered:

1. The increasing complexity of medicine.
2. Rapidly expanding fields in which medically trained personnel are being employed.
3. Rapid increase in specialization in medicine—some people feel that only gynaecologists should insert the IUD.
4. The comparative rates of increase of population and production of doctors.
5. The increasing gap between supply and demand of doctors. To a certain extent this is because medicine has lost its eminence amongst the vocations. An end result of this process is that many doctors are ambivalent about the field of birth control.
6. The traditional failing of medical education to include sex education as distinct from the physiology of reproduction. Coupled with this is the traditional failing of doctors to recognize that knowledge of the physiology of reproduction and of control of reproduction is an essential tool if the doctor is to help his clientele to overcome these problems. Until the very present day doctors have tended to ignore these responsibilities. At this time in history this is particularly tragic.
7. The fact that the above problems, complex enough for developed communities, are beyond the bounds of consideration for the underdeveloped communities and it is in these that the problem will have to be solved.

It becomes clearer every day that, in order to overcome these hurdles, para-medical personnel will have to work in close collaboration with doctors. In order to design models for doing so, it is not out of reason to review briefly the history of para-medical personnel.

There is relatively little source material concerning the formal use of para-medical personnel. Still some facts of common knowledge must be recalled. In primitive society, health care was carried out by wise men and by experienced women, usually older, because only years could provide the experience. There is no doubt that their procedures were unscientific and in fact that many of them consisted merely of mumbo-jumbo. The earliest forms of training of medical men consisted of apprenticeship. In Egypt, Greece, Macedonia and Rome, the emergence of medicine with pretensions to science is not blessed with a history of unanimity, scientific proof, or progressive improvement. The history of these ages is of controversy, acrimony and of faction. And the most concretely proven anatomical facts of this time when first propounded were considered scarcely less than heresy.

Through all these phases of medicine some patients were healed and some died. Throughout all these phases of medicine the healing arts were successfully performed by many who had no training in the medicine of the time. Cogent to today's subject is the fact that non-medical abortionists have always thrived. And, to be scrupulously honest, modern medicine evolved from the stages of apprenticeship, i.e. without a universally accepted body of knowledge, to a scientific study, largely out of the efforts of people who would today certainly not be considered medical. Examples of these in British medicine are the Society of Apothecaries who were granted one of the earliest charters for licensing physicians; and the barbers, from whom and by whom, it is well known the surgeons of the day were recruited and trained.

The substance of my present discussion, ladies and gentlemen, is that there has never been a time when medical personnel did not live cheek by jowl with para-medical personnel. Indeed, in the minds of the lay public beset by the scarcity of doctors, much healing has been sought from non-medical personnel, even when doctors were recognized as the legally licensed source of health advice.

A few facts of more contemporary significance must be adduced. In Britain, Europe, Asia and Latin America, the midwife has always enjoyed much popularity as an accoucheur. And, to the British trained, obstetrics is essentially the co-operation of the specialized accoucheur for difficult problems with the specialized or non-specialized midwife for that 95% of the total which are normal deliveries. In North America, the failure of medical schools to produce adequate numbers of doctors has encouraged the development of colleges of chiropractic and osteopathy with impressive institutions in which graduates practise their skills. The American public finds no difficulty in accepting these healing practitioners—today.

Furthermore, even in the most prestigious, modern, ultra-scientific institutions in North America, supposedly the zenith of modern medicine, results depend upon nurses, laboratory technicians, physiotherapists, radiographers, and social workers. More hospital wards are closed for lack of nurses than for lack of doctors. The use of ultra-modern radiology for cancer depends upon physicists rather than upon doctors. The limiting factor to exfoliative cytology—the Pap. smear—is often the supply of technicians, and no open-heart surgeon could operate, unless he had an adequate technician to run his heart-lung machine. The point I am trying to make here is that it is as true today as it was in A.D. 1500 that para-medical personnel are essential if the doctor is to do his job. These facts, even if they have not been given the official blessing of the medical profession, are especially relevant in underdeveloped countries. In underdeveloped countries, para-medical personnel are an unquestionable fact of life if we are to bring modern medicine to the people. Thus we see dispensers as anaesthetists in Jamaica and St. Vincent and, probably, many other places. Medical assistants are used for the same purpose in Kenya. Nurses have given intravenous fluids for me in Barbados and treated eclampsia for me in Trinidad. Midwives were the limiting factor and eventually the prime moving force in enabling the Japanese to effect their revolution in population control.

And so to the subject of our present discussion. Stycos 1964 has said,

“... a very strong medical bias dominates the planned parenthood movement in the United States.”

He deduces that this has meant a highly conservative attitude towards (amongst other things) non-medical personnel. That he may be correct in this deduction has certainly been verified by our experience in Barbados.

In Barbados (as reported by Cummins and Vaillant in 1965) an experiment was set up to

overcome the logistic problems of an IUD programme by employing nurse-midwives for the bulk of the work. At the outset I should like to define nurse-midwife. "A nurse-midwife, for our purpose, is a person qualified by basic general training as a nurse plus graduate training as a midwife." Our nurse-midwives not only inserted loops, they also took cytology smears. Progress using this method and difficulties involved have been assessed and reported (Vaillant, Cummins and Richart 1966).

Today I propose to review this briefly, and then to proceed in an attempt to outline the problems of selection, training, control and duties of such personnel, and their liaison with the medical profession. But before I do so let me say that the introduction of these nurse-midwives was met with considerable question and controversy by the medical profession. This controversy, I am happy to say, seems now to be completely settled, and, although our results to date are by no means completely satisfactory, there seems to be no question that this represents a possible means of overcoming the tremendous shortage of medical manpower with which we are faced.

The programme of nurse-midwife insertion of the Lippes loop has now been running in Barbados for almost two years. We have trained a total of 10 nurse-midwives in two groups, an early group of four and, very recently, a new group of six. Of the original group two are still working with us, two have migrated with their husbands to North America. A further one of these may do so soon. The new group of six was designed to cover these problems of attrition, but also to allow us to use nurse-midwives in the cervix treatment clinic, which is involved in the treatment of pre-cancerous lesions detected by the cytology smear. Furthermore, we hope to be able to set up production, because these girls had to work very hard.

We chose to use nurse-midwives because of

1. Their traditional professional status in treating pregnant women in conjunction with doctors.
2. Their acceptability to women in these matters.
3. Our hope to confine the scope of medical-legal problems, should they arise.

There is, however, one may say, no mystique about nurse-midwives although I personally feel that they represent the ideal group of people for this work. To put it another way, I, personally would hesitate to attempt this task with persons of other educational background, unless one was forced to do so because nurse-midwives were not available. Were this the case I feel a more comprehensive training programme would be necessary.

Our nurse-midwives work without direct medical supervision. Medical consultation is always available to them, and careful documentation plus compulsory consultation over certain categories of cases constitute the means of quality control of their work. Because they are not directly supervised, they are free to travel to wherever the largest groups of women may be congregated. This includes many peripheral clinics. In order to achieve the greatest production for their effort, they work with a team which consists of an interviewer trained to look after documentation, and a nursing assistant to keep up a constant flow of supplies to and from the nurse-midwife and her patient. We recruited the assistants from the ranks of women who had had a minimum of one year's training as practical nurses. This team arrangement has worked very well, and there is a fine elasticity in the performance of the members.

When the doctors were discussing the advisability of using nurse-midwives, the question arose of danger to the patient. My assessment of the situation is this: We have accepted the nurse as competent to catheterize the urinary bladder of women. We even accept them for the purpose of inserting an intravenous needle to take a sample of blood. These two procedures are potentially far more dangerous than the taking of a cervical smear. It remained to show that the nurse-midwife could be equally competent as the doctor with regard to inserting the IUD. The figures published by Vaillant, Cummins and Richart (1966) have demonstrated this. However, before leaving this point I should like to explain that no attempt is made to dissuade doctors from doing this work. On the contrary, we have made every attempt to encourage them to do so and offered help with training, supplies and documentation. Many of the doctors in the community have helped with the task.

To consider the more general problem of the application of para-medical personnel to this job, I should now like to outline the problems of selection, training, control and duties. Some

of the relevant points have already been made in discussing the programme we are using at the moment. With regard to selection, I feel it may be profitable on the one hand to examine alternatives and, on the other, to amplify the above criteria. In view of the clinical nature of the task, and especially in view of the intimacy of the procedure, I think anyone would agree that nursing is the only permissible type of background training. If we consider a midwife not trained in general nursing we have a person who is acquainted with the female genitalia, especially in pregnancy. But this person would have a limited background with which to assess the patient as a whole, especially with regard to features such as anaemia, shock or sepsis. It would be difficult to train them concerning gynaecologic conditions such as fibroids, retroversion, ovarian cyst, cervical polypus, neoplasm, etc. These difficulties would not be insuperable, but they would be very real. If on the other hand one accepted general nursing training as an adequate background, the problem would be to inform the student about the recognition of pregnancy, the dangers of failure to recognize early pregnancy and the problems of pregnancy and labour. Education and practical experience with regard to these problems represent a basis of maturity which improves the ability of our nurse-midwife to discuss problems with the people and to advise them on all aspects. However, besides this educational background we have felt it desirable to have women between the ages of 25 and 35, preferably married, who had had one or two children. We felt that this would give them an emotional tie with the problems of their patient and the ability to be tolerant and sympathetic.

With regard to training, I feel that I should record that many authorities feel that training for the insertion of an IUD could be carried out in one or two days for a gynaecologist and in one week approximately for a generally trained doctor. I have heard it said that you could train a nurse-midwife in a week. I feel that this view would bring the whole idea into disrepute because this shallow training would only produce a rash of perforated uteri, failed insertions, haemorrhages, and insertions into pregnant uteri. Moreover, a wonderful opportunity to bring preventive medicine to the patient would be lost. Our nurses are good at referring to medical care any gynaecologic abnormality which they may detect at the time of insertion. Our philosophy of training is that, if you can train a policeman, or an ambulance driver to deliver a baby, it should be possible to train a nurse-midwife to make a competent gynaecologic examination. She need not make diagnoses, it is only necessary that she detect abnormality.

With this in view we like to expose the trainee to gynaecologic clinics, to early pregnancies, normal and abnormal, to neoplasma before, during, and after various modes of treatment, and to operating sessions of all sorts. In this way they get a chance to see what the disorders mean—to the patient. They also attend the cervix clinic to see how pre-cancerous lesions are managed. We feel that they should be versed in all the contraceptive measures. In classroom they receive lectures on all aspects of their field and have a chance to discuss problems. It is true that they learn to insert IUDs in their first week. After the second week they are usually competent to insert them on their own. After this the intensity of their training programme gradually declines, and we expect it to last about two months.

This type of trained personnel is then free to do a full day's work as a specialist in the field in which they operate without direct supervision, as previously pointed out. They can thus travel to all parts of their area as directed from headquarters. They carry with them their supplies which they are responsible for maintaining in good condition and for preparing in a sterile manner. They proselytize patients in the clinics, advise them with respect to family planning, interview them, do smears, insert loops. They also follow-up the patients. Where necessary they refer them for medical consultation. They keep adequate records. On the average we think it takes about 20 minutes to interview the patient—this is a long time but necessary to cover the research aspects of the programme. It takes about five minutes to do the insertion. We are still trying to decide the optimum circumstances in which the nurse-midwife team should meet the patient. One feels that antenatal clinics are good for acquaintance and postnatal clinics should be good for insertion. So far this last has not worked out but as I say, we are still exploring. The best results so far have been achieved in Child Health Clinics, and in special Family Planning Clinics.

With regard to control and liaison with the medical profession, we have found it desirable

that the nurse-midwives should get full recognition as competent and responsible people. They are thus given a weekly schedule and are expected to follow it. They make daily a numerical return of the day's production. They are given specific instructions with regard to when not to insert a loop. Their schedule should vary a little because the work is repetitive and they could become slap-dash at it. As far as possible they follow-up their own patients but this is by no means the rule. They are free to consult the medical personnel of the project at all times. They do not compete with private practitioners, and they are expected to respect the medical ethics involved between their medical consultants and the private practitioner.

In conclusion, I may say that they have rapidly become an accepted part of the health scene in Barbados, and there is no tendency for anyone to attribute to them those mischances of the IUD programme which must occur.

The advantages of using them have been :

1. rapidly to increase the potential rate of applying the IUD programme.
2. to make contact with those sections and groups of the population most likely to make use of IUDs.
3. to remove the bottleneck imposed by a shortage of doctors.
4. to bring a public health type of screening to gynaecological patients in the relevant age-groups.

38. THE ROLE OF PARA-MEDICAL PERSONNEL (2)

Marina Phillips-Gay

Population Council Research Project, Barbados

My preliminary training for the inserting of Intra-Uterine Devices and the taking of Papanicolaou smears started one month prior to my appointment as a nurse-midwife with the Population Council Research Project in Barbados.

Two afternoons every week I visited the Barbados Family Planning Association where I was instructed and supervised by Dr. Cummins and/or Dr. Valliant.

I was taught: (a) How to differentiate between normal and abnormal findings which naturally enabled me to know when to insert or not to insert an IUD, therefore referring the latter cases to a doctor. I was taught not only to report any abnormal vaginal discharge, but also cysts, abscesses, fibroids, erosions, laceration, suspected pregnancy or any unhealthy-looking cervix.

(b) How to insert and use a speculum.

(c) How to examine the vagina, cervix, uterus and adnexa.

(d) How to take a Papanicolaou smear by using an aspirator, and a spatula to transfer it on to a pre-numbered slide after which it was sprayed with a fixative.

(e) How to insert a Lippes loop, first by using a probe to ascertain the depth of the uterus, then an inserter through which the Lippes loop was threaded before being inserted into the uterus.

(f) How to fill in the cytology forms, and the admission and follow-up records.

(g) How to keep daily records of all the patients I had examined at the various clinics.

This training continued for approximately two months before I was allowed to undertake the full responsibility.

Inserting IUDs is definitely within the capabilities of a nurse-midwife. Her training and practice allow her every opportunity to learn in detail the physiology of the reproductive organs. Since in normal practice she has the opportunity of dealing with non-selected categories of women, she must, of necessity, encounter the abnormal with the normal cases.

A well-trained nurse-midwife can relieve the doctor of a large number of cases which may not be of the importance that would need his skill, thus freeing his time and energy for a larger number of the more technical cases; this is especially of importance in a situation where there is a limited number of doctors to a large number of patients.

A nurse-midwife relationship has another great advantage in that there is a large number of women who prefer a woman-to-woman situation. They enjoy a greater degree of relaxation and seem to feel more free to talk of problems and seek for explanations in their own terms.

Some patients are more backward than others, and with these the nurse-midwife can play an important role: as her routine is not so strictly defined as a doctor's (who most probably may have more clinics to attend at specified times) she will be able to spend more time in giving them an explanation, and sometimes she may be of some assistance in helping them solve a problem even though it might be a matter of an entirely different nature.

On the other hand there are some who prefer the "masculine or medical" touch. Personally I think these people have much more confidence in men who they seem to think have been studying for years and know everything there is to know about the human body. Even if the same thing is done or the exact advice given to them by a doctor as by a nurse-midwife they enjoy a greater sense of security when it comes as we say, "straight from the horse's mouth".

There are still a few, those in the more elderly age group of from 60 years upwards who

think we look a bit "too young" to be examining them. Their famous saying is "I am old enough to be your mother, a little girl like you has no right examining me." I find, that once these people are made to feel relaxed and given a bit of humour before the examination they are usually very co-operative and tolerant.

The job can be very stimulating because in the normal course of work you feel part of the whole, and a member of the total Health Services team. We also meet people of different races, educational standards, denominations, languages and financial status. Since no two people are exactly alike, we therefore have to learn to accept and treat them as individuals and to adapt ourselves to suit their personality; at the same time we can see how the various classes of mankind react to the same situation.

To perform my duties I have the following facilities at my disposal:

(a) Health Centres throughout the Island so that my services can be offered to all the inhabitants and not limited to any one particular section of the community.

(b) Doctors, not only those attached to the Population Council Research Project, but those who are in charge of the Health Centres. They are always willing to help in every way possible to encourage and to educate patients about the importance of having IUDs and Papanicolaou smear tests.

(c) An assistant, who is not a fully-trained nurse, but has a knowledge of how to sterilize and keep the equipment sterilized. She was also trained to transfer the Papanicolaou smear on to the pre-numbered slide and to preserve it by using a fixative.

(d) An interviewer who is specially trained to collect and record the required information. There are two schedules—an admission record and a follow-up record closely related to the admission. Both schedules are so designed that very little writing is needed. The majority of questions simply require a tick in the appropriate box.

There are four sections: the first filled by the office staff and clinician summarizes the patient's status re the smear and the loop; the second and third sections, filled in by the interviewer, cover general demographic characteristics, reproductive history and contraceptive practices; Section D—(gynaecological history) is filled in by the interviewer and Section D—(insertion examination) is filled in by the clinician. The admission record is used on the first visit and a follow-up record is used for each subsequent visit.

After the schedules are completed they are returned to the office for checking and processing and the resulting tabulations form the basis on which the final report is written.

Information collected is strictly confidential and, in fact, all the staff employed on the project were required to take an oath of secrecy which renders them liable to prosecution if any information is revealed.

Information collected will be used solely in the preparation of tables showing the fertility patterns and the incidence and prevalence of cervical neoplasia in the Island. Information about a particular individual is merely a unit essential in arriving at an overall total.

(e) Transportation: There are two means of transport, a van and a small car. The van is driven solely by a chauffeur who is employed by the project to take us to the various Health Centres and the car is used by the Population Council Research Project personnel.

(f) The necessary equipment required by us consists of speculae, aspirators, insertors, probes, forceps, spatulae, Lippes loops, fixative, sterilizing agent (Iodine), gloves, sanitary pads and head lamp. These are transported in a large traveller's bag to the various clinics.

The training which I had created the following impressions in my mind:

(a) How much I still had to learn even though I am a State Certified Midwife.

(b) That I was really being of some help to mankind especially those of the poorer class who could not afford to have any more children, but just kept on having them—one almost every year, without knowing about such a thing as family planning.

(c) How eager the majority of them were to accept our word about the most modern method of contraceptive—the IUD—after explaining to them briefly what it was all about. We still have some of them who believe that using any form of contraceptive is immoral; and a few who prefer to have as many children as possible because they feel the more children they have, the more financial assistance they would get in their old age. With some of these very little if anything can be done about changing their minds.

(d) The readiness with which they (both the young and the old) came to the various clinics

to have a Papanicolaou smear taken and to accept or return for any treatment that might have been prescribed.

I could suggest that the following would increase the effectiveness of my work:

(a) More publicity, e.g. in our daily newspapers; posters at certain prominent advantageous spots throughout the Island; mass media; and publicity on the screen of our local and drive-in cinemas.

(b) Having short talks and film strips at least once or twice a month in various parts of the Island—schools, social centres and Health Centres.

(c) Midwifery training should include family planning even if on a very small scale, so that the midwife doing her routine duties would also be able to advise the mother about contraceptives. More often than not midwives are asked this question by the layman who seems to think that this is part of their training and how ignorant one can feel, when one gives the honest answer, "I really do not know, you will have to visit the Family Planning Association."

(d) A mobile unit which would allow us to go from house to house and in which we could carry out our work if housing conditions were below the average standard.

There are some areas in the Island where the bus fare is fairly expensive and so those in the very poor bracket usually with a large family find it impossible to reach the clinic; there are others who have to walk a distance of two to three miles or even more before they come within the bus route and quite a few whose domestic chores hardly allow them time to leave the house.

The majority of these people are quite willing to have their treatment, if it can be done on the spot and so I think that a mobile unit would be a great asset to us.

So far the Lippes loop has been fairly satisfactory, but in approximately 4:100 we get a genuine pregnancy with a Lippes loop *in situ*. Another major problem is that of spotting and haemorrhage—heavy periods sometimes twice in 28 days lasting up to eight days whereas that particular patient's normal period is four to five days.

There are some patients who complain of a vaginal discharge after insertion of the Lippes loop and still a few who seem to have lower abdominal pain, backache and occasional cramp in the legs.

Some of the difficulties encountered in this job are:

(a) Trying to convince the patients to have a Papanicolaou smear taken. The majority of them may be willing to have it done, but naturally are a bit afraid of the procedure, and whether or not it is going to be painful; some bluntly refuse to have it done, and the genuine answer is that they prefer not to know if they have or are susceptible to cancer. It is very difficult and more often than not impossible to persuade them to have this done—and still a minority who are a bit shy at first, but will quite easily co-operate if made to feel at home.

(b) Persuading the patients to have the Lippes loop as the most modern method of contraceptive. Quite recently, on record we had some cases of genuine pregnancy with Lippes loop *in situ*. It has not taken very long for this news to spread throughout Barbados, as this is a small Island, and so there are some patients who refuse to have the Lippes loop on this account.

My hours of duty are from 9 a.m. until 4 p.m. (or later depending on the number of patients there are to be seen at the afternoon clinic) daily from Monday to Friday.

The morning sessions are usually in the outside or rural clinics throughout the Island and the afternoon clinic at the headquarters—Barbados Family Planning Association or the Queen Elizabeth Hospital.

Patients with complications from the IUDs are always first seen and examined by a nurse-midwife before being referred to a doctor. All such patients are referred to the Barbados Family Planning Association on Monday, Tuesday and Friday afternoons when the services of a doctor are available.

39. THE RESPONSIBILITY OF THE PUBLIC HEALTH AND MEDICAL PROFESSIONS

F. Guttmacher

Planned Parenthood Federation of America

In the USA, until seven or eight years ago, organizations dealing with health have consistently resisted professional involvement in the field of pregnancy prevention. They stood in a neutral corner, neither condemning nor approving. This lack of official medical involvement was and still is true in much of the world. Why is it that physicians and public health workers have been and in many areas still are content to permit laymen to assume leadership in attempts to liberalize restrictive attitudes and laws concerned with the control of conception? Perhaps it is unfair to charge medicine and public health with equal responsibility, because usually public health follows medicine's leadership.

What is the source of the conservative attitude of the medical profession towards contraception and other forms of pregnancy prevention? There are many reasons; I shall enumerate six.

1. *Preserve life*

A physician's training gives primacy to the preservation of life, no matter how distorted, painful and wretched that life may be. Therefore preventing life is believed by some to be counter to medicine's primary goal. This medical attitude was highlighted for me early in my training. At a conference at the Johns Hopkins Hospital conducted by my great teacher, Dr. Whitridge Williams, the obstetrician's responsibility to a hopelessly malformed newborn was debated: must he resuscitate it if born apnoeic or simply put it aside and allow respiration to establish itself unaided?

2. *Non nocere (Do no harm)*

This is basic in the physician's credo, an essential component of his medical philosophy. In medical practice one must be careful never to injure patients, therefore, in line with this policy sins of omission are less grievous than sins of commission. In other words, a physician is less likely to be censured for doing nothing, if therapy is indicated, than for doing something, if the therapy he prescribes causes injury. To teach this, there was a large bronze plaque in the delivery room of the old Chicago Lying-in Hospital with the words, "non nocere". The "do-nothing attitude" of the medical profession towards contraception I believe stems in part from this. As long as doubt existed about the medical propriety of prescribing birth control, doctors were content to do nothing about it.

3. *Popularity*

The private practice of medicine is a strange hybrid. It is neither wholly a business nor wholly a profession. The average doctor with an eye to the practical wants a large and lucrative practice, and to obtain it seeks to court the favour of all, the ill-favour of none. By remaining publicly uncommitted to birth control he is less likely to offend anyone. Therefore why risk popularity by espousing a controversial social-medical issue like contraception? Years ago, at a small Baltimore hospital, I suggested to one of my most successful obstetrical colleagues that we lunch together in the hospital dining room. He told me he never ate there. I asked why, expecting the answer that the food was unedible. Much to my surprise he said, "There are always arguments among the doctors at the table and I do not want to become involved. I never take sides."

4. *Medical politics*

From my observations, most of them made in the United States, the medical profession is politically conscious and well-organized. And those physicians with medical political ambitions have noted that the doctor most likely to rise to the political top is the one who ruffles the socio-economic waters the least. He is the doctor who holds to the *status quo* with tenacity similar to a shipwrecked sailor clinging to a life preserver.

5. *"Won't play God"*

When it comes to many of the social problems of medicine, particularly those connected with obstetrics and gynaecology, many doctors retreat behind the "won't play God" syndrome. This type of intellectual cowardice is irrational. It lacks logic because through the very nature of his calling a doctor is constantly intruding himself into the work of the Deity. Does he wait for God to show approval by making some visible sign before he performs a Caesarean section, orders a blood transfusion, or undertakes a risky open-heart operation? If a physician uses his best socio-medical judgment before advising contraception, sterilization or therapeutic abortion, he should be confident even without ecclesiastical manifestations that the Deity will be in agreement.

6. *Objections of State and Church*

The reproductive tract is unique because of all body systems it is the only one which fascinates State and Church. Both have aimed to protect it, so that nothing reduces its maximum biologic functioning. The State's interest stems from a time when the foot soldier was the most important weapon—the larger the army a King could field, the greater his power. The Church's involvement goes back 3,500 years when the Jews were a small nomadic tribe with the philosophic ideal of monotheism which they felt impelled to offer the world. Surrounded by warlike enemies their survival depended upon more warriors, workers and breeders. The importance of population growth to the early Hebrews is attested by the fact that the first of 613 commandments given by Jehovah to his Chosen People was, "Be ye fruitful and multiply."

The situation in regard to the quantity of persons has changed mightily. Technological advance in science and ability to implement this new knowledge have relegated an army's size to one of secondary importance. Fire power and atomic sophistication rule the world, not the number of available soldiers. Then, too, the unprecedented, cataclysmic growth of population has removed man's obligation to continue to "people the earth" for he has already done it. Therefore the interest of many nations and religions in exacting the full reproductive potential of its members has been modified and reduced. Of the modern religions, Catholicism and Orthodox Judaism have changed least in this respect, but they are changing, albeit slowly.

Hesitancy by the Roman Catholic Church to extend its benediction to modern birth control methods still remains an important obstacle to the full acceptance of contraception by medical organizations in some geographic areas, particularly Latin America. Then, too, the small numbers of people in many newly emerging nations causes their governments and medical professions to oppose birth control because they equate it with population control. In such areas the only way to gain acceptance for birth control is to demonstrate that the improvement in maternal and child mortality and morbidity following introduction of contraception will result in net population gain. I encountered this obstacle in a trip last year to the English-speaking nations of Equatorial Africa where the common goal is to double population in the shortest possible time. There the best way to interest politicians and physicians was to argue that spacing births would allow mothers to build up anaemic blood and parturient deaths would decrease. Then, too, I argued that prevention of immediate reimpregnation would allow mothers to continue to nurse and thus reduce the incidence of the infantile killers, kwashiorkor and marasmus.

In my view, then, physicians were and to a lesser extent still are reluctant to support strongly the birth control movement. Six of many causative factors are: career dedication to preservation of life, ingrained vocational conservatism, desire for personal popularity, unwillingness to challenge the views of medical political leaders, hesitancy to assume God's role and in some areas, religious and political obstacles.

The earlier traditional indifference and uninvolvedness of the health professions in birth control have recently changed significantly in many parts of the world, certainly in this great country, Chile.

Unfortunately, the insularity which affects most of us leads me to document the change in professional attitudes by citing observations I have made in the USA.

In 1959 The American Public Health Association passed a policy declaration, reaffirmed and strengthened in 1964, stating that family planning "should be an integral part of all health programmes". In 1963 the American College of Obstetricians and Gynaecologists asked that "full freedom should be extended to all population groups for the selection and use of such methods for the regulation of family size as are consistent with the creed and mores of the individuals concerned". The powerful and at all times conservative American Medical Association issued a policy statement in 1964 supporting birth control. In part it said, "There should be no restraints on the physician concerning the dissemination of birth control information, and . . . such information should be equally available to both private and clinic patients." Until September 1958 not a single patient received contraceptive care in the 14 great municipal, tax-supported city hospitals of New York City. In 1966 birth control advice and supplies were given to over 28,000 patients by these same 14 institutions. Beginning in 1942 family planning services became technically available to women in the seven Southeastern states of the USA through State Health Departments. I said "technically" because in actuality very little programming was done to implement the policy. This was the situation until five years ago. Today 21 states have active statewide health department programmes and nine other states regional programmes. In 1964, 28.6% of the general hospitals in the USA with 500 or more beds conducted intramural birth control clinics and one year later the proportion had risen to 44.8%. In the 1956 edition of America's leading obstetrical textbook by Eastman and Hellman there is no section on contraception. For the first time a section on birth control is included in the 1961 edition which is given 60% more space in the current 1966 edition.

The question I should like to explore is why has world, and especially American, medicine changed its position from neutrality towards the control of conception to active involvement?

Two of the six restraining influences discussed in the beginning of this paper have been softened—medical political attitudes and objections by State and Church.

Since leading medical organizations have endorsed the widespread availability and distribution of contraception, timidity towards it is no longer necessary by doctors. This is not only true in the USA, Chile, and the UK, but in many other lands as well.

Governmental and religious obstacles have been materially lessened in the past several years. In 1965 the United States Supreme Court struck down the 1879 restrictive statute of the State of Connecticut on grounds of interference with the rights of the individual and his personal privacy. Massachusetts, the last of the 50 States to enforce an anti-birth control statute, repealed it in 1966. In the rest of the world, nation after nation has come to include population control in their government-supported programmes. Among them are: Mainland China, Pakistan, India, Turkey, Egypt, South Korea, Hong Kong and Singapore.

The protracted, publicized debate about methods of birth control within the Catholic Church, even though temporarily resolved along traditional lines, has caused physicians and patients to question the validity of the Church's position. A Church that wavers on a moral issue surrenders authority over that issue no matter what it decides. The fact that over one and three-quarter million women now use the birth control pill in Latin America proves the point. It is unlikely that the Church can recapture such contraceptive iconoclasts after they have broken away and return them to the rhythm technique. It seems likely that the number of Latin Americans using the Pill will increase annually on a sharply ascending curve.

What factors in addition to relaxation of the restrictive attitudes of organized medicine, government and religion have caused the health professions to assume a more favourable attitude towards family planning? There are several:

First, health is now viewed as a basic human right, not to be monopolized by any ethnic group, geographic area or social class. Furthermore, health is now viewed in a broad sense as defined by WHO in 1960, "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The health professions recognize that pro-

vision of effective means to space pregnancies and regulate family size contributes not only to the physical and mental health of mother and children, but the social well-being of the family. Second, the health sciences have become more realistic; they now state it is safer and better to control fertility through contraception than abortion. Studies like those of Armijo and his co-workers in Chile have demonstrated that when effective contraception is unavailable, illegal abortion fills the vacuum of need. Third, with technical improvement in contraceptives, particularly introduction of two coitally independent techniques, the Pill and the Intra-Uterine Device, health workers have learned that they have methods which are highly acceptable to the users. The traditional methods are less effective and also less acceptable for sustained, conscientious use. Previously the enthusiasm of doctors and public health workers for contraception as a useful medical modality was tempered by its high rate of failure and the discouraging discontinuation of use. With effective, coitally independent methods both problems have been lessened. Then, too, early fears by many among the medical profession that oral gestogens, and to a lesser extent IUDs, may give rise to serious side effects have been largely eliminated by the reports of competent, impartial investigating groups such as the special committee of WHO convened in Geneva, the Dunlop Committee in England and the FDA Advisory Committee in Washington, D.C. Fourth, urbanization with its burgeoning, crowded, sordid slums has persuaded uncommitted physicians of the socio-economic necessity for restrained reproduction. This explains why the birth control movement has taken root so firmly in the great cities of the world, be it Mexico City, Lagos or Cairo. Fifth, the plight of the developing nations—their excessive population growth, relative illiteracy, poverty, primitive agriculture and in many instances food shortages—have persuaded most thinking men, particularly members of the health professions, that there is no single, simple cure, but that any therapeutic regimen omitting population control is doomed to failure.

Physicians in medicine and public health have a unique opportunity to see for themselves the grave results of unwanted and unplanned pregnancy in terms of abortion, deserted infants, maternal and child mortality and morbidity, and social disintegration of the family. The health professions have front row seats in the world coliseum to observe how seriously developing nations are handicapped, and in some instances overwhelmed, by the locust-like plague of too many people too fast. What group is better informed and equipped to assume leadership than the medical profession in the cause of voluntary and responsible parenthood? All over the world the restraints which prevented the involvement of the health professions have been largely lifted. Therefore ours is the task and the opportunity.

RAPPORTEUR'S SUMMARY

The Session Chairman established the similarity between the epidemiological problem of malaria and the problem of population, and said that the fact that the malaria problem is on the way to being solved in India allows us to think that the population problem could also be solved in the same way.

Most of the subsequent questions referred to the role of para-medical staff in family planning programmes.

To the question of the role of voluntary Family Planning Associations, Dr. Cummins answered that two main points should be considered:

1. In general terms, public authorities have been somewhat reluctant to begin programmes in accordance with a definite population policy and therefore in the past these activities have been started by private institutions.

2. The presence of private organizations is necessary even if the governments have accepted responsibility for family planning programmes. This private participation can fulfil specific functions besides carrying out alternative programmes in difficult times.

It was suggested that a feature of the developing countries was a marked shortage of the technically qualified, particularly of para-medical personnel. The question was raised as to what could be done while suitable auxiliary personnel were being trained; both Colonel Bhatia and Mr. Adil agreed that this was a serious problem. Nevertheless in both countries measures have been taken to satisfy the needs for man-power resources. It is estimated in Pakistan that one assistant is required for each 25,000 fertile couples. From a total of 50,000 IUD insertions each month, 15,000 have been done by assistants. It was noted that the rejection rate amongst patients is very high because of the natural hesitations of the assistants due to their lack of experience.

Dr. Anibal Faundes-Latham from the University of Chile, while accepting the obvious shortage of doctors and para-medical personnel in rural areas, stated that for the development of family planning programmes this is not such a major hindrance as has been thought. Family planning is part of the maternal and child health services and therefore family planning work should be absorbed into these centres.

In the metropolitan area of Santiago this additional task meant extra work for the first two years only, as it was later balanced by the lowering of the birth-rate and where two midwives were employed before, only one is required now.

It was suggested that when a midwife finds technical problems she has to refer the patient to the doctor and thus time is lost. Dr. Cummins said the midwives work independently but of course they always have the opportunity to consult. Mr. Adil added that up-to-date 700,000 IUD insertions have been done in Pakistan and that a great proportion of these have been by midwives. In addition, from the 10 million units of traditional contraceptives that have been supplied, 90% have been sold by village midwives.

Colonel Bhatia said that in India assistant personnel with high qualifications have been used, both graduates and those who have specialized.

Dr. Guttmacher regarded the IUD as being by nature temporary and, therefore, training programmes should not be restricted to only this one contraceptive method. He thought it only logical to use assistant personnel for these duties and pointed out how interns in hospitals have been replaced by technicians in some surgical activities.

The question was raised of the incidence of uterine perforations and a possible comparison between the incidence of this complication in the insertions made by doctors and those made by midwives.

Dr. Cummins answered that in Barbados only one case of perforation had been reported among insertions performed by midwives and he added that the incidence among those insertions performed by doctors is unknown as they have less supervision.

The remark was made that the comparison between the patients seen by doctors and those seen by midwives was not acceptable from the methodological point of view as the possible variables in relation to the cases themselves had been disregarded.

Dr. Cummins answered that the report was limited in extent and besides it presented a small comparative sample of 500 cases taken from case histories which were comparable.

Doubts were expressed over the ability of the midwives to diagnose pelvic pathology. Dr. Cummins said that in his experience there were no major dangers from this and that in general midwives found out any abnormality.

A question was asked on the relation between parity and the moment the insertion was made. Dr. Cummins said that the only criteria for selection in relation to parity was that insertions were not performed on nulliparac.

It was mentioned that by training nurses of low educational standard there was a risk of training them to perform abortions. Dr. Anibal Faundes-Latham of the Chile University replied that illegal abortions were not performed generally by people with special training. Sometimes it was the pregnant woman herself who carried it out.

Abortion is a social and economic problem and the consequence of strong environmental pressures.

Mr. Sam Keeny, Session Chairman, closed the meeting after a brief comment on the discussion and remarked that what is essential is what can be done to benefit people the world over, particularly the women.

Session 9

EFFECTIVENESS

40. IMPACT OF FAMILY PLANNING PROGRAMMES ON THE BIRTH RATE

O. Harkavy
The Ford Foundation

Two of my country's leading demographers, both associated with the same department of the same university, view through two quite different spectacles the progress made by the world in dealing with excessive population growth. Philip Hauser looks at the family planning programmes in progress throughout the world and suggests that it is mighty premature for those in the business to congratulate themselves on the success of their programmes.¹ "Where," he asks, "has it been demonstrated that organized family planning programmes in developing countries have actually brought down the birth rate?" (He also asks that responsibility for documenting the effects of family planning programmes should not be left entirely in the hands of those who run them, but be subjected to scrutiny by independent evaluators whose reputations do not depend upon the success of the programmes they are evaluating.) Hauser's colleague, Donald Bogue, looks at the same phenomena and finds on the other hand, eight revolutionary new developments that "promise hope in coping with the population crisis in Asia and throughout the World".² These include the "burgeoning field of family planning research and experimentation"; the "discovery that tradition-based resistance to family planning among the masses is only minor"; the "discovery that privation is a powerful motivating force for fertility control", and most "revolutionary and far-reaching . . . the incorporation of family planning as a part of the official programme of national health and family welfare in nations around the world." But when he has completed his optimistic recital of factors that promise to bring fertility under control, he properly concedes that these "discoveries and developments are too new to permit an accurate evaluation of the impact they will have upon the world's population problem".

Hauser and Bogue are really in basic agreement. Except for the extraordinarily well-documented case of Taiwan, and the cases that can be made for Hong Kong and South Korea, it is too early to measure the effects of national family planning programmes on the fertility of nations, but at the same time, enough real progress has been made to suggest hope, rather than despair.

Developing nations that have officially adopted national family planning programmes have done so with the primary aim of reducing their rate of population growth. They are convinced that their efforts to improve the standard of living of their citizens are hampered by excessive rates of population growth. These nations have adopted specific goals expressed in terms of reduction in crude birth rate or rates of natural increase, as for example:

India: reduce birth rate from 40 to 25 in 10 years.

Pakistan: reduce birth rate from 50 to 40 by 1970.

Taiwan: reduce rate of natural increase from 3.02% in 1965 to 1.9% in 1968, and 1.87% in 1973.

Korea: reduce rate of natural increase from 2.8% in 1965 to 2.5% in 1971.

A nation that determines to invest substantial quantities of such scarce resources as administrative energy, trained personnel and foreign exchange in a nationwide programme of fertility control is eager to see, at the earliest possible moment, some tangible evidence of return for its investment. It seeks hard statistical evidence that fertility has fallen. Unfortunately, it is exceedingly difficult to demonstrate incontrovertibly that a given programme of fertility control has, in fact, been responsible for a given decline in fertility. This difficulty is compounded because reliable measures of fertility are scarce in developing countries. Even

more scarce are any that are sensitive to small changes. For until behaviour resulting in fertility limitation is generalized throughout a population, the effect of a given family planning programme, regardless of how vigorous or "successful" within its own terms of reference, cannot be expected in the first few years to make more than a small difference in the fertility of its immediate clientele, let alone a measurable difference in the fertility of a nation. Most national family planning programmes are very new. As my colleague, Lyle Saunders, remarks, a bit sardonically, "in the form of large-scale efforts by national governments to decrease rates of population growth, family planning is newer than nuclear fission".³ To those who devote their energies to the operations of family planning programmes, it is most heartening to find some statistical indicator of falling fertility. But it is dangerous for the administrator prematurely to claim a cause and effect relationship between his programme activities and the fall in the fertility rate. The next time the figures are published, the fertility rate may rise, to the acute discomfort of those who have taken credit for the fall. There are usually many factors affecting fertility other than family planning that may completely vitiate effects of a given programme. A recent publication of the Demographic Training and Research Centre of Chembur in India illustrates the hazards involved in explaining a low birth rate by the prevalence of contraceptive practice.⁴ The birth rate in Greater Bombay based on registered births has ranged between 26 and 31 per 1,000 since 1951, while the best estimates of the actual birth-rate for all India have remained above 40. Bombay has had a vigorous family planning programme for many years. And as the home of a large urban, middle class population, one would expect its birth-rate to reflect the contraceptive habits of its citizenry. But while the birth-rate is low, the over-all marital fertility level for Bombay's married women aged 15 to 44, as corrected for under-registration, is 184.6, higher than that of India as a whole, which is estimated at 177.9. Thus the prevalence of contraceptive practice cannot be claimed as the cause of Bombay's reported low birth rate.

Table I. Marital fertility rates⁴

Age group	Registered data, Bombay	Corrected, Bombay	India
15-19	156.1	202.0	154.3
20-24	263.6	341.2	305.0
25-29	224.6	290.7	314.2
30-34	173.2	224.2	252.2
35-39	112.2	145.1	168.1
40-44	23.2	30.0	76.3

The corrected fertility rate for Bombay women is lower than that for all India in ages 25 to 44. It might be argued that since women in these age brackets are more likely to use contraception than women younger than 25, this table does in fact suggest that the use of contraception is more prevalent in Bombay than in India as a whole.

There are two major reasons for Bombay's low birth-rate according to the Demographic Centre's calculations. Neither is related to family planning. One is the relatively large proportion of Bombay's women in the 15-44 age group who are unmarried—25%—compared to 14% for India as a whole; the other is the relatively low proportion of women in the reproductive age in Bombay's total population. Immigrating men who have left their families behind as they come to work in Bombay's industry result in a ratio of 150 males for every 100 females, compared to a ratio of 106 to 100 for the whole of India.

As a matter of fact the registered birth-rate for Bombay has risen from 28.2 in 1962 to 30.7 in 1965. But there is no more reason to attribute this apparently adverse trend to a slackening interest in birth control than to attribute Bombay's low registered birth-rate to the effectiveness of its family planning clinics. Birth registration may have improved between 1962 and 1965. Even in Bombay, where 87% of births occur in hospitals, it was estimated in a special study made in 1963 that only 86% of these hospital births were registered, while less than half of home deliveries were registered. Furthermore, Bombay's birth register records only those births actually occurring in the city. But an estimated 20% of babies born to

Bombay residents are delivered at their mother's homes outside the city; this is only partially offset by babies born to visitors to Bombay. As traditional habits are abandoned, more of Bombay's mothers may well be having their babies in the hospitals of Bombay, instead of returning to their native villages, thus raising the registered birth-rate.

The only country for which there is reasonably hard statistical evidence of a reduction in fertility brought about by organized, large-scale family planning campaigns is Taiwan. The deck is stacked in favour of Taiwan in this respect because of the effectiveness of its programme and because its vital statistics are good, the operational statistics generated by the Taiwan Population Studies Centre are complete, accurate and useful for obtaining results that are meaningful to administrators.

As shown by Freedman and Takeshita,⁵ fertility had already begun to decline before any large-scale family planning programme had been instituted. Between 1958 and 1962 the crude birth rate had fallen 16% for Taichung and 10% for Taiwan as a whole. Thus the Taiwan programme is "an effort to accelerate rather than to initiate fertility decline . . . we must ask whether any fertility decline following the experimental effort is greater than that might have occurred naturally anyway. It should, at least, be greater than the decline occurring in the other cities of Taiwan or in the island as a whole".⁶

While Taiwan began an island-wide family planning programme in 1964, the main experimental programme for which extensive data are available, is concentrated in the city of Taichung. The Taichung experiment can be divided into the following phases: (1) February to October 1963—intensive education campaign carried on; (2) October 1963 to April 1964—the educational programme suspended by clinic services continued to be available; (3) April 1964 to January 1965—some additional educational efforts made outside neighbourhoods that had previously been subjected to the intensive programme; and (4) beginning March 1965—new effort made to recruit acceptors by offering free IUD services. These activities resulted in a remarkably high level of "acceptances" of family planning. Of some 36,000 married women in Taichung in the 20–39 age bracket, about 7,500 or 20% "accepted" family planning by July 1965.* By removing from this population couples in which the husband or wife had been sterilized (9%), those who were satisfied with their present contraception (20%), and those who wanted more children (8%), fully 31% of the remaining eligible population had been reached. Of course "acceptance" of family planning—being fitted with an IUD or accepting supplies and/or instruction—is no guarantee of future reduced fertility of the acceptor. But it is significant that during 1963, the year of the intensive educational programme the total fertility rate in Taichung fell 6.4% as compared with 3.1% for other large cities in Taiwan and 4.7% for Taiwan as a whole. But then when 1964 is compared—even though the cumulative number of acceptances kept climbing in Taiwan—with 1965, it turns out that Taichung's decline in total fertility rate (– 6.1%) is less than that for other cities (– 8.6%) and only slightly more than for Taiwan as a whole (– 5.5%).⁸

One of the causes for this relatively "disappointing" performance relative to other cities is the apparent effectiveness of the island-wide IUD programme begun in 1964. But to quote Freedman and Takeshita:

. . . we must admit that the problem of how to evaluate the potential birth rate decline resulting from a given rate of adoption of contraception is very complex. Research teams at Michigan and elsewhere are working on this problem at present. The solution involves estimating not only the past and current fertility of acceptors and non-acceptors without the program, but also it involves estimating the retention and use of the contraceptives and the effectiveness of the program over a period of time for different groups in the population.⁹

Among the many advantages originally attributed to the IUD was the expectation that it would at last be possible to calculate fairly easily and with a much greater degree of certainty the potential effect on the birth-rate of a given number of insertions. This initial optimism is now somewhat dampened by the realization that a large percentage of women who use the IUD shift from other methods of contraception (40% in the case of Taichung), and it is extremely difficult to measure the difference between their potential fertility with the IUD in

*Cumulative acceptances are reported at 10,000 as of April 1966.⁷

place and what it would have been with the complex of other methods they were using previously. It is also dampened by the realization that only about 50% of IUDs remain in place after two years;* one must have detailed data on subsequent contraceptive practice of ex-IUD users in order to calculate a given programme's effect on fertility over time.

Application of the multiple decrement life table technique with data derived from detailed follow-up surveys offers the most promising approach to this problem, I am assured by Professor Robert Potter of Brown University, an expert in this kind of calculation.†

One preliminary finding from Potter's analysis of the Taiwan data might be mentioned in passing. It is more efficient in terms of potential reduction in fertility to provide IUDs to older women than to the younger. This seemingly paradoxical conclusion results from the fact that younger women, in Taiwan at least, are much more likely to expel their IUDs or have them removed—principally to have another child, or for medical reasons—than are older women who wish no more children.

Women in the 35–39 age group are about 50% as fecund as those in their 20s, but this is more than offset by their decreased propensity to remove or expel the IUD. The mean duration of IUD retention by women aged 35–39 is 56 months, as extrapolated by Potter from Taiwan data, compared with 17 months for those in the 18–24 year old group and 26 months in the 25–29 year old group.¹²

It still remains true that really major declines in a nation's rate of population growth, as well as optimum health and welfare of the family, will await the acceptance of child spacing by younger women, in addition to the cessation of child bearing by older women of high parity. But Potter's finding should give pause to those who feel family planning programmes that have so far just reached the latter group are a waste of effort in terms of overall fertility reduction.

Can the Taichung performance be compared with that of national family planning programmes? The Taichung experiment reached some 20% of its target population of women in reproductive ages in two and a half years of operation. But if we go down the roster of national family planning programmes we find that few of them have been in operation that long.

Parker Mauldin gives the following dates for the inauguration of national programmes:

Table II

Country	Year programme started
India	1951
Pakistan	1960
Taiwan‡	1964
South Korea	1961
Turkey	1965
Malaysia	1965
Ceylon	1965
Tunisia	1966
IJAR	1966
Morocco	1966
Singapore	1966

‡But without an explicit national policy

He notes that family planning activities are also supported and/or encouraged by countries such as Thailand, Hong Kong, Kenya, Barbados, Trinidad and the USA.¹³

The "effective" starting date of a programme may not coincide at all with its "official" starting date. A government may officially launch a programme at a given date, but it may be years before an effective administrative network is established to provide information and

*This figure does not take reinsertions into account. One analysis shows that one can add at least five percentage points to the usually reported retention rates to take account of reinsertions.¹⁰

†Potter's work is directed towards such calculations as are contained in Lee and Isbister.¹¹

service to the entire population. Furthermore, it may well be argued that effective programme action should be dated from the official adoption of IUDs and/or orals as the contraceptives of choice. Thus India's official programme dates back to 1951, but effective action by this definition may be considered to have begun in July 1965 with official approval of the IUD. Pakistan adopted the IUD as part of a nationwide research-cum-action programme in 1964¹⁴ and South Korea also began large-scale insertions in the year.* Hong Kong and Singapore are two other countries that have had family planning programmes in operation long enough and on a large enough scale in terms of their entire population to expect an effect on the birth rate. In this short time, however, much has been accomplished.

Table III gives some indication of the impact of the programme in terms of proportion of the population reached for countries with large-scale programmes that have been in "effective" operation for at least two years. The measures of programme accomplishment

Table III

Country (1)	Estimated population mid-1965 (in millions) (2)	Estimated number of couples in reproductive age (in millions) (3)	Estimated number of couples reached by programme (4)	Rough estimate of per cent of eligible couples reached (5)
India	482.5	82.0 (a)	Cumulative through August 1966: (b) 980,000 IUD insertions 1,600,000 sterilizations (4,000,000 "contraceptors") (c)	5
Pakistan	115.0	16.5	Cumulative through 1966: 533,000 IUD insertions (d) 36.3 million units, conventional contraceptives distributed (e) (1,000,000 "contraceptors") (f)	6
South Korea	28.4	4.6	Cumulative through 1966: 737,000 insertions (d) (20.1% "currently practising family planning") (g)	20
Taiwan	12.5	2.0	Cumulative through 1966: (d) 260,000 IUD insertions	13
Hong Kong	3.8	0.5	Cumulative through 1966: 53,000 IUD insertions (h)	11
Singapore	1.8	0.25	1965: 27,000 "first clinic visits" (i) Old and new patients Cumulative through 1966: (d) 28,000 IUD insertions	11

Sources: (a) B. L. Raina, "India", *Family Planning and Population Problems*, p. 111.

(b) *Centre Calling*, New Delhi, October 1966.

(c) Estimate of S. J. Segal, in unpublished communication to World Bank, 2nd November 1966.

(d) P. Mauldin, and D. Nortman, "Retention of IUDs", *Studies in Family Planning*, March 1967 (preliminary).

(e) "Annual Report on Working of Pakistan's Family Planning Programme, 1965-66", p. 3.

(f) Author's estimate. $36.3 \text{ million units}/100 = 0.4 \text{ million couple years of protection}$. (See Parker Mauldin, "Measurement and Evaluation of National Family Planning Programmes", April 1966, p. 10).

(g) "The Findings of the National Survey on Family Planning, 1966", Ministry of Health and Social Affairs, Republic of Korea, December 1966, p. 161.

(h) Ronald Freedman, Memorandum on Research and Evaluation to Family Planning Association of Hong Kong, 2nd February 1967.

(i) 16th Annual Report, Family Planning Association, Singapore, 1965, p. 13.

*About 112,000 were inserted in 1964.¹⁵

indicated in column (4) of this table are rough estimates as reported by a number of official and unofficial sources and are only roughly comparable as among countries. Those expressed only in terms of cumulative IUD insertions do not, of course, consider use of other contraceptives. (This omission is at least partially offset by the failure to correct cumulative insertions for expulsion and removals.) Nor do they take into account contraceptive practice of couples not participating in organized family planning programmes. Allowing for great margins of error, they suggest that family planning programmes in the four smaller countries are reaching about twice the proportion of their eligible population that is reached by the India and Pakistan programmes. As in the case of Taiwan, fertility rates in Hong Kong and Singapore have been falling over the years. Ronald Freedman calculates that about 40% of Hong Kong's 10 point fall in birth-rate from 1961 to 1966 is due to the decline in the proportion of women aged 20-29, a cohort decimated by low births and high infant deaths during World War II. But his recent study of the Hong Kong census data convinces him that a major part of the decline can properly be attributed to the work of the Hong Kong Family Planning Association.

Preliminary results of Korea's 1966 census indicate that its rate of population growth has declined; its average growth rate was 2.7 over the past six years, as compared with a rate of 2.9% calculated on the basis of the 1960 census.¹⁶ It is plausible to believe that the rate was lower in the latter years of the six-year period than in the earlier and that the development of a vigorous family planning programme which is asserted to have reached 20% of the target population has made a material contribution to this decline.¹⁷

It is premature to seek declines in national fertility that can be attributed to the family planning programmes of India and Pakistan. The organizational problem involved in providing information and service to a large enough proportion of the target population of India and Pakistan is of a different order of magnitude from the other countries in the table. It is well to recall that eight out of India's 15 states have populations that exceed that of South Korea. Furthermore, each state has great autonomy in matters of health and family planning, and there is a great range of attitude, policy and performance among the responsible officials of the several states. As of June 1966 more than half of India's total IUD insertions were performed by the three states of Punjab, West Bengal and Maharashtra, while Madras, Orissa and Kerala performed the highest number of sterilizations *per capita*, and together with Maharashtra accounted for more than 50% of those performed in India during 1965-66.¹⁸ An analysis of insertions during the first eight months after official adoption of IUDs for the national family planning programme showed that the rate of insertion per 1,000 women for five states of India exceeded that of Taiwan and Korea at similar stages of their development.* Unfortunately these high initial acceptance rates have not continued as the programme has matured. It is to be hoped that with reinforced educational programmes and improved medical follow-up, the trend of insertions will regain its upward course.

CONCLUSION

There are signs of hope that national family planning programmes will indeed succeed in bringing down birth rates, and there is growing evidence of real accomplishment. But it is probably too early to claim at this time in history that these programmes are sure to bring world population growth under control. We are, after all, at the beginning. But it is not too early to appreciate the benefits of a planned family to each individual member of that family, in terms of health, happiness and economic well-being.

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41. THE IMPACT OF FAMILY PLANNING PROGRAMMES ON INCIDENCE OF ABORTION

Takuma Terao

Family Planning Federation of Japan
The Faculty of Economics, Keio University, Tokyo

The remarkable recovery of post-war Japan is often regarded as one of the miracles of the century, and no one doubts that the so-called demographic revolution has played an important part in that recovery. Immediately after World War II, Japan was confronted with numerous difficulties coming mainly from an almost completely destroyed economy and the menace of over-population. Six million soldiers and civilians then abroad were forced to return to their mother country, and one year later, there came the inevitable increase in the birth-rate. The total number of births in three years (1947-49) reached 8,000,000, the birth-rate reaching 34 per 1,000 or over. On the other hand, mortality continued its declining trend in spite of the social confusion. The pressure of over-population bore heavily upon the whole nation, and the necessity of restricting the population growth was painfully obvious to all. Thus began the active campaign against high fertility which led afterwards to the family planning movement.

It should be noted that the first step was taken, not by the government, but by the people. It was some years later that the government began to act.

The success of the movement was so remarkable that a demographic revolution was accomplished in a few years. The birth-rate began to decline sharply in 1950, and in five years it fell below 20 per 1,000. Since 1960, it has remained steady at between 17-18 per 1,000, that is to say approximately half that of the years 1947-49.

We are often asked, how and why the Japanese could achieve such a remarkable result. To answer that question seems rather difficult, because there were many factors acting together. The main points, however, may be summarized as follows:

(1) The economic situation of post-War Japan was so wretched compared with that of pre-War Japan that the desire to regain what was lost was unusually strong. Such a feeling is apt to lead to a desire for smaller families.

(2) The idea of birth control was not new to Japan; under the Tokugawa regime (1603-1867) infanticide and abortion were widely practised all over the country, and it was only 100 years ago that they were forbidden by law.

(3) There were no powerful objections either moral or religious.

(4) The medical sciences which could aid the desire to limit families were highly advanced in Japan.

These are the main factors which have contributed to the realization of population control after the War. It is, however, a mistake to say that family planning was adopted from the beginning, if induced abortion is not considered to be family planning. What was resorted to in the first few years was almost completely restricted to induced abortion. The government, adhering to pro-natalist ideas, remained hostile to contraception.

The mass of the people were still lacking in knowledge of contraceptive methods. As they were determined to restrict births they could do nothing but resort to induced abortion. Induced abortion, however, being strictly prohibited by the law, except for purely medical reasons, caused a boom in so-called black-market abortions, which was naturally very dangerous to maternal health, as the operations were often done by the unskilled. We may safely infer that it was for the purpose of preventing mothers from such dangers that the

government promulgated the famous Eugenic Protection Law in 1949. Induced abortions and even sterilizations, though under certain restrictions, were made the means of birth control that were available to the people. The law came into force in 1950. In the first year, the reported number of induced abortions was a little fewer than half a million, but, increasing year by year, it surpassed the million mark three years later, reaching the maximum (1,170,000) in 1955.

The most important target of the Eugenic Protection Law is, or should be, as the name suggests, a matter of heredity. But from the beginning, its effects have been otherwise. For instance, in 1954, of the 1,143,059 legal abortions performed, only 2,872 were for hereditary diseases. Even sterilization is mainly used for other reasons than hereditary diseases; in 1954, of 38,056 performed only 500 were for hereditary diseases. "Other reasons", has meant almost entirely maternal protection. What does maternal protection mean? The statement in the Eugenic Protection Law is extremely ambiguous. It says that the doctor may perform an artificial interruption of pregnancy, "if the continuance of pregnancy or the delivery seems particularly injurious to the health of the mother due to her physical or financial condition". And it is noteworthy that the doctor who performs the operation has the responsibility of judging the patient's financial condition. The way these judgements are made is obvious. It is mainly for this reason that Japan is said to be the paradise of induced abortion. Indeed, we know very few cases which are refused nowadays.

Under such circumstances, it is natural that induced abortion produces various undesirable effects upon the mothers, or more broadly, upon the females in general, because they are not performed mainly to protect health. Added to this, as time went on, the unforeseen widespread practice of induced abortions gave rise to criticism from the moral point of view. The government was forced to take some effective counteraction, and resolved to try and replace induced abortion by contraception. Though the government did not employ the word family planning and insisted always upon maternal health, this can be regarded as the beginning of the family planning movement in Japan.

In 1954, the Population Problems Council composed of scholars and business leaders demanded that the government should adopt family planning as a part of the overall population policy.

Apart from Governmental Agencies there arose numerous non-governmental voluntary groups which assumed the task of spreading information on family planning, of which the Family Planning Federation of Japan is the most important. The Federation was established in 1954, and we had the opportunity of opening the 5th International Conference on Planned Parenthood the next year in Tokyo. The stimulus given to the public by the Conference was so great that the name of family planning became popular at once all over the country. But to be frank, it was highly doubtful whether its real meaning was understood at that time, even by the leaders concerned. This stemmed from the fact that the necessity for controlling births was aroused by the imminent danger of population pressure at that time. The most important necessity was to lower the birth-rate, irrespective of the methods used. It was clearly Malthusian ideas, rather than family planning, which were then the most dominant. The demand of the Population Council to the government to adopt family planning as a part of an overall population policy reveals clearly the atmosphere of that time. It was some years later that the family planning movement began to find its proper place which is the rationalization of family life, not the restriction of the population growth. The turning point was brought about by rapid economic recovery and the already markedly lowered birth-rate. This experience could be important when considering the efforts that are being made to apply family planning to the developing countries. It tells us that in order to make people control births, numerous requirements must be fulfilled beforehand, even more so if family planning in its strictest sense only is being considered.

The efforts to replace induced abortion by contraception have since then been powerfully pursued by the Governmental Agencies as well as non-governmental bodies. But it is extremely difficult to ascertain the degree of success achieved on a nation-wide scale. Of course, when a small group such as a small village, or an industrial firm, is guided with great care, the possibility of success is very high, and figures can prove this. The result of the experimental projects conducted in several districts and firms by the President of the Family Planning

Federation of Japan, Dr. Koya, are often quoted as the proof of the effectiveness of family planning to that effect. But such cases are as yet very few. They may show the theoretical possibilities of family planning replacing induced abortion, but so long as a large part of the nation cannot be guided and instructed with the same care, we shall not be able to come to general conclusions.

Indeed, when there are several methods of achieving a certain objective and the choice of them left to those concerned, it is generally difficult to evaluate their effectiveness. In our problem, the difficulties are especially large, because the statistical figures for induced abortion are far from reliable, although it is legal in Japan; as for contraception, it is almost impossible to assess it numerically. The case being so, the following statement is only a very vague conjecture.

The number of induced abortions reached a maximum of 1,170,000 in 1955, and since then began to decrease, reaching 843,000 in 1965. In these 10 years, the total population increased by 9,000,000, in which the increase of those in the productive age group was proportionally larger, because of the changing age-structure of the population. As to the birth-rates, they fell from 19.4 to 18.5 in the meantime.

Then, if the same proportion of induced abortions in 1955 be applied to 1965, it should have reached at least 1,300,000 instead of 843,000. As we have no evidence that unreported induced abortion has increased in the meantime, we may safely conclude that the role of induced abortion has decreased to a remarkable degree. On the other hand, the number of births, increased only 90,000 in these 10 years, which means a fall in the birth-rate of from 19.4 to 18.5. Thus, if the birth-rate falls in spite of the fall of the rate of induced abortion, it may be justifiable to infer that contraception has taken the place of induced abortion. Now, to evaluate the effectiveness of contraception is, as you know, extremely difficult, because we are confronted with too many unknown factors. But if we can be content with very rough estimation, the line of reasoning will be as follows. Calculate the possible or potential number of births, deduct from it the realized number of births and the total number of induced abortions (reported and unreported). Then the remainder may be regarded as the number prevented by contraception. Supposing the potential number of births to be 3,470,000 for 1955 and 3,820,000 for 1965, and assuming the ratio of unreported induced abortions to reported ones to be 40% for both years, the number of births prevented for 1955 is around 100,000 and for 1965 around 1,000,000. Of course the result is far from reliable. Such factors as age composition, effects of sterilization, etc., should be taken into account. But if we remember that 1955 was the starting point for the Family Planning Federation of Japan, we can believe that the above figures suggest to some extent the effectiveness of the Federation. In Japan, some scholars are now engaged in scientific investigation on the matter, and I hope we shall be able to report their findings to you in the near future.

In Japan, such chemicals and devices as oral contraceptives and IUDs are not authorized yet for public use owing perhaps to the suggested incompleteness of testing. Their effectiveness is well known. Therefore if they were to be permitted in the future, the effectiveness of contraception would be doubled, and we may reckon that the number of induced abortions might be considerably diminished.

In concluding my paper, I must refer to a very curious event which took place last year in Japan in regard to demographic trends. It is a sudden and astonishing decrease of births through the whole year. The number of births was only 1,350,000 which means a birth-rate of a little lower than 14. So far as I know, such a low rate in peace time must be a record in human history. In the previous year (1965), the number of births was 1,820,000 so the decrease amounted to nearly half a million. The event was occasioned by an entirely absurd superstition, but what is interesting to us is that this large reduction seems to have been occasioned not by induced abortion but by contraception, the number of the former, at least of reported abortions, showing no increase. Of course, it is possible to wonder whether secret or unreported abortions had not contributed to a certain degree. However, half a million is too large a figure to be explained by that alone. Therefore, it is natural to infer that wider use of contraception might have played an important role. The superstitious motive itself is a matter to be deeply regretted, but we are consoled to some extent by the reflection that it offered an opportunity of expanding the principles of family planning.

42. A CRITICAL EVALUATION OF NATIONAL FAMILY PLANNING PROGRAMMES

F. W. Notestein

The Population Council

Last year in New York a television show offered us a picture of a hideous future in which human reproduction was illegal in the absence of governmental permission. It was a lugubrious little drama of no particular distinction, and I disliked the way it tended to equate what it called "population control" with repressive governmental policies. I mention it only as an excuse to emphasize the fact that planned parenthood has the opposite objective. Its major goal is to ensure individual couples everywhere in the world a free and unrestricted choice in deciding how many children they will have. The planned parenthood movement is one of the major forces in the world fostering the right of parents to choose the number of their children.

The freedom of parental choice is advocated in the belief that its realization will indeed go far toward assuring that the quantity of life will not diminish its quality. This demographic result will be only an important by-product of success in achieving the fundamental human right of choice. So far as I am concerned, if attainment of the right of individual choice leaves demographic problems still unresolved, the solution will lie, not in the constraint of free choice, but in the alteration of the institutional setting in which the choices are made. It is surely along these lines that, in many fields, mankind has most successfully endeavoured to couple individual freedom with the attainment of social goals. The urgent need is for the spread of voluntary family planning. Most of us see that spread as part of the developmental process which is required as a defence against famine, deprivation and widespread disorder.

A dozen years have passed since the inauguration in India of the first national, government-sponsored family planning programme. Since then, the programmes have spread—together with policies favourable to family planning—to the governments of more than half of the people living in the developing world. This fact is, indeed, one of the most heartening developments in the whole complex of forces and circumstances that we sum up under the name of the population problem. We become somewhat less heartened, however, when we consider the question: What have the national family planning programmes accomplished?

Until this year, the answer to this question had to be phrased in terms of training and organization. We were required to report that the programmes had generated no discernible impact on birth-rates anywhere in the world. Now, however, the situation is more encouraging. Preliminary figures indicate that several large programmes—including those in the Republic of Korea, Taiwan, Hong Kong and Singapore—are beginning to show an effect on birth-rates. The optimists among us are saying that the family planning programme in several Indian states will show an effect on the birth-rate before long. Yet despite these new grounds for confidence, we have to conclude that nationwide family planning programmes in general have been slow to take hold. I would almost propose—I do not know how seriously—a "law of lag", which is inferred from experience that has seemed to show a delay of some years before anything of substance is accomplished after a government has come out publicly in favour of family planning. This delay applies not just to the nations of the developing world, but also to the USA, where the first Federal pronouncements in favour of family planning in 1962 are only now beginning to result in positive action. Delay is one symptom of the difficulties faced by large-scale family planning efforts. The fact is that such efforts have, indeed, encountered great difficulties. Before discussing these, however, I should like to mention some

recent developments that have given family planning programmes a happier outlook than they had a decade ago, or even five years ago. Since the impact on birth-rates in the newly developing countries is just beginning to be noticed, we can say that the work has barely begun. Yet we can also say—confidently, and perhaps for the first time—that the world now has the prerequisites for successful family planning programmes.

Not the least of the reasons for fresh optimism is the recent revolution in contraceptive technology. In the intra-uterine device, we seem to have found an appliance particularly effective for the developing world. If the rates at which the IUD is retained by women are not as high as we would have liked, the device is still exhibiting an effectiveness beyond what almost anyone would have hoped as little as five years ago. We are now beginning to explore the effectiveness of programmes in which the IUDs are supplemented with Pills, which are becoming progressively less expensive. We also have the highest expectations about still newer developments in contraceptive technology which are now under development in a number of laboratories around the world.

Of equal importance to the future of the programmes is the discovery that men and women everywhere want to avail themselves of the benefits of family planning whenever they are informed that family planning is possible. Studies of knowledge, attitude and practice concerning contraception and the limitation of family size have now been carried out in all parts of the world, most of them within the past five years. Their results contradict the belief held by many persons in positions of authority that parents in developing societies have no wish to limit the number of their children, or that such parents rate their financial and old-age security in direct proportion to the number of their children. Quite the contrary. The studies suggest that such men and women have often experienced the impoverishing effects of unduly large families in an immediate and personal way, and would like to limit their childbearing. The men and women who desire family planning represent a considerable majority in the developing nations. They constitute a constituency that encourages their leaders to take action. The recent study of attitudes has done much to make the leaders aware that family planning programmes are political assets rather than liabilities.

The recent histories of Taiwan and Korea have an importance beyond the national boundaries of those countries. They show that nations in the developing world can, if they try, speed the reduction of their birth-rates while they are in the midstream of the modernization process. Programme successes serve to accelerate trends which have been evident in both nations for some time. In Taiwan, for instance, seven years of declining birth-rates will have reduced those rates from a high of 39 to 40 per 1,000 in 1960 to perhaps less than 30 per thousand by the end of this year. This decline is the heartening outcome of individual choices and of individual actions. It supports the conclusions reached by the studies of knowledge, attitude and practice—that men and women everywhere not only favour family planning but will do something about it if the knowledge and opportunity are only made available to them. These conclusions also find support in a number of successful pilot programmes carried out in India, Egypt, Tunisia and a number of other countries. In Thailand, which has no national family planning programme, the first rural birth control clinics have been swamped by persons seeking help even in areas where pressures on the land are not yet severe and all too little progress has been made in the fields of health, education and development.

The decade of the sixties has thus given us firm grounds for believing that the problem of undue population growth can be solved by intelligent human action. This improvement in our prospects, however, must not blind us to several circumstances which continue to confront us. One of these is that more than half a billion people are now living in nations where the first step toward family planning programmes have not yet been taken. Another is that very few of the nationwide family planning programmes that have been inaugurated in the less developed nations have as yet been pursued with sufficient vigour to meet the needs of the nation. Even where programmes have won the support of government, an appreciation of the importance and magnitude of the problem has rarely seemed to penetrate all echelons of government. A consequent lack of whole-hearted support has tended to affect programmes at each of the points where they are vulnerable.

The first point of vulnerability is money. A lack of wholehearted support has often appeared

in the form of insufficient appropriations. A second and more important point involves the administrative level at which the programmes have been organized. Sometimes it has happened that adequate amounts of money have been appropriated only to have the programmes placed in the hands of administrators without sufficient prestige or status. Needless to say, if appropriations are inadequate, the programme administrator will automatically be a man of inadequate status. The prestige of the administrator is usually a measure of the prestige of the programme, and for family planning it is a matter of particular importance inasmuch as a birth control programme will be a new effort. It will lack an historical and established position in the web of bureaucracy. In the past, the programmes have found themselves isolated, the stepchildren of the family of health services rather than members in high standing.

Beyond its newness, family planning will represent for most of the developing nations a new *kind* of effort. Birth control is much more than just another public health programme. Family planning programmes will usually be assigned to health ministries, but their ramifications should also involve many activities outside the health field. A successful programme will administratively involve other ministries—notably, information, education and finance. Only a prestigious person can move freely across ministerial lines, and the family planning director must be prestigious enough to do this. He must also be prestigious enough to attract first-rate talent to assist him in spite of the fact that family planning will not be firmly seated in the bureaucracy—with all that implies to career civil servants. Careerists will too often see themselves as taking a chance in entering the family planning field; their future prospects will not be clear to them. When the number one people are not of sufficient status to attract talent, as has often been the case, family planning programmes will end up getting the dregs of the health establishments. Family planning is more complicated than malaria control, for example, and more difficult to implement, but there are very few countries in which the family planning programmes have been granted the same prestige and respectability as malaria control.

Without sufficient respectability, the programmes will often find themselves diluted for administrative and budgetary reasons. In these circumstances, moreover, family planning services are likely to represent merely an added chore for the overburdened medical staffs that are already carrying a multitude of responsibilities. When this happens, family planning receives perfunctory attention. This is not to argue that family planning should not be a part of standard health services, as fully accepted a part of normal health procedures as, say, communicable disease control. Experience has shown us, however, that to be effective family planning programmes must have some personnel for whom it is a full-time assignment even at the village level.

Beyond the subject of personnel, the material requirements and techniques of administration form an area that has rarely been given adequate attention in national family planning programmes. In most programmes, far greater efforts should have been devoted to getting birth control services properly organized. Sufficient attention, for example, has not been paid to such a comparatively simple matter as transport, and to organizing the train of logistics which delivers birth control supplies to the places where they are needed when they are needed. Furthermore, service must be co-ordinated with educational programmes that tend to generate an initial enthusiasm for family planning—an enthusiasm that evaporates when service and supplies fail to appear. Village education, in turn, will form one part of a programme of public health education in birth control, and public health education will have to be co-ordinated in its turn with the medical education programmes which widen the training of both doctors and para-medical workers. Family planning will thus involve educational programmes that are not easy to carry out and that, to be effective on a national scale, must be organized on a massive basis.

An essential goal of programme of medical education should be to arouse enthusiasm for family planning on the part of local medical establishments wherever knowledge and enthusiasm are lacking. A vital part of medical education can come through the support of research in the developing world. It is sometimes argued that research should be left to the laboratories and universities of the more developed West. This position is wholly untenable. The fact is that many of the answers simply cannot be obtained outside the areas where local

conditions have given rise to the questions in the first place. Furthermore, the development of local scientific activity should be regarded as an important means of gaining the interest, the understanding and the involvement of the scientific community whose public and political support will be essential for any viable programme. Family planning programmes are always innovative, and innovations generally have to be introduced against a background of doubt, if not active suspicion. Innovations are much more easily effected when they are supported by local experts rather than by outsiders. Technical guidance, especially in controversial fields, comes best from one's own people. Local research, in short, generates both knowledge for the world and local support.

The key to many of the difficulties which have afflicted family planning programmes lies just here, in the question of widespread support in the leadership groups. Even when formal support has been given by government to a family planning programme, the work has often lacked vitality because it has not received strong support throughout the government and among the leaders of the community. As we have seen, the ordinary people want family planning, and will practise it when the necessary services are available; but the lack of strong and broadly based support in the government and the community results in weak programmes. In general, it is only after some years when the failure of weak programmes becomes evident that strong and solid programmes develop.

Undoubtedly, the problems will become simpler as new, more effective, and more appropriate contraceptive methods become available. But here too there is difficulty, difficulty that has bedevilled the family planning movement for decades everywhere. In a scientific age, we are so intrigued with technology that we expect it to do all our work for us. A new method of contraception is developed. Hopes get very high. The method is introduced with little thought or attention to educational problems. It proves to be less attractive than had been hoped, and we retire to await another improvement in technology. This has been the history of the condom, the diaphragm, the foam tablet, and is now coming to limit the usefulness of both the IUD and the oral steroids. Our ability to go through this cycle of high hopes, inept trials and resigned disappointment with one method after another, and still blame the difficulties on inadequate technology, is eloquent testimony to our faith in gadgets, and to our unwillingness to see our own shortcomings. Clearly, the major problem has been lack of attention to the organization of service and to the educational problem. Both the oral steroids and the IUDs begin to face the same difficulties. With hopes high we rush in with poorly designed programmes and services. We fail to educate acceptors about potential difficulties, fail to provide service for women in trouble, fail to involve and inform the medical profession, fail to take account of the vested interests of potential competitors. Then we are surprised when, after the first blush of enthusiasm, inadequately cared-for cases become foci for spreading adverse gossip. We then begin having new doubts about our latest technology. One would think that by now the lesson might have been learned that organization and education pay, and will be essential however advanced the technology becomes. Instead, many of us respond by complaining that the latest methods have not provided an automatic miracle. In fact, they almost have produced miracles. We can only be disappointed in the performance of the oral steroids and the IUDs if we compare the actual experience with our highest hopes. The reasons for the disparity between hope and reality lie in the weakness of our organizational and educational efforts.

In the foregoing I have not meant to disparage the importance of contraceptive technology. The IUD and the orals have carried contraceptive technology to entirely new dimensions. They have been the most important elements in recent successes. My purpose is to emphasize the fact that our major failures have been those of education and organization of service. Until these defects are remedied we will not be able to take full advantage of the methods we now have, not to mention the greatly improved methods that appear to be coming in the next two to four years. If we had the new methods today, we would not be in a position to use them very effectively. Indeed, if by a miracle tomorrow we learned how to make prayer the perfectly effective means of contraception, we would not have the organizational and educational machinery to make very efficient use of the discovery. In short, it is high time that those of us who are interested in education and in the organization of service programmes stopped blaming the lack of suitable technology for our own failures.

These educational and organizational aspects of the programme must be developed locally, and can become strong only with strong and broadly based public support. It is exactly here, in the development of local support, that planned parenthood chapters can play an effective and innovative role: the same role, indeed, that has won the movement renown in the past. The chapters can serve as friend, as critic, and as advocator and educator in a way that no one else is able to do, neither government official nor, especially, foreign expert. They can be particularly helpful in the early stages of a governmental programme when strong support is needed.

Unfortunately, too often disputes have broken out. New government personnel has sometimes tended to upstage the established planned parenthood workers, or the private organization had poorly concealed the fact that it considers government workers as inexperienced interlopers. Arguments have arisen over whether the government should operate its own birth control clinics or should simply finance the established planned parenthood services. These controversies have sometimes obscured the discouraging fact that both the governmental and the private work were floundering, at just the time when the new governmental programme needed a large-scale rallying of public support. Forming local constituencies, planned parenthood chapters can advance governmental policy, be alert to push and praise and—most important—help mould a general climate of public opinion favourable to family planning.

Where government-sponsored and nationwide family planning programmes do not yet exist, planned parenthood should continue to maintain its clinics. These isolated centres of family planning activities have in the past performed superbly by entering wedges into the societies in which they have been located. They have aroused interest. They have spread the word about the benefits of family planning. They have generated a nucleus of satisfied patients and begun to build the foundation of public support.

As government enters the family planning field, the clinical services of the private organizations are likely to become less important, in relative if not in absolute terms. It is in the efforts to build public understanding by broadly based educational efforts that help from the planned parenthood organizations is particularly needed. In this, the local organizations have the unique advantage of representing a non-official voice that still speaks to its own compatriots. The private planned parenthood organizations are urgently needed to support and nurture the new governmental programmes they have helped to bring into the world. With respect to these governmental programmes, it is to be hoped that all of the private organizations will become, what the large majority of them already are, not jealous fathers but proud parents, determined to give the child a better chance in the world than they had.

43. MEASURES FOR GREATER EFFECTIVENESS

Jae Mo Yang

*Department of Preventive Medicine, Yonsei University, Seoul.
Planned Parenthood Federation, Korea*

SUMMARY

The Family Planning Programme in the Republic of Korea has developed quickly as measured by knowledge, attitude and practice (KAP) studies, census data and independent surveys. In some areas of development the programme has tried to move too rapidly forward without first setting up lines of authority, answering procedural questions, training necessary personnel or determining evaluational methods to be used. We have been fortunate to have the services of capable voluntary agencies which have fulfilled most of the above functions until such time as the government could take over.

Realignment of personnel and facilities and re-evaluation of the present status of the national family planning movement are only a part of the future picture. Even more important than an efficiently operating organization are people in the organization who are strongly motivated and carry the programme forward with vigour and determination. No matter how good the structure it will only succeed if the administrators are dynamic and aggressive.

In addition the hierarchy must be open minded in accepting changes which inevitably will occur. The government must be flexible in its approach, and unhesitant in evaluating new ideas. Success of the programme must be the first thought in everyone's mind, not personal status.

Lastly, co-operation among the various government agencies, the voluntary agencies and the workers themselves must be stressed. The government should go out of its way to accommodate doctors, health centre workers and family planning workers. Enthusiasm should not be dampened by undue inflexibility or illogical demands.

If the pattern outlined above is followed the Republic of Korea will become the first country in the world to reduce the birth-rate prior to major industrialization.

INTRODUCTION

People in the world today can be classified into the following four levels in terms of family planning:

1. Those who are completely ignorant about family planning.
2. Those who know about it but do not practise it.
3. Those who are practising it unsuccessfully or by relatively poor methods.
4. Those who are practising it successfully.

Therefore, the ultimate goal of a family planning programme is to bring all persons into the fourth level as soon as possible. In order to attain the ultimate goal, however, the family planning programme must be broken down into the following intermediate steps:

- (a) Acceptance of a small family size goal and its achievement as the social norm.
- (b) Acquisition of knowledge about relatively safe and effective birth control methods.
- (c) Easy access to an effective means of birth control for all who want it.

The first step is mainly concerned with a broad educational programme in connection with aspirations for a better life. The second step is connected with a specific information service, and the last step is concerned with the organization and operation of an efficient service system.

Each country must vary the strategy and focus of its programme according to the current

stage of family planning, educational level, available resources, religious, cultural patterns and its government policies.

Since many national family planning programmes currently aim at the reduction of fertility as their ultimate goal, the effectiveness of the programme is often measured only by the degree of reduction of birth-rates. However, this kind of measurement is not suitable for the short term evaluation of the programme in its initial stage. Where induced abortion is the most prevalent method of birth control, an effective family planning programme in the area could replace induced abortion by contraceptive methods but might have little impact on fertility rates.

Keeping the above mentioned fact in mind we should discuss briefly the following questions:

1. What has the effectiveness of the programme in Korea been? 2. What has contributed to its effectiveness? 3. What kind of problems do we have before coming to the subject of "Measures for Greater Effectiveness"?

WHAT HAS THE EFFECTIVENESS OF THE PROGRAMME IN KOREA BEEN?

The national family planning programme in Korea seems to be effective so far on the basis of the following data:

(a) Intercensorial rates of growth

The average annual rate of growth between the 1955 and 1960 censuses was 2.9%, while that of the 1960-66 period was 2.7%. However, the national programme in Korea was only begun in 1962. In addition it has only been since the middle of 1964 that the programme has had a sufficient number of family planning workers and has started using a relatively effective method, the IUD, nation-wide. Extrapolation from the census figures indicates that the annual rate of growth in 1960-61 and 1965-66 were 3.0% and 2.5% respectively which means a 17% reduction during the first five years of the programme.

(b) KAP survey

From 1964 an annual KAP survey with a nation-wide sample has been carried out during April (Table I).

Table I. Percentage of respondents by knowledge, attitude and practice*
April 1964, April 1965 and April 1966 surveys

	1964			1965			1966		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
1. Knowledge:									
Heard about the term "Family Planning"	71.0	80.6	68.0	83.8	84.6	83.4	87.7	88.0	87.5
Knew rhythm method	20.8	—	—	14.3	21.6	11.0	13.1	22.6	8.7
Knew condom method	22.2	—	—	51.5	52.6	50.9	55.8	59.7	53.9
Knew foam tablets	25.8	—	—	39.7	39.4	39.9	39.6	46.9	36.2
Knew IUD methods	4.8	—	—	44.8	38.3	47.6	60.1	38.6	60.8
Knew vasectomy	2.5	—	—	34.4	30.2	36.3	40.4	42.4	39.4
Do not know any method	49.2	32.8	54.4	35.4	33.5	36.2	27.7	27.0	28.0
2. Ideal family size:									
Total	4.2	3.8	4.3	3.9	3.5	4.1	3.9	3.6	4.1
Boy	2.5	2.3	2.6	—	—	—	—	—	—
Girl	1.6	1.5	1.7	—	—	—	—	—	—
Either	0.1	—	—	—	—	—	—	—	—
3. Attitude toward contraception:									
Approve (want to practise)	(44.4)	(52.6)	(41.8)	89	91	87	86	90	85
Oppose (do not want to practise)	(49.7)	—	—	4	3	5	5	3	5
Do not know	5.9	—	—	7	6	8	9	7	10
4. Practice:									
Currently practising	9.1	19.2	5.9	16.2	20.7	14.3	20.1	25.5	17.5
Stopped practising	2.8	4.6	2.3	6.2	9.4	4.8	7.1	8.7	6.3
Ever practised (CP + SP)	11.9	23.8	8.2	22.4	30.1	19.1	27.2	34.2	23.8
No experience	88.1	76.2	91.8	77.5	69.8	80.8	72.8	65.8	76.2
No response	0.2	—	—	0.1	0.1	0.1	—	—	—
5. Method of current users:									
Oral	—	—	—	6.3	—	—	5.0	—	—
Loop	3.8	—	—	23.5	—	—	39.6	—	—
Sterilization	3.8	—	—	6.2	—	—	7.2	—	—
Condom	36.3	—	—	54.2	—	—	41.3	—	—
Other methods or combined	120.6	—	—	80.3	—	—	52.0	—	—
Total number of respondents	4,008	967	3,041	3,445	1,060	2,385	3,368	1,074	2,294

*Source: The Ministry of Health and Social Affairs and PPFK.

The percentage of those who do not know any method of family planning has been reduced to 28% in 1966 from 49% in 1964; a remarkable reduction has occurred in rural areas during the last two years, and now there is no measurable difference in knowledge between urban and rural respondents.

Although the ideal family size and attitude toward contraception have changed very little, the rate of family planning practice has more than doubled in general and tripled in rural areas. As for the methods used by current users, the loop (IUD) increased ten-fold (from 3.8% to 39.6%) during these two years.

These data clearly indicate that the programme was successful in the dissemination of knowledge of more effective birth control methods such as IUD and vasectomy and their application particularly in Korea's rural areas.

(c) Operational statistics

Medical doctors participating in family planning services are requested to submit a list of IUD acceptors and vasectomies monthly to the health centre to get government subsidy payments and loop supplies. Reports from 189 health centres through their Provincial Governments arrive at the Ministry of Health about one month later. Although there are variations between provinces and health centres in rates of accomplishment of the allocated targets, most of them have been encouraging so far (Table II). These operational statistics match fairly well with the estimated contraceptors by various methods calculated on the basis of the KAP survey data. Breakdown by province of the accomplishment rate of the 1966 targets shows a range of from 69% to 105% in IUD insertion and from 66% to 130% in vasectomy targets.

Table II. Programme goals and accomplishments by year*
(Unit 1,000)

Calendar year	IUD			Vasectomy			Traditional methods		
	Insertion goal	Accomplishment	Accomplishment rate (%)	Goal	Accomplishment	Accomplishment rate (%)	Users goal	Accomplishment	Accomplishment rate (%)
1962				3	3	100	59	59	100
1963	2	2	100	23	20	87	130	130	100
1964	106	106	100	28	26	93	156	156	100
1965	228	226	99	15	13	87	248	192	77
1966	400	391	98	20	20	100	150	169	113
Total	736	725	99	89	82	92	743	706	95

*Source: The Ministry of Health and Social Affairs.

This table is limited to the free services provided by the National Family Planning Programme.

(d) Action research projects

The three major research projects (Seoul, Koyang and clinical follow-up) have been carried on with energy and competence.

Referring to the Koyang rural project in which the author is personally involved, there has been a large increase in the practice rate of contraception among eligible couples from 8% in 1962, or before the programme, to 36% in 1966 in Koyang. Wondang, a township in Koyang, where the action programme has been conducted for four years, is particularly noticeable. The expected number of births for a year in Wondang should have been 376 live births for 1,522 eligible women if the women had the same fertility experience as in 1962, while the actual number of births enumerated for 1966 was 248 live births.

Therefore, the difference between the actual and expected number of births was 128. Thirty-six out of 128 or 28% were due to IUD insertion, 32 or 25.0% to traditional methods, 5 or 4% to vasectomy and the remaining percentage, or another 55 births, may be attributed to other factors including the effects of induced abortion.

In this rural area, the crude birth-rate was reduced from 36.8 per 1,000 in 1963 to 26.7 in 1965, exceeding a decline in control areas.

WHAT HAS CONTRIBUTED TO ITS EFFECTIVENESS?

1. The government and voluntary leaders have created a favourable climate for family planning.

(a) Ever since the government adopted a policy of support for family planning, President

Park has reiterated his strong emphasis of the importance of the programme at his first visit of the year to the Ministry of Health.

(b) The Prime Minister's special order issued in September 1963 to all the ministers concerned asked for their full co-operation for the programme by mobilization of the resources of their ministries.

(c) In January 1967, the Deputy Prime Minister, who is also Minister of Economic Planning, emphasized "Savings and Population Control" as the most important government programmes.

(d) The Ministry of Home Affairs set up a standard score for the evaluation of achievement in local government administration in which family planning represents a larger proportion of the total score than any other subject.

Two provinces have been honoured for their achievement of more than 100% of their IUD target and 130% of their vasectomy target.

(e) The voluntary organization—the Planned Parenthood Federation of Korea—with its advantage of flexibility, good reaction time and capable leadership was able to recruit voluntary leaders and experts, to utilize existing facilities to the greatest possible extent.

Until the government established a section responsible for the programme in December 1963, practically all work—training of personnel, education of the public, planning and evaluation of the programme, introduction of foreign advisors for technical assistance, and running of pilot projects such as the vasectomy programme and the IUD programme, was done by the PPFK. From 1964 the PPFK has gradually handed many of its responsibilities over to the government but a good deal of the work is still done by the PPFK exclusively or jointly with the government.

2. The methods were first tested on a pilot scale; and only those which were proven were applied to the nation-wide programme, providing methods of reaching the people even in remote areas.

(a) The Koyang Project by Yonsei University administered during the period of 1962–64 with a cafeteria style method of distribution, proved that the condom is the best among traditional methods, though they have a high failure rate in general. Based upon these findings, the quota of government supplies was changed to condom 85%, foam tablets 7%, and jelly 8% in 1965, from condom 32%, foam tablets 58% and jelly 10% in 1963.

(b) In the last couple of months of 1963, the vasectomy programme was tested by the PPFK for its acceptance and application utilizing private practitioners. This turned out to be a successful programme for those who had had enough children and caused no objection at all.

(c) The IUD was introduced into Korea in 1963. In 1964 after clinical trials for one year with two University Hospitals and one Missionary Mobile Team it was proved to be the best method for nation-wide use.

(d) The oral contraceptive is now undergoing field testing at three areas mainly for women who are IUD drop-outs.

(e) The mobile bus donated by the IPPF was tested in Korea and proved to be useful for the training of doctors in rural areas, and for education and service to those who live in remote areas, but this type of vehicle has difficulty with poor roads in many rural areas and requires a relatively high maintenance expenditure. Because of this, reconditioned three-quarter-ton army ambulances were chosen to be used for the same purposes in all provinces and have been in use since 1965.

(f) IUD service experiments in Koyang and other areas during 1965 and 1966 showed that the provision of services either by stationing a nurse in the rural village or by visits from a mobile team were highly productive in increasing IUD acceptance. These experiments also proved that para-medical personnel, if well trained, could be used for IUD insertion where there is no doctor available. Another result is the idea that insertion need not necessarily be limited to the first ten days of the menstrual cycle if the client has been free from the risk of pregnancy during the preceding unsafe period. Although most women prefer female doctors for IUD insertion, sex seems not to be the only factor in the decision as to whom they will choose for IUD services.

3. Motivation for family planning, which was reflected in relatively high aspirations even

prior to the programme, has been accelerated and enhanced by a strong educational effort and by effective application of mass media.

(a) According to the 1964 KAP survey findings, mass communication media such as radio, newspapers and magazines were the most effective channel for bringing information concerning family planning to women in rural areas as well as those in urban areas (Table III).

(b) Extensive utilization of such mass communication media, as well as the increase in the number of family planning workers in rural areas since 1964, has had the effect of increasing communication through personal contacts such as neighbours, village (Ri-Dong) Chiefs, and relatives (Table III).

Table III. Channel of communication

	1964 survey %	1965 survey %	1966 survey %
Newspaper	20	24	22
Radio	37	46	54
Health centre	31	51	67
Magazines	31	16	18
Lectures	21	21	14
Doctors	7	6	5
Drug store	3	3	2
National Reconstruction Movement	18	9	4
Ri-Dong, Ban† Chief	—*	35	39
Relatives	37	34	—*
Neighbours	—*	64	40

Note: *Not available. †Ban = village.

Source: The Ministry of Health and Social Affairs.

(c) Continuous education of doctors and family planning workers utilizing the Population Council grant has helped maintain high morale and has allowed the introduction of more effective contraceptive methods. Among the techniques covered in this instruction are methods of counteracting unfavourable rumours spread by a few unsatisfied users, and means by which attention could be generally shifted from locating couples wanting family limitation, to younger women in the postpartum period in order to initiate child spacing.

WHAT KIND OF PROBLEMS DO WE HAVE?

While on one hand the rapidity with which the programme has developed can be regarded as a major achievement, on the other hand it has inevitably produced certain imbalances. These are:

1. Organizational problems

(a) Although the Maternal and Child Health section is spending one-third of the total health budget, it is still only one of many subdivisions of the Ministry of Public Health. The work load involved, increased emphasis on the Family Planning Programme and the necessity for inter-bureau and inter-ministerial co-ordination requires the upgrading of the entire section in order to allow for its increased importance.

(b) Frequent changes in government personnel responsible for family planning administration, particularly at provincial and health centre levels, have had a discouraging effect on the programme as most of the newcomers lack experience and are ignorant of the programme to date.

(c) Family planning workers both at the health centres and at township level are employed on a temporary basis. Because of this a civil service clerical worker is generally responsible to the health centre director for the programme. These clerical workers have little knowledge concerning the technical aspects of the programme.

(d) Some township level family planning workers obtain employment through patronage.

These personnel are poorly qualified and non-productive, but there is no means of screening these people out of the programme.

(e) Most health centre directors have made arrangements for family planning services with doctors practising in their area (five doctors for IUD insertions and two doctors for vasectomy per health centre is the average). This has led to poor co-operation from specialists and general hospitals including missionary hospitals, although they were pioneers in the early stages of the programme.

(f) Those projects using foreign aid grants have been generally operated jointly by the Korean Government and voluntary organizations. Some of them have experienced poor co-operation at the local level, mainly because of lack of experience in such co-operative projects and some mutual jealousy or distrust. A poor salary scale for government personnel and the shortage of skilled administrators on the part of voluntary organizations may be another cause of these problems.

2. *Problems in service and education*

(a) Although field studies on the use of para-medical personnel for IUD services have shown encouraging results, the government is still reluctant to apply this service method to an area where there is no doctor available.

(b) There is no legal provision to help a woman who becomes pregnant after IUD insertion or after the sterilization of her husband.

(c) The retention rate for IUD is dropping continually primarily for medical reasons. This is contrary to our early expectations that removal for medical reasons would become negligible after a few months of wear.

(d) Some doctors do not participate in the programme for one reason or another. Among these doctors some are so opposed to the programme that they spread adverse publicity. These doctors may advise removal of the IUD even though the problems involved are comparatively minor.

(e) Satisfied IUD users are generally silent about their satisfaction, whereas dissatisfied users are notoriously vocal. These few dissatisfied users are quite willing to put the programme in a bad light and do much damage through their condemnation. The problem is not to quiet the vocal minority, but to get the satisfied users to endorse the IUD.

(f) How, when, and to whom, another effective method (i.e. the oral contraceptive) should be introduced with minimal detriment to the IUD programme is a problem presently under research.

(g) Recruiting and retention of well qualified obstetric and gynaecological specialists for mobile teams is a problem since the ordinary scale is not attractive to these doctors.

(h) One difficulty is to avoid a too hurried service without destroying the incentive to the accomplishment of the assigned goals.

(i) Methods must be found to obtain and keep the enthusiasm of the village leaders who are voluntarily participating in the programme. Suggested methods of retention are monetary incentives, citations and honours, and increased responsibility with the concomitant increased respect in the community.

(j) One question to be answered is whether it is time to eliminate traditional contraceptive methods such as the rhythm method, foam tablets, diaphragms and jellies from the alternatives offered by the family planning workers at home visits or group meetings.

3. *Evaluation problem*

(a) How can we measure periodically the achievements of individual workers, of villages, of health centres and of provinces quickly and accurately?

(b) How can we improve vital statistics, maternal and child health and family planning simultaneously and quickly?

(c) Is the family planning field worker reliable as an interviewer for the nation-wide KAP survey?

(d) The government subsidy can be misused in that re-insertions could be reported as initial insertions. This false reporting produces exaggerated totals. The only possible solution to this problem seems to be to appeal to the loyalty and conscience of the individual doctor. In the same respect this violation of procedure is difficult or impossible to detect.

MEASURES FOR GREATER EFFECTIVENESS

In order to increase effectiveness the following objectives must be achieved:

- (a) To reach more women who are potential participants in the programme but who have not yet accepted family planning guidance.
- (b) To reach the younger women and teach the benefits of child spacing.
- (c) To provide the best method for a particular woman and encourage continuous use.
- (d) To provide alternative methods in case the initial method is unacceptable.

In order to attain the above objectives the principal measures to be taken immediately are as follows:

1. *Organizational or administrative improvements*

(a) Raise the level of the family planning administrative authority at least to that of a Bureau, which would then be directly responsible to the Vice-Minister in the Central Government. This would not only provide sufficient authority for negotiation with other authoritative persons in the governmental hierarchy, as well as providing sufficient manpower to administer the programmes, but would also make the Bureau Chief's position attractive to a well qualified and able person. This will have an impact on the local government organization. Also it will demonstrate to the people the degree of importance of the programme. Without such authority it will be difficult to mobilize all the resources available and necessary for a successful programme.

(b) The bureau chief in charge of the programme at the provincial level is, in most cases, not technically qualified in any of the skills he is called upon to supervise. The three subordinate sections, medical affairs, social affairs and preventive medicine, are often guilty of poor inter-cooperation. The provincial hospital, under the Medical Affairs section, has trained obstetric and gynaecological and maternal and child health specialists; the health centre, under the Preventive Medicine section, could utilize the talents of these medical personnel if they were made available. If the bureau chief were medically trained and properly oriented he could aid in creating arrangements for the most efficient utilization of the variety of talents found in the three sections.

(c) One goal is to establish a sub-centre in each township to provide maternal and child health and family planning services closer to the village level. Establishment of township sub-centres would place the township level family planning workers under the direct control of the county health centre director.

(d) At present a male clerical worker directs and reports on the programme to the health centre director. Since these workers have no technical knowledge it is suggested that the senior family planning worker in the area be made a permanent civil servant and have the responsibility of reporting the programme. Since the clerical worker would, in effect, become her assistant, certain complications can be expected to arise.

(e) A pilot project conducted in Koyang to determine the feasibility of organizing women's clubs at the village level demonstrated that utilizing village women to disseminate information about family planning resulted in a 250% increase in the acceptance of services. Consequently this year these "mothers' classes" will be organized nation-wide in every village. Last month a one-day Family Planning Acceleration Conference was held at each provincial capital for Gun (County) chiefs, the health centre chiefs, National Reconstruction Movement chiefs, Agricultural Reconstruction chiefs, and Farmers Co-operative chiefs to explain the advantage of village level "mothers' classes" and how to reactivate or organize the women's club for the programme at the village level. Some provinces have already held county level conferences which will eventually we hope, go down to the township and village level in the near future.

(f) Good co-operation must be maintained between the government and the voluntary agencies working in the programme.

(i) The Ministry of Health should be responsible for planning and supervision, but the actual programme execution should be delegated as far as possible to local authority and the voluntary agencies. If the government tries to take over too much of the work then the co-operation of universities, foreign, research and advisory groups or the PPFK may be lost.

(ii) Private practitioners and obstetric and gynaecological specialists must receive their loop supplies from the health centre nearest them. Because of professional jealousy and the fact that a kick-back is often required from the specialist for patients referred to him by the health centre, it is suggested that the voluntary agencies take over distribution of the loops to private practitioners. This would allow distribution to all medical personnel in the country, instead of just to those who are favoured by the health centre director.

(iii) The administration of mobile teams was a joint effort of the PPFK and the central government. It has been placed under the exclusive control of the PPFK in order to achieve less conflicts in administration.

2. Training and educational improvements

(a) Most of the training is presently being conducted by the PPFK on an *ad hoc* basis. A national training institute of family planning closely allied with the staff of a major university is essential for the effective education of those who will become leaders and supervisors of the programme. Due to cost and the possible loss of talented personnel, long-term overseas training should be limited to the very top leaders, and should include training visits to such nearby countries as Japan and the Republic of China (Taiwan).

(b) Continuation training of all workers should be integrated into the working chain of command. At present the courses are held at five local training centres and are directed toward three levels of workers with a separate course for each level (the assistant family planning workers course, the health centre family planning workers course and the health centre directors course). If the provincial level leaders could also act as instructors for county and township level personnel, the training and administrative/command channels would be effectively integrated. This would allow for the discovery of regional or local problems and the transmittal of new information to the local level. Using this training method semi-annual meetings of all family planning workers for re-education, and monthly meetings of health centre officials for reporting purposes could be held. This would provide a more responsive re-education programme which is vitally needed, as a survey has shown that the trained family planning worker gains more knowledge through magazines and newspapers than from the health centre director, Ministry of Health and PPFK combined.

(c) The Family Planning *News Letter* published by PPFK should be put out in two editions, one aimed at technical personnel, the other toward the village women and mothers' class leaders.

(d) Presentation of alternative contraceptive methods by the family planning worker is confusing in that all alternatives are presented. Instead, the presentation should only include the two or three most effective methods.

(e) Emphasis following childbirth in order to inform them of child spacing. If this programme is integrated into a well-baby clinic for postnatal checkups then the mothers will be more receptive and those who would not come to the hospitals for themselves, but will come to obtain care for the baby, can be contacted.

(f) All textbooks which emphasize large family size or give adverse publicity to small families should be revised or replaced with texts reflecting a small family as being desirable. Civics courses should include a description of the merits of voluntary social service, the need for good child care, parental responsibilities for education and support of children and the idea that the large extended family is being replaced by the smaller nuclear family. Maths courses should include examples of counting households, figuring the average family size and determining the average acreage per individual. In addition, population projections should be calculated by students to incorporate births, deaths and migration and so to determine the overall increase. Science courses should include some human ecology, nutritional requirements and a comprehensive description of reproduction. All of these programmes will aid not only in the recruiting of workers, but also in the subsequent detailed training of volunteers and the promotion of family planning as a social norm.

(g) In order to attract young working mothers who are either not at home when the family planning worker calls, or have no time to go to a clinic, the programme should be re-opened

to industrial groups and other allied organizations where these women are employed. This will also aid in extending the programme to unmarried women who are more susceptible to illegitimacy than their rural counterparts due, among other factors, to a later age at marriage and general emancipation. This programme will require the re-education of medical service officers of industrial organizations and the creation of new positions where not already established.

(h) Military demobilizing centres currently give soldiers a programme of courses to include new agricultural methods, sanitation standards, nutrition and a general re-orientation to civilian life. Since many of these military personnel are married very shortly after discharge, family planning information should be included in this programme.

3. *Improvement of services*

(a) In order to counteract adverse comment by physicians not in the programme, all practising physicians should be incorporated into the system or invited to join. Those who do not join will therefore be the hard core anti-population control doctors whose numbers are few and continually decreasing.

(b) In order for women in areas not presently serviced by doctors to be included in the programme, either para-medical personnel should be authorized to make loop insertions, or doctors must be provided with jeep-type transportation to visit these areas. In the event that para-medical personnel are utilized they should be given the training and authority necessary to treat minor complications. However, the services of a doctor must be made available for the treatment of severe complications and screening of clients. In addition, arrangements should be made to visit any village or area that is comparatively deficient in acceptors with a mobile family planning team.

(c) Formerly only minor complications appearing subsequent to IUD insertion were cared for by the inserting doctor. Moderate problems were referred to the county clinic. Both minor and moderate complications should have been reported in order to obtain subsidies for treatment, however, due to professional pride and the paperwork involved, these complications were rarely reported. In addition, too, the inserting doctor often was hesitant to refer moderate cases to the county clinic. As a result of this lack of reporting and failure to use the established means of referral, the inserting doctor is being asked to treat both minor and moderate complications, with no report required. To make up for the rescinding of the treatment subsidy a higher insertion subsidy should be paid. Severe cases should continue to be referred to the designated specialist and subsidies should continue to be paid for treatment of these cases.

(d) The family planning worker should locate satisfied users and have them address mothers' classes or group meetings if possible. A small reward or incentive might be made available to those who are willing to express their satisfaction.

(e) One method of counteracting the demands of women to have the IUD removed would be to compare the complications involved in retention with the possible complications of an induced abortion. Since these complications are generally much more severe, they should be brought to the attention of the woman by the family planning worker.

(f) Due to *per capita* cost the IUD must remain the preferred method of contraception but an alternative should be provided. A pilot project is currently being conducted to gauge the feasibility of offering the oral contraceptive to all loop drop-outs who are not contra-indicated for acceptance.

4. *Evaluational and research improvements*

(a) The quarterly evaluational seminar held at the provincial level has been found to be a very valuable platform for the exchange of ideas and for the passage of information both up and down the chain of command. It is recommended that this seminar be held at least semi-annually, and that it be closely connected with both training programme and continuation seminars in order to provide more stimulus to training and better response to problems in the clinics and health centres.

(b) The national knowledge, attitude and practice (KAP) surveys should be repeated at least bi-annually.

(c) Research must be programmed through the ministry in order to conform to the objective of the national programme. This would avoid duplication of effort and would ensure thorough coverage of problem areas. Results must be analysed and published as soon as possible and should be aimed at a practical solution of current problems rather than giving esoteric answers to unnecessary questions.

(d) Evaluation must continue at all levels. Not only should the background characteristics of individual acceptors be analysed, but group motivation, methods of distribution, informational media and other variables must be analysed. In addition, the characteristics of the people who administer the programme must be weighed in order to recruit the most effective workers possible.

(e) In Korea academic personnel have worked closely with the government programme from the start, partially due to provisional research grants to faculty members.

RAPPORTEUR'S SUMMARY

The papers presented at the session on *Effectiveness* aroused great interest in the audience, who responded with over 30 questions and comments. Due to time limitations, only about half of these were discussed at the session.

The advisability of making genetic counselling an addition to family planning programmes wherever adequate personnel and resources are available was stressed at one of the discussions.

The role of the psychiatrist and of other social scientists in investigating the personal attitudes and the failures of contraceptive users was discussed. Areas of such investigation would possibly include: the voluntary action of asking for contraception; the constancy of use; errors in use; and reasons for abandoning a method.

Ways of awakening and increasing motivation were extensively discussed by several experts. It was agreed that the easy availability of good services is the most important single factor; that motivation for limiting family size does exist in the population at large; and that free and easy access to good clinic services is the best "selling gimmick" of any programme. Several speakers from different countries pointed out that heavy propaganda usually backfires, and gave local examples. Accessible, clear, reliable and truthful information and its educational effect are more important and give better results than propaganda.

It was recommended that emphasis be placed on reaching and educating the younger groups, who are the most receptive to change and to new ideas and goals, and who have the longest life span ahead of them.

In the educational effort, the socio-economic advantages of small families should be stressed. The education of groups younger than those now being approached should be considered. It was suggested that use might be made of the school arithmetic exercise built around numbers of people in relation to housing, available land and resources. This might be a way of introducing changes in cultural patterns early in life, and of awakening realization of the relationship of family size and population to resources and well-being.

"Mass effectiveness" of various contraceptive methods, and ways of establishing the "ideal" family size for a country were also discussed. It was pointed out that it is necessary to know the number of women of reproductive age in a given country; the crude fertility and mortality rates; the family size accepted in the cultural environment; and the population policies of the government. The possible application of the multiple decrement life table was also mentioned in the context of mass effectiveness, as probably the best presently available approach to this evaluation.

National family planning programmes were briefly discussed. It was pointed out that in some countries the words "birth control" could not be used. In others, like the USA, no federal or national programmes exist; and none can be established on a national basis, due to the peculiar internal political organization and the structure of the medical organization. Despite this, due to the efforts of voluntary organizations and local health departments, a particularly strong family planning movement exists in the USA. Family planning programmes in the USA have received some financial help from the federal government through programmes giving special assistance grants. But there are still 5,000,000 women of reproductive age in the USA who are not receiving family planning advice or services; and the least educated are the last to be reached.

The fallacy of relating statistics on use-effectiveness to the population of a given country or geographical area was discussed. It was pointed out that in most cases the evidence was indirect.

Several experts stressed the increasing role and importance of voluntary family planning organizations in assisting, advising and taking stock of government programmes. The importance of the work and responsibilities of the voluntary organizations has been increased rather than diminished by the existence of large government programmes. Having such

programmes does not mean a lesser role for those who were working before; but, on the contrary, a greater challenge, since no family planning organization, governmental or private, in any country, has been able to reach and serve all those in need. The private and voluntary organizations must therefore advise, police and fill the gap.

There was also discussion of the dangers of "over co-ordination" of government programmes, deriving from strong and rigid centralization and from bureaucratization. Lack of expert personnel, the mushrooming of programmes and unexpected rapid expansion due to the ready acceptance by the people do produce frictions; but it was agreed that it is preferable to have less central co-ordination and more flexibility since this will speed the establishment of services. Heavy bureaucratic machinery is a financial burden to all programmes, and usually slows implementation and development at the local level.

Several speakers stressed that it was desirable to have more demographers working in association with family planning programmes; and that their work should be *properly utilized* in programme design and evaluation, as well as in working out more sensitive indices to measure effectiveness in relation to the many variables.

Clear and careful stress was placed upon the need for avoiding duplication in the international field; and the need for better understanding and close co-operation among local governments, local voluntary associations, the IPPF and the international governmental assistance agencies and foundations. International co-ordination of efforts is needed for the success of local programmes; and local voluntary organizations and governments must co-ordinate and integrate their efforts if they are to succeed in their programmes and goals.

Session 10

RECENT DEVELOPMENTS IN THE BIOLOGICAL CONTROL OF FERTILITY

44. CONTINUOUS ADMINISTRATION OF 500 µg. OF CHLORMADINONE ACETATE AS A METHOD OF REGULATING FERTILITY WITHOUT INHIBITING OVULATION

J. Martínez-Manautou, J. Giner-Velázquez, R. Aznar-Ramos,
M. Lozano-Balderas, W.H. Rudel,
Institute of Social Security, Mexico

INTRODUCTION

The regulation of fertility by the use of hormonal compounds, begun by Pincus in 1955,¹ opened up an enormous field of investigation concerning the many aspects of human reproduction.

Our research group in Mexico was not satisfied merely to confirm these studies, but was eager to explore this fascinating work in greater depth.

Pincus noted numerous side-effects of varying importance associated with the high contraceptive efficiency of a combination of an oestrogen and a progestogen, and this led us to investigate the part that each of these hormones plays both in contraception and in the production of undesirable hormonal effects.

In 1964² we published our first studies showing the contraceptive activity of various synthetic and natural oestrogens used without progestational compounds. From this type of treatment, in which a progestogen was later added during the last phase of the menstrual cycle, sequential contraceptive therapy originated.

While this contraceptive method reduces the cost of treatment and the frequency of undesirable hormonal effects, its efficiency is also reduced.

Continuing our investigations, we decided to study the contraceptive efficiency of a progestogen, chlormadinone acetate, using doses of 500 µg. a day, administered continuously.

In 1965 and 1966³⁻⁷ we published our first results. These already showed a number of advantages, because of the small dosage of the steroid. These advantages have subsequently been corroborated.

The present article describes the results we have obtained with this contraceptive method to date.

MATERIAL AND METHOD

The study was carried out in the Fertility and Sterility Research Centre (Centro de Investigación sobre Fertilidad y Esterilidad), Mexico City. Included in the investigation were 1,123 fertile women aged less than 36 years.

The compound was dispensed in packages containing 60 500 µg. tablets of chlormadinone acetate.

At the first interview in every case a clinical history was taken and a general examination, including a gynaecological examination, was carried out. A sample of the secretions from the vaginal vault and from the cervix was also taken for cytological study by means of a Papanicolaou smear, and this was repeated every six months.

In a group of women chosen at random the urinary pregnanediol level was determined from 24-hour samples, collected between the 19th and 21st days of the first or subsequent cycles of treatment, and in two instances in serial samples of urine collected during two consecutive cycles, one before (as a control), and the other during treatment.

During the different cycles of treatment endocervical and endometrial biopsies were taken, most of which were fixed in formaldehyde and processed in the usual way for histological

study. Twenty-four of the samples were frozen immediately for histochemical studies, and 56 were fixed in glutaraldehyde for ultrastructural study.

In 115 women an examination was carried out, during different cycles of treatment, of the cervical mucus obtained between the 9th and 16th days of the cycle, in order to study its physical characteristics, the phenomenon of arborization and the penetrability of the spermatozoa (post-coital test).

In 50 women in different cycles of treatment a culdoscopic study was performed between the 17th and the 23rd day, and in 18 of the 37 cases in which an endoscopic diagnosis was made of the presence of a corpus luteum, the ovary was brought out into the vagina and a biopsy taken from the gonad.

The following laboratory analyses were carried out: haematic cytology, general examination of the urine, glucose, urea and uric acid in the blood, bilirubin in the serum, proof of retention of bromsulphalein, thymol turbidity and flocculation, glutamic pyruvic and glutamic oxaloacetic transaminase, and determination of protein-bound iodine.

Patients attended surgery every 60 days, to report to the doctor the appearance of any undesirable effects and to receive a fresh supply of tablets.

RESULTS

The continuous administration of 500 µg. of chlormadinone acetate for contraceptive purposes has been investigated to date in 1,123 women during 13,202 cycles of treatment. Fig. 1 shows that 126 of these women received uninterrupted treatment during 21 cycles.

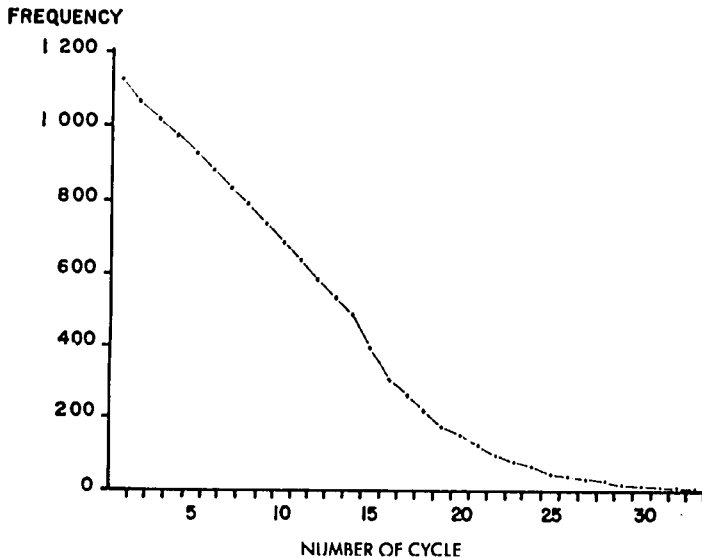


Fig. 1. Total of consecutive cycles in 1,123 women.

During this study 40 women became pregnant; six of these pregnancies were taken as failures of the method since the patient denied having suspended the treatment; the other 34 were the result of the patient having omitted the treatment for several days. These results show a clinical efficiency for the method of 3.7 pregnancies per 100 woman-years.

In 10 of the patients who became pregnant through omission of the treatment, the administration of chlormadinone acetate was continued during the first weeks of gestation while the differential diagnosis of amenorrhoea was being made. In every case, pregnancy followed a normal course and went to full-term; births were normal and spontaneous. Eight of the babies were male and two female. Careful physical examination of these children showed no congenital anomalies and no signs of virilization.

In order to ascertain the real number of tablets omitted by patients, a study was made in which each woman was given a packet with a known number of tablets and then recalled in a

period shorter than the time for which the tablets would last. At the following interview the patient was asked whether she had omitted any tablets and those left over were counted.

From a total of 58 women studied, 25 (43.1%) omitted from one to nine tablets, 20 (34.4%) did not omit any, and 13 (22.4%) used more tablets than was necessary. Only four patients stated that they had omitted some tablets; nevertheless the number of tablets declared as omitted was always less than the number found by the investigator when rechecking the tablets used.

The intervals between menstrual bleeding ranged from 21 to 24 days in 11.8% of the cycles, from 25 to 35 in 65.5%, and from 36 to 59 in 20.6%. Only in 2.1% of cases were periods of amenorrhoea lasting more than 60 days observed, and in no case did menstruation cease entirely (Table 1).

Table 1. Intervals between menstrual cycles

Intervals (days)	Menstrual cycles	
	Number	%
From 21 to 24	1,560	11.8
From 25 to 35	8,655	65.5
From 36 to 59	2,729	20.6
Amenorrhoea	258	2.1
Total	13,202	100.0

The duration and amount of menstrual bleeding was in most cases similar to that characteristic of each woman before beginning treatment. In 19 cases, blood-flow was very abundant and treatment had to be suspended.

During the first cycle of continuous administration of chlormadinone acetate, intermenstrual blood-flow occurred in 20.3% of women; this decreased progressively to 12.2% in the 6th cycle, 8.3% in the 18th cycle, and 2.3% in the 21st cycle. The amount of this flow was slight in most cases (Fig. 2).

In order to discover the mechanism by which this compound acts, urinary pregnanediol determinations were made on 138 samples taken during the second phase of the different

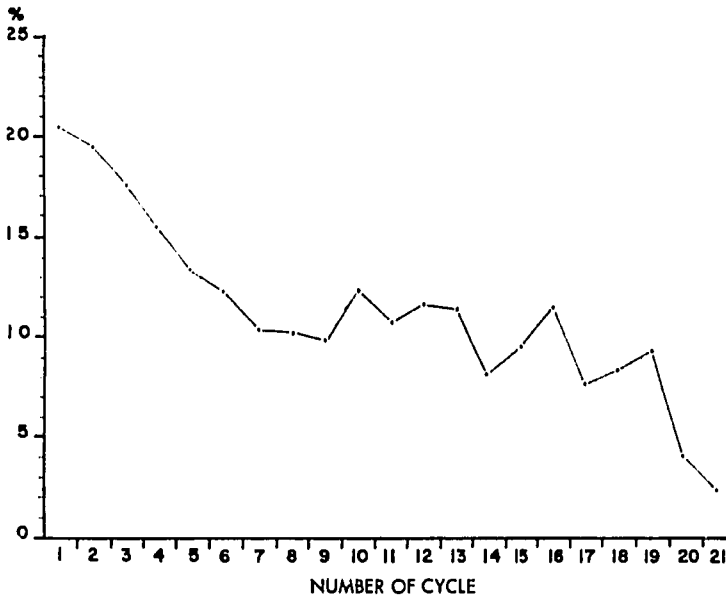


Fig. 2. Percentage of intermenstrual bleeding.

treatment cycles. According to the Goldzieher and Nakamura method used in this study,* amounts greater than 1.0 mg. in 24 hours indicate the presence of an ovulating cycle. In 71.5% of the samples studied, the figures for pregnanediol corresponded to non-ovulating levels and in 28.4% were characteristic of ovulation (Fig. 3).

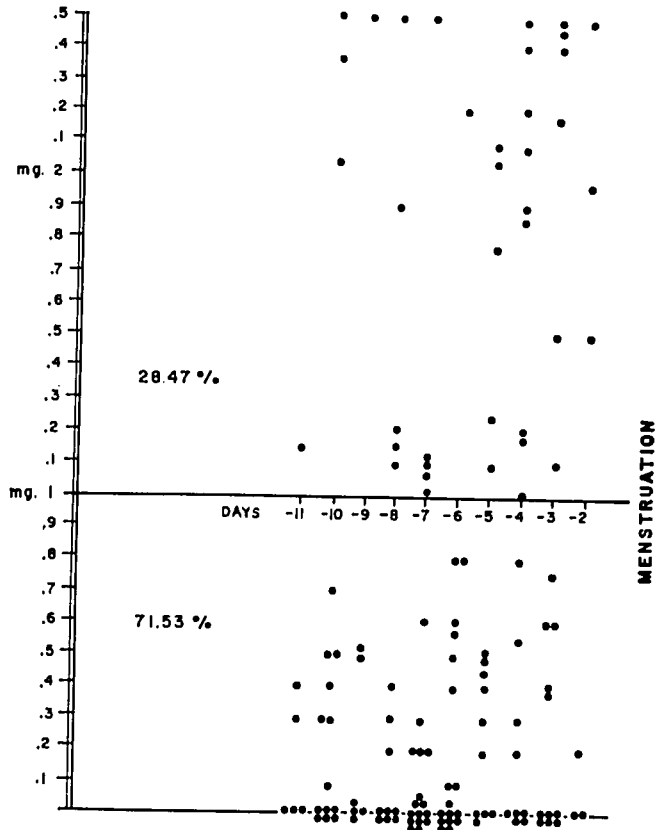


Fig. 3. Estimations of urinary pregnanediol.

In the two cases in which serial pregnanediol estimations were made, Sulimovici's method* was used, the curve of excretion of urinary pregnanediol corresponding in the first case to an ovulating cycle, while in the second it was non-ovulating (Figs. 4 and 5).

To investigate the effect of this type of therapy on the cyclic changes in the endometrium, 380 endometrial biopsies were performed; 37.9% were diagnosed as irregularly secretory, 30.5% normally secretory, 15% irregular, 9.5% proliferative, and 7.1% inactive (Table II).

Table II. Endometrial biopsies

Diagnosis	Cases	
	Number	%
Secretory, irregular	144	37.9
Secretory	116	30.5
Irregular	57	15.0
Proliferative	36	9.5
Inactive	27	7.1
Total	380	100.0

Histochemical techniques were used in 24 endometrial biopsies in this series. The condition of the endometrium in the ovulation specimens was similar in the first and 10th cycles of treatment. Of the 24 biopsies, 22 showed, histologically, a secretory endometrium with a pattern comparable to that which appears between the 18th and 27th days of the normal cycle, and only in two cases, one corresponding to the first cycle and the other to the 10th cycle of treatment, was an irregularly secretory endometrium observed with slight secretion and underdeveloped glandular elements.

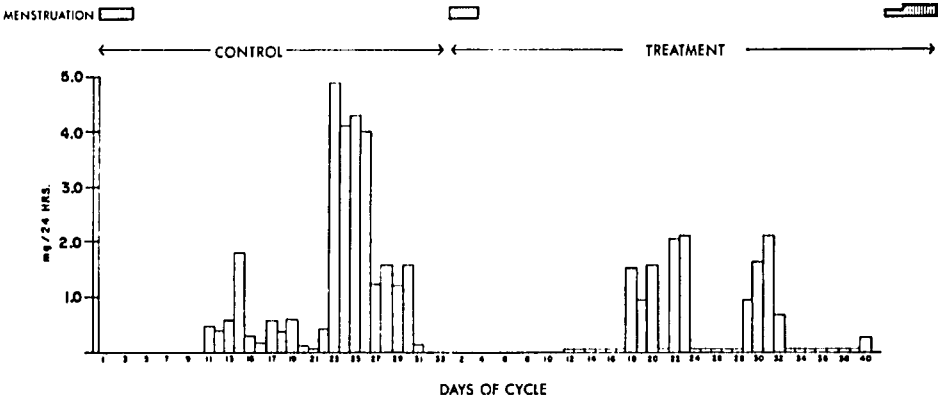


Fig. 4. Daily pregnanediol determinations.

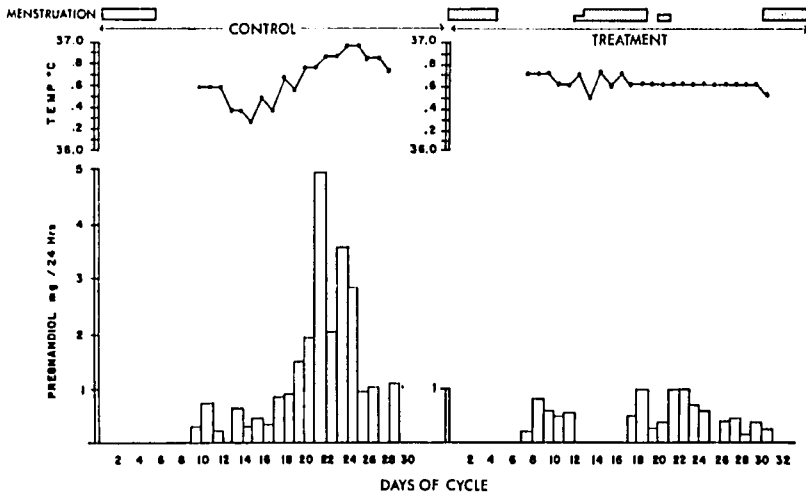


Fig. 5. Daily pregnanediol determinations.

Alkaline phosphatase activity in the 22 biopsies with normal morphology was comparable to that found in the secretory phase of the endometrium in women without treatment, i.e. only moderate activity existed in the walls of the spiral arterioles and minimal or nil in the glandular covering; the acid phosphatase activity also showed no modification in these 22 cases and there was evidence of slight to moderate activity in the epithelial cells and little or none in the elements of the stroma.

In only two of these 22 specimens did we find small intra-epithelial drops of fat and in seven cases there were drops of fat of small or moderate size in the cells of the stroma.

The distribution and amount of glucogen were similar to that found in the endometrium of the normal cycle; nevertheless it is as well to point out that studies were not made of a sufficient number of specimens to give a significant quantitative result.

The amount of both succinic and lactic dehydrogenase was normal in these 22 endometria, but in six cases the distribution and size of the granules were abnormal compared to the control material; the granules were in fact very large and intensely dyed, giving the impression of being an accumulation of small granules which had become joined.

In the two cases with an irregularly secretory endometrium there was a notable decrease in activity of both dehydrogenases. The glucogen was clearly diminished. There was also a smaller amount of activity in the acid phosphatase, while the alkaline phosphatase showed no change. In these two cases we found a few drops of fatty matter, both intra-epithelial and in the stromal cells.

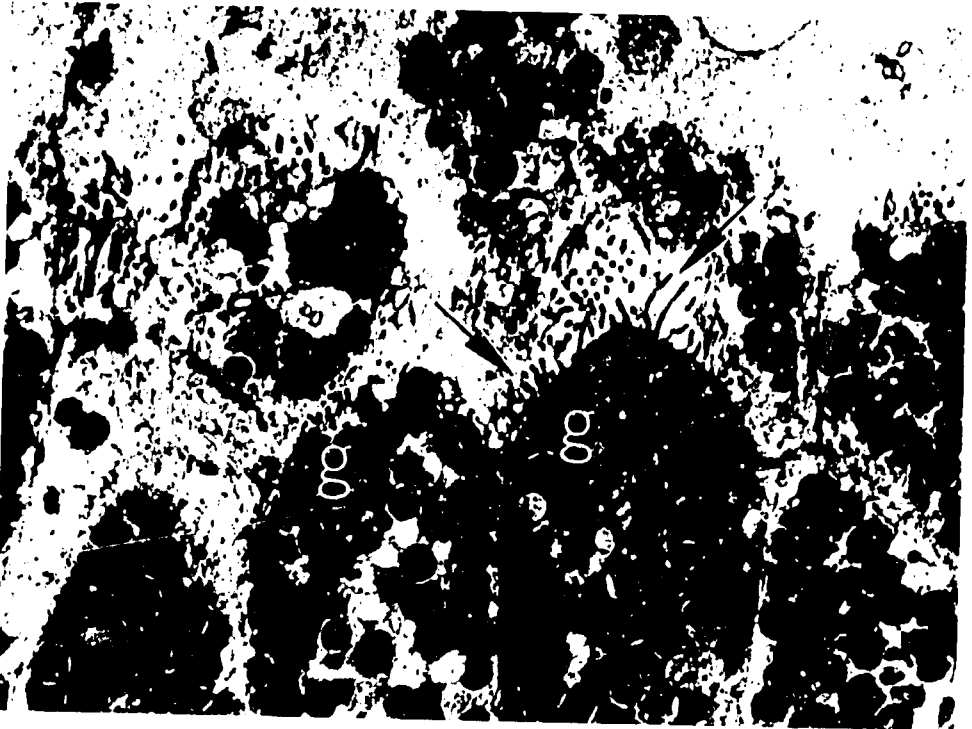


Fig. 6. Electronmicrograph showing the top part of four mucus secretory cells of an endocervical human gland. Numerous microvillousities can be seen (arrows) projecting towards the glandular lumen. The cytoplasm of the cells shows numerous secretory granules (g); some of these can be seen too in the lumen of the gland (reduced 50% from $\times 9,000$).

According to the above data, the alkaline and acid phosphatase and the glucogen in the normally secretory endometria do not undergo change; in approximately 30% of them the activity of the dehydrogenases is altered, and the remaining 70% show no histochemical modification.

The drops of lipid material observed corresponded to cases in which there was alteration in the distribution of the dehydrogenases, which seems to indicate that there is an alteration in the respiratory coefficient of these tissues.

In the irregularly secretory endometria both the morphology and the amount and distribution of all the enzymes are altered, with the exception of alkaline phosphatase.

In the electron microscopic study of the 16 endocervical biopsies, epithelial cells with two types of secretory granules, large clear ones, and small dark ones, were observed. The surface of the mucus cells showed microvillousity and in the cytoplasm small vesicles were found. Ciliated cells with microvillousity were observed, apparently as transitional phases between the mucus and ciliated cells. The stroma showed fibroblasts often full of glucogen, rounded cells, numerous collagenous fibres and occasional lymphocytes. The findings mentioned correspond

to a normal endocervical pattern as compared with the control group, and with those described in the literature (Fig. 6). The ultrastructure of the endometrium was studied in 30 biopsies made during the secretory phase of the menstrual cycle, and three histological conditions were observed—normal, irregular, and inactive. The normal condition showed epithelial cells covered by a cytoplasmic membrane furnished with numerous microvillousities, endoplasmic reticulum and an underdeveloped Golgi's apparatus, and without the microtubular system in the nucleolus, which has been described in the normal endometrium and has been interpreted as an anatomical sign of ovulation. The stroma showed cells with little cytoplasm and with only a little endoplasmic reticulum (Fig. 7).



Fig. 7. Electronmicrograph of several epithelial cells of an endometrial gland during the secretory phase. The cells are columnar and have irregular oval nuclei (N) where one or two nucleoli (asterisks) can be seen. In this phase some ciliated cells (C) can still be seen. Observe the numerous microvillousities (arrow 1) and the cilia (arrow 2) (reduced 60% from $\times 9,000$).

The ultrastructure of the irregularly secretory endometrium differed little from the normal; in it some reduction was noticeable in the microvillousities, with a normal appearance of the endoplasmic reticulum and Golgi's apparatus. In the inactive form of the endometrium a greater reduction was observed in the number and length of the microvillousities, endoplasmic reticulum and Golgi's apparatus, which was little developed, and as before, no tubular formations were observed in the nucleolus. In the stroma, cells with little cytoplasm were observed, occasionally with glucogen and endoplasmic reticulum and only slightly developed. The conditions interpreted as a normally secretory and an irregularly secretory endometrium were very similar in their ultrastructure, and the inactive form corresponded to a condition of atrophy, in accordance with the morphological details described.

The ultrastructure of the corpus luteum was studied in biopsies of eight ovaries. Cells of vacuolate cytoplasm were observed, with granular endoplasmic reticulum, prominent Golgi's apparatus and osmiophilic matter in the cytoplasm.

These morphological findings correspond to those described previously in the normal corpus luteum (Fig. 8).

The length of the menstrual cycle correlates with the histology of the endometrium, 90% of the cycles lasting between 20 and 36 days in those cases where the endometrium is normally secretory. As the glandular secretion diminishes, the number of cycles of from 20 to 36 days decreases, shorter or longer cycles taking their place.



Fig. 8. Electronmicrograph of three cells of human corpus luteum. The nuclei (N) of two cells can be seen in the micrograph. Note the globular and vesicular endoplasmic reticula (Er), elongated mitochondria (M) and little fatty matter (arrows) (reduced 60% from $\times 12,600$).

Specimens in Figs. 6-8 were fixed with osmium tetroxide (Palade), in Epon 812 and Araldite; the tincture was made with lead citrate and a Philips EM-200 electron microscope was used.

Owing to the discrepancy observed between the results of the pregnanediol determinations and the histology of the endometrium, we decided to investigate the frequency of ovulation in these women by culdoscopic studies. A total of 50 cases were examined, in 37 of which the endoscopic diagnosis showed a corpus luteum to be present; in six cases the morphology of

Table III. Culdoscopic studies

Findings	Cases	
	Number	%
Corpus luteum present	37	74.0
Inactive ovaries	6	12.0
Follicular activity. Corpus luteum absent	3	6.0
Ovarian cysts	3	6.0
Old corpus luteum	1	2.0
Total	50	100.0

the ovaries indicated inactivity of the gonad; in three cases follicular activity without formation of a corpus luteum was observed; in three cases ovarian cysts; and in one there was a corpus luteum not of recent origin (Table III).

In 18 of the 37 cases in which culdoscopic diagnosis showed the corpus luteum present, a biopsy of the ovary was performed, and the presence of an active corpus luteum confirmed in 12 of them. Three of the biopsies corresponded to normal ovarian tissue without the corpus luteum, two of them showed thecaluteal cysts and one an involuted corpus luteum (Table IV).

Table IV. Histopathological results of ovarian biopsies (performed when culdoscopy showed a corpus luteum to be present)

Diagnosis	Cases	
	Number	%
Active corpus luteum	12	66.8
Ovarian tissue without corpus luteum	3	16.6
Thecaluteal cyst	2	11.1
Involuted corpus luteum	1	5.5
Total	18	100.0

Studies were made of the cervical mucus in 115 women in this series during the 12th to 16th days of the first three cycles.

Modifications were observed in the physico-chemical characteristics of the cervical mucus, consisting in an increase of viscosity, decrease in filamentation, increase in cellularity, and inhibition of crystallization phenomena, which only attained between +++ and ++++ in 11% of the cases. Of the 115 post-coital tests made, 80% were negative, 15% were fair and only in 5% was the result positive (Table V).

Table V. Result of post-coital tests (Sims-Hühner)

Day of cycle	Number of cases	Negative		Faulty		Fair		Good		Excellent	
		Number	%	Number	%	Number	%	Number	%	Number	%
9	15	3	20.0	10	66.0	2	13.0	0	—	0	—
10	15	3	20.0	11	73.0	0	—	1	6.6	0	—
11	13	1	7.6	9	69.0	1	7.6	2	15.2	0	—
12	11	2	18.0	6	54.7	2	18.0	1	9.0	0	—
13	8	0	—	4	50.0	4	50.0	0	—	0	—
14	26	3	11.5	18	69.0	4	15.3	1	3.8	0	—
15	21	2	9.5	14	66.6	4	19.0	1	4.7	0	—
16	6	1	16.6	5	83.0	0	—	0	—	0	—
Total	115	15	13.0	77	67.0	17	14.7	6	5.2	0	—

Negative = No spermatozoa in cervical mucus.

Faulty = Spermatozoa present but motionless.

Fair = Between 1 and 5 spermatozoa with motility between 3+ and 4+.

Good = Between 6 to 10 spermatozoa with motility between 3+ and 4+.

Excellent = More than 10 spermatozoa with motility between 3+ and 4+.

In 12 women, daily appraisals were made of the concentration of sodium chloride in the cervical mucus, during one control cycle and one treatment cycle. In the 12 control cycles, the curve of concentration of sodium chloride rises towards the time of ovulation, whereas with administration of chlormadinone acetate it remains flat.

The undesirable hormonal effects most frequently observed with this contraceptive method were hypogastric pain and distension, nervousness and headache, with frequencies of 7, 6.7

and 5.6%, respectively. A smaller proportion of women suffered abdominal pain, diminution of libido, dysmenorrhoea, mastalgia, and nausea. Other side-effects such as chloasma, acne, mammary atrophy, increase in varices and loss of weight appeared so rarely as not to be significant (Table VI).

Table VI. Frequency of side-effects in 1,123 women

<i>Side-effects</i>	<i>Frequency</i>	
	<i>Number</i>	<i>%</i>
Hypogastric pain and distension	78	7.0
Nervousness	75	6.7
Headache	62	5.6
Abdominal pain	35	3.1
Diminution of libido	30	2.7
Chloasma	19	1.7
Dizziness	11	1.0
Dysmenorrhoea	11	1.0
Acne	10	0.9
Mastalgia	7	0.6
Nausea	6	0.5
Increase in libido	5	0.4
Mammary atrophy	3	0.3
Increase in varicose veins	2	0.2
Weight loss	2	0.2
Total	356	31.9

Haematic cytology, analysis of urine, blood glucose and urea, and tests of hepatic and thyroid function were carried out on a total of 44 women before administration of the chlormadinone acetate began, on 19 who had received 500 µg. of chlormadinone acetate during 7 to 18 cycles, and on 26 who had received it during 19 to 30 cycles.

In both the control determinations and those made during treatment, the haemoglobin and haematocrit values were below normal in 15.9% and 25.1% of cases, respectively. This percentage of abnormality did not change significantly during treatment.

The general urine analysis was normal in all the women studied. The test of hepatic function showed no alteration during treatment. Blood glucose and urea showed no important modification.

Thyroid function, as measured by the protein-bound iodine test, was not modified during the continuous administration of chlormadinone acetate.

Of the 1,123 women who completed at least one cycle of treatment, 271 or 24% withdrew from the programme for various reasons (Table VII).

Non-medical causes were the principal reason for withdrawal, with a total of 210 cases; 40 women discontinued treatment on account of pregnancy—34 from omission of the treatment and only six from method failure. In the remaining 21 cases, the reason for discontinuation was the existence of side-effects such as excessive bleeding or amenorrhoea.

DISCUSSION

The uninterrupted administration of 500 µg. of chlormadinone acetate to 1,123 women during 13,202 cycles, has demonstrated that this is a very effective method of regulating fertility.

Considering the low cultural level of the people studied, we feel it prudent to analyse independently the real effectiveness and the clinical effectiveness obtained with this method, to give a more accurate picture of its value in contraception.

In the 13,202 cycles, six women became pregnant without apparently omitting the treatment, for which reason they were considered as method failures, the real effectiveness being thus 0.5 pregnancies per 100 woman-years in accordance with the Pearl index. Another 34 women became pregnant through omitting the treatment, which gives us a clinical effectiveness of 3.7 pregnancies per 100 woman-years.

Table VII. Percentual distribution of the 271 patients who discontinued treatment

<i>Causes of discontinuation</i>	<i>Patients</i>	
	<i>Number</i>	<i>%</i>
Could not be discovered	58	21.5
Pregnancy from omission of one or more tablets	34	12.8
Change of address	31	11.4
Pregnancy after discontinuing treatment	27	9.9
Could not come for consultation	27	9.9
Objection by husband	19	7.0
Bleeding	16	5.9
Did not specify cause	15	5.5
Patient's illness	7	2.6
Would like to become pregnant	6	2.2
Pregnancy from method failure	6	2.2
Medical advice	5	1.8
Divorced or separated	4	1.5
Distrust of treatment	3	1.1
Discontinued treatment	3	1.1
Unspecified side-effects	3	1.1
Illness of husband	2	0.7
Surgery	2	0.7
Amenorrhoea	2	0.7
Adverse publicity	1	0.4
Total of discontinuing patients	271	100.0

In the study specially designed to check the veracity of the patients regarding the omission of treatment, 43.3% omitted one or more tablets but denied doing so; the packets containing the tablets did not give the patients any means of noticing such omissions. This leads us to believe that if a more adequate presentation of the medication were made which would allow the patient to know whether she had or had not taken the tablet each day, the number of pregnancies arising from omission of the treatment would be noticeably reduced and would give us in consequence an indication of clinical efficiency much closer to the actual one.

The frequency of hormonal side-effects such as nausea, vomiting, nervousness, chloasma, mastalgia, etc., observed with this method, has been much lower than that reported in hormone therapies, combined and sequential, with the single exception of transhormonal bleeding which was present in 13% of all cycles.

The scant interference in the hypothalamo-hypophyseal-ovarian axis during continuous administration of 500 µg. of chlormadinone acetate is evident from the occurrence of 65% of menstrual cycles of between 25 and 35 days, similar to Vollman's¹⁰ report on normal women not treated. Only in 2.1% of cases were menstrual cycles longer than 60 days observed and in no case did menstruation cease entirely.

We do not as yet know the mechanism by which this method operates, but it is certainly not the inhibition of ovulation, since approximately 70% of the women ovulate during treatment, as the culdosopic studies have shown.

The studies made on the cervical mucus suggest that this steroid modifies its physico-chemical characteristics, making it hostile to spermatic penetration. Nevertheless, the routine methods employed in studying the cervical mucus lack the precision needed to reach a definite conclusion in this respect.

The histological studies of the endocervix and endometrium by optical and electron microscopes, did not generally show any change which would elucidate the contraceptive mechanism of this steroid. Both analyses showed the endocervical samples to be normal in all cases.

Of the 22 cases of normally secretory endometrium in which histochemical techniques were employed, 16 were normal and in only six was a change in the distribution of succinic and lactic dehydrogenase observed, revealing a probable alteration in the respiratory coefficient

of this tissue. The two cases of irregularly secretory endometrium showed a diminution in activity of both dehydrogenases and of acid phosphatase, and a diminution in glucogen.

Since an irregularly secretory endometrium was observed in 37.9% of the 380 biopsies studied, these histochemical alterations could be important in explaining the contraceptive action of chlormadinone acetate. Their investigation would require a broadening of this study.

The laboratory tests to discover the toxicity of continuous administration of chlormadinone acetate showed no important effects.

CONCLUSION

From what has been said we conclude that contraception by continuous use of 500 µg. of chlormadinone acetate is effective in regulating fertility; is practical for continuous administration; exhibits a low incidence of hormonal side-effects; and is the first hormonal contraceptive method that does not primarily depend on inhibiting ovulation.

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45. SIX SEQUENTIALS

R. P. Shearman,

Department of Obstetrics and Gynaecology, University of Sydney

INTRODUCTION

In Australia there are currently more than 20 different oral contraceptives on sale, and many more undergoing clinical trial. It seems reasonable to say that their objective is the same now as it was in 1956 when Rock, Pincus and Garcia published their first paper on the use of oral contraceptives in women;¹ that is, to ensure fertility control with the minimum incidence of side-effects. The succeeding siblings and generations of oral contraceptives—seemingly endless in their proliferation—can only be justified, commercial considerations notwithstanding, by a reduction of side-effects without a reduction in efficiency.

It is the purpose of this paper to present results of clinical trials with five different sequential preparations (compounds A to E), and some laboratory data on a sixth (compound F). The degree of ovarian suppression has been assessed in the laboratory by assay of mid-cycle

Table 1

<i>Preparation</i>	<i>Days</i>	<i>Number of patients</i>	<i>Number of cycles</i>	<i>Pregnancy rate (per 100 woman years)</i>
A. Mead Johnson 0.1 mg. EO* 0.1 mg. EO + 2 mg. megestrol acetate	$\frac{16}{5}$	100	764	4.7
B. Mead Johnson (Ovin) 0.1 mg. EO 0.1 mg. EO + 25 mg. dimethisterone	$\frac{16}{5}$	100	496	2.4
C. British Drug Houses (Serial 28) 0.1 mg. EO 0.1 mg. EO + 1 mg. megestrol acetate Lactose	$\frac{16}{5}$ 7	1,187	13,000	0.3
D. G. D. Searle 0.1 mg. mestranol† 0.1 mg. mestranol + 0.5 mg. ethynodiol diacetate	$\frac{10}{10}$	280	4,186	0.6
E. Eli Lilly 0.1 mg. mestranol 0.1 mg. mestranol + 1.5 mg. chlormadinone	$\frac{14}{7}$	52	396	0.0
F. Parke Davis 0.05 mg. EO 0.05 mg. EO + 1 mg. norethisterone acetate	$\frac{10}{11}$	Midcycle oestrogens only		

*EO = ethynyl oestradiol

†Mestranol = ethynyl oestradiol 3 methyl ether

oestrogen excretion in a smaller group of women using sequentials containing either mestranol, 0.1 mg., or ethynyl oestradiol, 0.1 mg. or 0.05 mg.

SUBJECTS AND METHODS

The preparations used are shown in Table I. Clinical data have been collected on patients who took part in controlled clinical trials with compounds A to E. All these patients were resident in Australia and were seen at least once each month during the trial. Some of the results with compound C have been published previously.²

Twenty-four hour urine specimens were collected from patients taking compounds C, D and F at a time in the cycle before progestins were introduced. This was usually on days 9 and 10 of the tablets, corresponding to days 14 and 15 of the cycle. Urine was collected over 10 ml. of glacial acetic acid, and oestrone was assayed by Brown's short method.³ Patients taking compound F are resident in Fiji, and urine samples were air-freighted to Sydney.

RESULTS

CLINICAL

The number of patients, cycles of use, and pregnancy rates are shown in Table I. No attempt has been made to distinguish patient failures from tablet failures, as it is increasingly apparent that it is futile to attempt distribution of cause in retrospect. The type and dose of oestrogen in tablets A, B and C is identical and there is no immediately obvious reason for the disparity in pregnancy rates.

The commonest side-effect was nausea. The incidence in the first treated cycle varied between 14 and 20%, decreasing to 0% by the fourth cycle of treatment.

Breakthrough bleeding occurred in 3.4% of all cycles, with the highest incidence of up to 12% in the first treated cycle. Amenorrhoea occurred in less than 1% of cycles with all compounds.

In new patients, equal numbers showed weight gains or losses of more than 2½ lb., with the exception of the 10/10 formulation (D). Here one investigator found an equal distribution of weight change while another found a weight gain of more than 2½ lb. (27%) to be almost twice as common as weight loss of more than 2½ lb. (14.4%).

An increase in menstrual loss, sufficient to be classified as menorrhagia, occurred in 0.6% of the patients of one investigator using compound C.² However, other workers using the same preparation found an incidence of 2.8%. With compound D increased menstrual loss occurred in nearly 25% of patients during the first two cycles of use, but thereafter settled.

LABORATORY

Mestranol has been described as less potent pharmacologically than ethynyl oestradiol.⁴ However, there has been no evidence from the human female for or against this suggestion.⁵ The results in Table II do not indicate any difference in potency, at least in terms of ability

Table II. Midcycle oestrone excretion

Compound	Number of patients	Oestrone (µg./24 hr) mean ± S.D.
Combined tablets	108	2.2 ± 1.2
Mestranol 0.1 mg.	20	2.0 ± 1.7
Ethynyl oestradiol 0.1 mg.	18	2.6 ± 1.5

to suppress ovarian oestrogens. The results with 100 µg. of mestranol are not significantly different from those with 100 µg. of ethynyl oestradiol, nor is there any difference between these results and those previously established for mid-cycle oestrogen excretion in women taking a variety of "combined" tablets.^{6,7}

With 50 µg. of ethynyl oestradiol, however, the results are different (Table III). Only six patients have so far had assays performed, but one of these (E.S.) showed no evidence of

suppression in cycle 4, the levels being similar to those found during spontaneous cycles of the same stage. Repeat assays in cycle 6 showed that suppression was again inadequate. A study of oestrogen and pregnanediol excretion throughout this 5th cycle is in progress.

Table III. Midcycle oestrone excretion with 0.05 mg. of ethynyl oestradiol

Patient	Cycle number	Tablet day	Oestrone ($\mu\text{g.}/24 \text{ hr}$)
S.D.	3	10	5.3
D.C.	2	9	1.0
		10	0.8
E.S.	4	9	11.0
		10	14.6
	6	9	7.0
		10	7.6
J.S.	2	9	0.5
		10	0.7
A.S.	3	9	3.6
		10	2.5
J.G.	2	9	0.8
		10	0.8

SUMMARY AND CONCLUSIONS

Results from clinical trials of five sequentials indicate an acceptable pregnancy rate with all but one of them, and a low incidence of side-effects. There is no indication of an increased incidence of amenorrhoea as treatment is prolonged, nor is there, overall, any evidence of significant weight change.

Mestranol and ethynyl oestradiol appear to be of equal potency in ovarian inhibition at a dosage of 100 $\mu\text{g.}$ A dose of 50 $\mu\text{g.}$ of ethynyl oestradiol does not, however, appear to be sufficient.

I am most grateful to Drs. W. G. McBride, K. R. Heber, B. R. Hanley, H. U. H. van Alpen and L. Perry for giving me access to their clinical results.

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46. POST-COITAL ORAL CONTRACEPTION

J. McLean Morris and
Gertrude van Wagenen

*Department of Obstetrics and Gynecology,
Yale University School of Medicine, Conn., USA*

The observation that oestrogens in sufficient dosage administered to a woman post-coitally may prevent implantation of the ovum,¹⁻³ leads to obvious questions regarding practical clinical application. These include: types of compounds, dosage, timing and length of administration, degree of effectiveness, and side-effects.

Types of compounds. Oestrogens that appear to be effective in man include oral stilboestrol and ethynyl oestradiol, and parenteral oestrone. Mestranol would undoubtedly be effective, as well as ORF-3858 (1-methyl-2-ethyl-3-phenyl- Δ^4 -cyclohexenecarboxylic acid), although the latter is not yet available for human use. Studies now under way with a variety of compounds suggest that any oestrogenic substance in sufficient dosage will probably prevent implantation.

Time and length of administration. The effective period of administration of these compounds is only during the time between fertilization and implantation. In the primate, as opposed to lower species, oestrogens apparently have no effect after implantation has occurred.

As the time required for implantation is approximately 6 days, the duration of administration has usually been 4-6 days, depending to some extent how long after exposure the patient presents herself. Laboratory studies suggest that higher doses may be effective if the administration period is shorter, but no clinical experience is available on single high doses. In some instances medication has been given on alternate days for 3 doses.

In terms of clinical application this raises many questions relative to the timing of ovulation and sperm survival time. It is obvious that high doses of oestrogen cannot be given throughout the cycle without suppressing ovulation and encountering as many side-effects as occur with current anti-ovulation compounds, or even more. Therefore, while oestrogens may be considered effective post-coital contraceptives when a single mid-cycle exposure occurs, if coitus is occurring regularly the compounds are more properly post-ovulatory contraceptives.

Dosage. The original dosages employed were 25-50 mg. of stilboestrol, or 0.5-2 mg. of ethynyl oestradiol daily for 5 days. While there have been no pregnancies at these levels, experimental studies in the macaque suggest that the dosage of ethynyl oestradiol is borderline, and that 2-5 mg. may be a safer range in man.

Degree of effectiveness. In over 100 mid-cycle exposures in a series of patients ranging in age from 13 to 41 years there have been no pregnancies when either stilboestrol or ethynyl oestradiol at the levels indicated above have been given for 4 or more days post-coitally. Some additional successes have been reported by others using injectable oestrone (from pregnant mare's urine) in 2-20 mg. doses every other day for 3 or more days.

It is difficult to determine the statistical significance of such a clinical trial for a variety of reasons. The fact that a woman does not become pregnant after intercourse does not mean that a successful contraceptive technique has been employed. Reasons for uncertainty may be: (1) her fertility may not have been established; (2) the exposure may have been with a male of unknown fertility, or viable sperm may not have been demonstrated in the cervix; or (3) no temperature chart or other means may have been available to prove that ovulation occurred at the time of exposure.

In the majority of cases in this series the patients were multiparous with known midcycle exposure. A Huhner test was obtained whenever practicable. Patients who did not show an elevation of the basal body temperature of over 98° F. were not treated. Pregnanediol

determinations and endometrial biopsies were performed in some instances to confirm ovulation.

Failures. In evaluating contraceptive effectiveness, the fact that a patient does not become pregnant is of less positive significance than the occurrence of pregnancy. However, the clinical experience to date coupled with the experimental work in the monkey is such that failures may be attributed in all likelihood to (1) inadequate dosage or (2) incorrect timing.

Inadequate dosage. While there were a number of patients who did not become pregnant on what may eventually prove to be borderline or inadequate doses (such as 0.5-1.0 mg. of ethynyl oestradiol for 4-5 days), perhaps because they were more responsive than usual to the hormone, there was one pregnancy in an improperly supervised patient, who took 1 mg. of ethynyl oestradiol for 2 days only. Dr Eleanor Mears⁴ has reported 5 pregnancies out of 8 cycles in 5 patients when stilboestrol in the 3-10 mg. range was given for 5 days post-coitally.

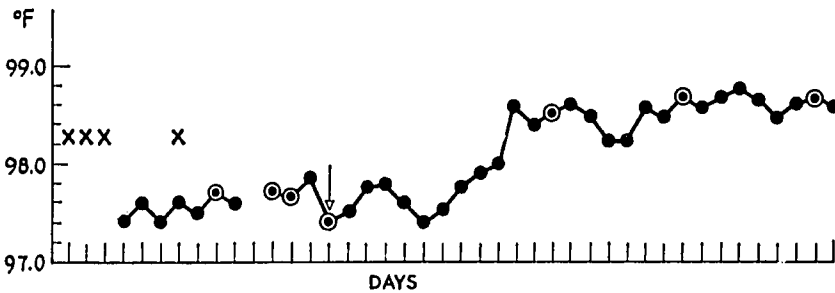


Fig. 1. Last exposure (arrow) 5-9 days before temperature rise. Patient pregnant.

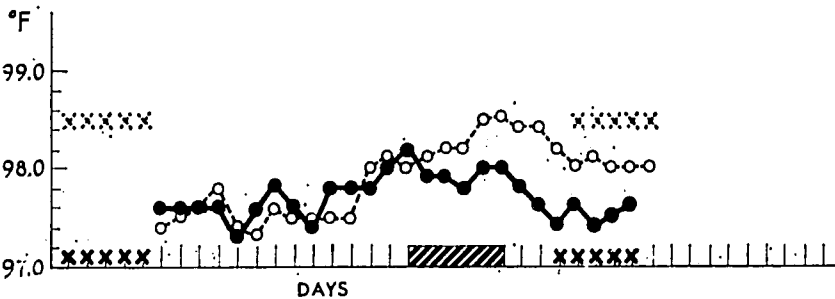


Fig. 2. Consecutive cycles with (solid dots) and without (circles) post-ovulatory ethynyl oestradiol, showing temperature fall with oestrogen administration.

Incorrect timing. A patient may be inaccurate about the time when exposure occurred or may report a single exposure when there may have been other unreported inseminations. Assuming that the time of exposure is known, there are still unsolved questions regarding sperm survival and if and when ovulation occurred.

Sperm survival. The generally accepted period for sperm survival in the female genital tract with capacity for fertilization is 3 days. This has been used for practical purposes in this study.

Occasional viable sperm have been recovered from the female genital tract as long as a week or more after intercourse. Whether sperm are capable of fertilization after this period is a matter of question. Kleegman⁵ has reported one case in which pregnancy resulted from insemination 7 days before the ovulatory temperature rise, and we have noted a similar case (Fig. 1).

Both these cases are unusual, but do not necessarily prove that sperm are capable of fertilization after they have been in the female genital tract for a week. It is equally possible that the temperature chart is in error and that ovulation occurred 4 or 5 days before the temperature elevation.

Timing of ovulation. The question is naturally raised as to the reliability of the temperature chart in the timing of ovulation. Many factors influence the accuracy of the basal body temperature. These include the accuracy of the thermometer, the ability to read it correctly, the reliability of the patient, and the nature of her activities, including how well she slept, significant alcohol intake the previous evening, the concomitant occurrence of any febrile disorder, or any other causes of temperature change.

In spite of these valid objections the basal body temperature still remains the best routine indicator of the time of ovulation, and a persistently elevated temperature beyond 14-15 days is one of the earliest indications of pregnancy.

The occurrence of pregnancy without a temperature rise to 98° F. or above appears to be extremely rare, and dependence on the temperature chart alone to time the administration of a post-ovulatory contraceptive would result in failure in such a case. Six patients were not treated because there was no temperature elevation for 3 or more days after exposure. One became pregnant (Fig. 1).

Effects and side-effects. The most consistent finding following oestrogen administration was the lowering of the basal body temperature (Fig. 2). This occurred most commonly within 12-24 hours, although in some instances several days passed before the temperature fell below 98° F.

A series of 60 consecutive temperature charts were evaluated, 25 representing control cycles and 35 representing treatment cycles (Table I). Because of the vagaries of single oral temperature readings, the first 2 days after the temperature reached 98° F. were averaged and compared with the average of days 7 and 8 one week later (in most of the patients on medication this coincided with the first 2 days after medication).

Table I. Average post-ovulatory basal body temperature (in °F)

	Day (1 + 2) 2 (°F.)	Day (7 + 8) 2 (°F.)	Difference (°F.)
25 control cycles	98·14 (98-98·5)	98·43 (97·8-98·8)	+ 0·29
10 stilboestrol treated (50-250 mg.)	98·18 (98-98·4)	97·83 (97·1-98·4)	- 0·35
25 ethynyl oestradiol treated (1·5-10·0 mg.)	98·15 (98-98·4)	97·82 (97·1-98·3)	- 0·33
			0·62-0·64

In the untreated patient the temperature tended to rise during the first week of the luteal phase and was found to average 0·29° F. higher on days 7 and 8 after ovulation than on day 1 and 2. The treated cycles at the end of medication averaged 0·64° F. lower than untreated cycles in the same patients.

Endometrial biopsies most commonly revealed a "retarded endometrium". Basal vacuoles, which are ordinarily not seen after the 4th post-ovulatory day, persisted for 6 to 12 days after ovulation. Areas of marked oedema alternated with areas of dense cellular stroma.

In two instances a mixed endometrium was encountered, with proliferative as well as secretory glands. The remainder of the biopsies, taken late in the cycle, showed normal late secretory endometrium.

Undesirable side-effects included those ordinarily associated with oestrogen medication and are listed in Table II. The only significant problem appeared to be nausea and, in some

Table II. Side-effects

	No. %
None	54
Nausea	40
Breast soreness	12
Prolonged menses	6
Insomnia	3
Unknown	6

instances, vomiting. This was significantly decreased when the oestrogens were taken at mealtime and when an antiemetic, such as prochlorperazine, 10 mg., was given in addition.

Mechanism of action. There is evidence to support a number of hypotheses regarding mechanism of action. These include accelerated ovum transport in the tube, changes in "stickiness" of the blastocyst, "retardation" of the endometrium with alterations in cell membrane permeability, modifications in glucose metabolism, or other changes adversely affecting the implantation site. More than one factor may be involved. Whatever mechanism is responsible, however, the "implantation interaction" described by Noyes *et al.*⁶ appears to be altered sufficiently by large doses of oestrogen to prevent implantation.

Summary. High doses of oestrogens given during the 4 to 5 days after fertilization appear to prevent implantation in man.

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47. A CONTRACEPTIVE INJECTION STUDY

E. T. Tyler

The Tyler Clinic, Los Angeles, USA

When we talk about contraceptive injections, there are two major types that are in use experimentally today. One of them is a *once-a-month injection*, which is intended to maintain the menstrual cycle in the same way as oral contraceptives are currently doing. These injections contain both oestrogen and progestogen, and they are given once approximately every 28 days. Injections are given on the eighth day of the cycle and the duration of action is such that withdrawal bleeding episodes occur about 26 days apart in about 70% of the subjects. Up to the present we have been giving these injections to about 700 patients in this particular series and there have been no unplanned pregnancies, but there are a number of variations in the bleeding pattern.

To illustrate how these injections are given and their convenience, they are pre-packaged in such a way that the part of the syringe that keeps the needle sterile is removed and becomes the plunger for the syringe. When the injection is given, the entire material is discarded. From that standpoint they are extremely convenient. We have not as yet analysed our data in this series for a report, but plan this at a later date.

The *once-every-three months injection*, which will be discussed in detail in this paper, is prepared in a similar way. The medication used is medroxyprogesterone acetate. In the USA, at present, the material is on the market, but is only approved for therapeutic purposes, such as in endometriosis and spontaneous abortion; for contraceptive purposes there is no approval. We have used medroxyprogesterone acetate experimentally in doses of 150 mg. intramuscularly every 90 days. In our series of 136 patients, we have used a relatively fertile group, about two-thirds of whom have had at least three full-term pregnancies. Two-thirds had also had a pregnancy which ended within a year of starting the injection programme. In addition, we restricted the group to those who had not had any hormone treatment within 90 days of the time of starting the injections. All patients were in the age group of 15 to 40 years.

It should be noted at this point that with this programme we are dealing with a new concept in hormonal contraception. In all the other types of contraception that have been used systematically, there has been an attempt to maintain, at least to some degree, the normal menstrual pattern. Even with the low dosage, or "microdose" chlormadinone and other progestogens, there is at least the hope that the normal pattern will be maintained. With this particular type of contraception, we are not specifically trying to maintain what we would consider to be normal cycles, and we accept the fact to begin with that there are going to be menstrual difficulties. The patients are not going to be regular from the standpoint of having 28- to 30-day cycles. They are just going to bleed at random, so to speak. To illustrate this, we tried to obtain some kind of bleeding pattern tabulation that would make a little sense. To do this, we went through the records and picked out those patients in the group of 136 who had had at least 10 bleeding episodes, which we could say amounted to "periods". By that, I imply that they had at least 10 instances where there was a start of bleeding and then a stop, and then a start again. We considered that the time between the start of one bleeding episode and the start of the next, would be considered an interval. We did not consider it a cycle because the term "cycle" implies a certain regular sequence. We found that there were 17 patients who had completed 10 intervals, but the time required for this varied from about 5½ months (153 days) to as long as 425 days—or about three times as long. In other words, some women had what we would consider a "period" 10 times within 5½ months, while others had periods 10 times within about 18 months. This, of course, gives some idea of the unpredictability of the bleeding pattern.

In considering this material, we have to stress that we are talking about intervals and not cycles. In considering these separate intervals it is apparent that the number of days is quite variable from interval one to interval 10, ranging from an average of about 19 days to an average of 32 days. These figures are simply averages, but I think it is more important to call attention to the range. Some women will bleed again within three days, others will go as long as 146 days before they bleed again, with many going well over 50 to 60 days before they have another bleeding episode. Therefore, "amenorrhoea" or missed periods is one of the problems related to the use of this medication. Of course, at the other end of the spectrum we have a number of women who will bleed, stop, and start bleeding again right away, with no regular pattern.

We have also analysed the number of days of bleeding that occurred in the intervals. This was found to range, as averages, from about six to 20 days, and there is no definite trend in duration going from the first interval to the tenth. There did seem to be a little tendency towards shorter bleeding in the later intervals, and I think this is correlated with some of our other data. But it should be noted that the bleeding varied from a single day to as many as 50 or more days of continuous bleeding. Another way of looking at the bleeding situation, is to add up the number of days that all the women have been given the injections. By totalling the number of women who have had the injections, and the number of days since the first injection, this gives us the number of woman-days of injections. We can then estimate the percentage of bleeding time by adding up the days of bleeding for all the women. Using these calculations, we found that during the first interval the women were bleeding about one-third of the time. As we went along further in the course of therapy (and we are up to about two years now) the percentage days of bleeding became less. In the next interval, for example, it was about 21%. It got down to about 16% in the third interval. If one calculates the amount of time that women bleed without any therapy, considering perhaps a five- or six-day menstrual period and a 28-day cycle, women normally bleed about 17% of the time. Therefore, by the third interval we are fairly close to the normal average number of days of bleeding. It may very well be that all these figures are not really comparable because we are dealing with irregular types of bleeding, even though the total days are the same.

Accepting bleeding abnormalities as the major side-effect, we should at this point consider the side-effects usually associated with hormonal contraceptives. Unfortunately, it is very difficult to interpret the significance of some findings. For example, in our series, for some reason nervousness seems to be the major complaint (other than bleeding irregularities) and averages about 8%. Nausea is the next most frequent, but when we deal with nausea, we have to consider that many of these women realize that other patients who are taking oral contraceptives have some degree of nausea, and it may very well be that they are volunteering nausea as a complaint even though it is not really caused by the injections. But since we have to record any untoward effect that may occur during medication, each instance is noted. Other side-effects are of a very low degree of magnitude and I do not think they are very significant. None of these has been a major problem. The major problem, obviously, is bleeding or lack of it.

The important point, of course, is how the women accept this particular type of injection. First of all, in our clinics, we use the so-called "cafeteria" system. Patients are able to choose any method they like. Therefore, the women who decide they want the once-every-three-months injection, have already turned down the once-a-month injection because they do not like the frequency, they have turned down all oral contraceptives, and they have turned down intra-uterine devices—so they have some kind of empathy for this type of therapy. We have, I would say, a group that is really anxious to maintain itself on once-every-three-months injections. There is undoubtedly quite a good amount of motivation here, but regardless of that, it is very important to note that with all the difficulties in bleeding, only about 5½% discontinued this particular programme because of bleeding problems. When we eliminate those who moved away and those who could not get to the clinic, our total possible medicine-related drop-outs would be less than 20%, which I consider rather good in any series.

Of major importance is effectiveness, and as of January 1967 there were about 1,100 woman-months of use. During this time there were no pregnancies.

Our study has also had the additional objective of obtaining data on return of fertility.

We took a separate group of about 30 patients and gave them one to three injections and then tried to determine how soon after the last injection ovulation re-occurred. We also tried to induce ovulation with chlomiphene and we are now trying it with human menopausal gonadotrophin (HMG). I might mention that to test for ovulation we used the usual criteria, such as pregnanediols, endometrial biopsies, basal temperatures, cervical mucus studies, vaginal smears and examinations of the patient, etc. To summarize our findings, about one-third of the group resumed ovulation within about six months, but that did not mean that they consistently ovulated after that. For example, one patient who ovulated at five months, did not ovulate again until about eight months, and consistent ovulation did not start until about a year after the last injection. On the other hand, there were a few who ovulated at six months and then at seven and then ovulated consistently after that. Virtually all patients ovulated within a year of the last injection.

I would say that in general this is a very unusual contraceptive method, because we get effective protection from pregnancy, but we have the difficulty of very irregular bleeding with no particular menstrual pattern at all. We have, on the other hand, the convenience of only one injection every three months, with nothing added in between. Possibly when the work of Dr. J. Zanartū and others develops, it may be every six months. Therefore, we do have this matter of convenience. The patient does not have to be as motivated as patients are on oral contraceptives, because this is something that may be utilized by a public health team, and from that standpoint it has certain advantages. It also may ultimately have the advantage of, perhaps, lack of expense, because the manufacturers say that eventually the medication will not be too expensive to produce and market. At present, I believe we have something that should be tried to a greater degree, perhaps in some of the developing countries, to determine its acceptability in various cultures.

48. EFFECT OF ORAL CONTRACEPTION ON LACTATION

Siva Chinnatamby

Family Planning Association of Ceylon

All oral contraceptives are composed of a progestogen and an oestrogen. Since the development of the breast and milk secretion are both influenced by oestrogen as well as by progesterone, it would appear that oral contraceptives should have an effect on lactation. This effect has been inadequately studied. A few reports indicate that higher dosages appear to decrease lactation, though at lower dosage there is little effect (WHO 1966). This study was undertaken to evaluate the effect of oral contraceptives on lactation and the effects on the baby of excretion of the hormones in the maternal milk.

EFFECT ON THE BREAST

Oestrogen causes thickening of the nipple and marked growth and branching of the ducts. These changes probably account for the duct changes occurring at puberty. In certain animals like cows and goats, oestrogen administration produces alveolar development as well as secretion of milk.

Progesterone given alone when the breast is underdeveloped or following its growth under oestrogen treatment, produces no changes; but when given at the same time as oestrogen causes marked glandular development which may ultimately be equivalent to that attained at the end of the first half of normal pregnancy. No secretory changes occur, however.

BREAST FEEDING

The behaviour pattern of breast feeding is to some extent dependent on the ability to lactate, but many women in affluent societies never attempt breast feeding or abandon it early. It is usually believed that women in developing countries breast feed their infants for periods varying from 18 months to two years. This is mainly considered to be due to the non-availability of food substitutes and the infants are practically dependent on human milk for their dietary protein. There is, however, a trend at present towards abandoning breast feeding, for some of the reasons given below:

1. Working mothers find it difficult to breast feed during the day time.
2. Powdered milk is available in all "well-baby" clinics and mothers prefer to give it to the baby, though it is really meant for the mothers, to increase their milk supply.
3. Most of the mothers in rural areas do not like to take cow's milk, and their diet is deficient in essential proteins. They are, therefore, advised to give supplementary feeds, and this advice often results in breast feeding being abandoned.
4. There is now a drift of population from the rural areas to the towns, with a concomitant trend towards abandoning breast feeding.

THE TRIAL

When Family Planning Advice Clinics were started in postnatal clinics, the problem arose as to the most acceptable contraceptive methods for the women, especially those belonging to the low socio-economic groups. Conventional methods were not practised and acceptability was low. Intra-uterine devices (IUDs) were not in use then. The oral contraceptive was gaining in popularity in other clinics, and it was therefore decided to offer the Pill to those mothers who visited the clinics six weeks after delivery. As the effect of the Pill on lactation has not been established so far, the women were told of the uncertainty of its action in this respect. All the women who participated in the trial were willing to take the chance, since to them avoiding another baby was a greater need than nursing.

There were more than 600 women in the trial, but for the purpose of this paper, the results in only 150 have been analysed.

Age

The majority of the women were in the age group 21-35 years (Table I).

Table I. Age group

Age in years	15	16-20	21-25	26-30	31-35	36-40	40+
No. of cases	0	18	34	58	25	15	0

Parity

The parity of the women included in the trial is shown in Table II; most had two to four previous pregnancies.

Table II. Number of children

No. of children	1	2	3	4	5	6	7	8	9	10	11
No. of cases	8	35	29	24	16	12	8	5	4	7	2

Socio-economic Level

Of the women 49% had an income of less than Rs. 100/- (\$20) a month, 83% had an income of less than Rs. 200/- (\$40) and 94% were under Rs. 300/- (\$60) a month.

Body Weight

No less than 81% of the women were under 100 pounds in weight.

Period after Delivery

The selection of cases was mainly from women who had lactated for more than three months in previous pregnancies. The women were selected within three months of delivery (Table III).

Table III. Time of selection

Period after delivery	4 weeks	6 weeks	2 months	3 months
No. of cases	22	50	40	38

Preparations Used

Different contraceptive tablets were used without restricting the trial to any one kind. The number of cases in the different groups is insufficient for comparison, but the trial continues

Table IV. Oral contraceptives used

Trade name	Preparation Progesterone	No. of women using preparation	No. of women with suppression of milk	
			In 1 cycle	In 3 cycles
Conovid E	Norethynodrel, 2.5 mg.	30	4	18
Lyndi 1	Lynocstrenol, 5 mg.	20	3	12
Lyndiol 2.5	Lynocstrenol, 2.5 mg.	20	0	2
Anovlar	Norethisterone acetate, 4 mg.	10	1	4
Ovulen 1 mg.	Ethynodiol diacetate	20	0	1
Sc 11800 3 mg.	Ethynodiol diacetate	10	0	5
Sc 11800 2 mg.	Ethynodiol diacetate	10	0	1
Sc 11800 0.5 mg.	Ethynodiol diacetate	15	0	0
Sc 11800 0.1 mg.	Ethynodiol diacetate	15	0	0
Total		150	8	43

and at a later date a comparative study will be made of the effects of different contraceptives on lactation.

The types of preparation used in this study and the number of women given each type are shown in Table IV, together with the number of women with suppression of lactation within one and three cycles.

Effect on Duration of Lactation

Duration of lactation in previous pregnancies and the effect of contraceptives with and without administration of supplementary feeds to the child are summarized in Table V.

Table V. Duration of lactation

	No. of cycles					
	1	3	4-6	7-9	10-12	13-18
No. of cases in previous pregnancies	2 1.4%	23 15.3%	60 40%	30 20%	30 20%	5 3.3%
	16.7%		83.3%			
No. of cases during contraceptive therapy without supplementary feeds	8 5.3%	36 24.4%	50 33.3%	27 18.3%	26 17.3%	3 2%
	29.7%		70.9%			
No. of cases during contraceptive therapy with supplementary feeds	0	0	15 10%	31 20.9%	25 16.6%	20 15%

In Table V, eight (5.3%) of the women had marked suppression of lactation in the first cycle and they had to resort to artificial feeds.

Thirty-six women (24.4%) were able to carry on for 3 cycles with breast feeds only, and of these, 15 (10%) were able to continue for about six months with supplementary feeds.

Fifty women (33.3%) breast fed successfully for 4-6 cycles, and for the next 3 cycles 31 of these (20.9%) continued to feed with supplementary feeds.

Twenty-seven women (18%) were able to lactate for 7-9 cycles without any suppression at all, and 25 of these (16.6%) had slight suppression after the 9th cycle, but continued to breast feed for 10-12 cycles with supplementary feeds.

Twenty-six women (17.3%) lactated for 10-12 cycles and 20 of these continued to lactate, giving at least three feeds a day up to 18 cycles.

Of the women, 83.3% had lactated in previous pregnancies for more than 4 cycles, while of those having oral contraceptives 70.9% breast fed for the same period.

Only 43.3% of the women had given breast feeds for more than 7 cycles in previous pregnancies; while taking oral contraceptives 37.7% continued to breast feed without supplement.

Only 16.7% of women stopped breast feeds within three months in previous pregnancies, while 29.7% had to abandon breast feeding in three months owing to suppressive action by the Pill. Of these, 56% who had marked suppression of lactation in 3 cycles with oral contraceptives had not lactated for more than 4 cycles previously.

This study therefore indicates that there is a certain degree of suppression of lactation which varies with the dose of progesterone in the preparation (since the amount of oestrogen in the different preparations is more or less the same). The higher the dose of progesterone used the greater the degree of suppression of lactation. The degree of suppression of lactation also varies with the duration of lactation in previous pregnancies. The shorter the duration of lactation in previous pregnancies the greater the degree of suppression of lactation with the Pill.

Views of Mothers

All the mothers were interviewed to find out the effect of the Pill on breast feeds: 44% definitely felt that the Pill had no suppressive action on lactation, while 56% stated that they

were unable to continue breast feeds because the milk was reduced after taking the oral contraceptive pills.

Effect on Postpartum Amenorrhoea

Lactation is associated with a delay in the return of menstruation. This was considered to be due probably to non-secretion of the gonadotrophins FSH and LH, but this is now disputed, as pregnancy can occur during the period of amenorrhoea. The period of amenorrhoea after childbirth normally varies from one to 30 months in different women and in the same women in different pregnancies.

In one study, 78.7% of the women had amenorrhoea for an average of nine months or more when no oral contraceptives were taken, but 83.3% of these had amenorrhoea of only one month since oral contraceptives were started. The longest duration of amenorrhoea was 11 months in one case where Lyndiol, 5 mg., was given. These results are shown in Table VI.

Table VI. Average duration of amenorrhoea

	Months													
	1	2	3	4	5	6	7	8	9	10	12	15	18	24
Before use of oral contraceptives (No. of cases)	4	6	3	2	7	4	2	4	10	30	68	2	6	2
During use of oral contraceptives (No. of cases)	125	15	4	2	1	2				1				

Endometrial Biopsy

Endometrial biopsies were done on the women at varying periods in the postpartum amenorrhoeic period before the oral tablets were issued. Biopsies were done as early as the 4th week to see how soon ovulation starts in these cases, and were compared with those done after oral contraceptives were started. The biopsies were also done on women with amenorrhoeic cycles while taking oral contraceptives. The biopsies are illustrated by Figs. 1-3.

Babies

It was not possible to get the women to bring the babies on each visit. The birth weight of each baby was recorded at the 3rd month, at the 6th month and at 1 year.

According to the average birth weight of babies in Ceylon (which is under six pounds) the gain of weight of the babies in the trial group was satisfactory, but this is not a very accurate record as most of the women fed the babies on coriander water, rice water, etc., as well, and sometimes failed to mention that these substitutes were given (as it was taken for granted by them that this is a routine which needs no mention).

Effects on the Babies

Withdrawal bleeding. No case of bleeding per vagina in any infant was recorded.

Enlargement of breasts. This symptom was specially looked for—but no baby had any breast enlargement.

Vomiting. One baby had vomiting and the mother had to give up nursing. Another baby refused to take the milk after the mother started the pills.

Limitation of the Trial

1. Women relied entirely on their memory as regards duration of lactation and amenorrhoea after the previous pregnancy.
2. It was not possible to record the weights of the babies at each visit.
3. Supplements like rice water and coriander were given to babies in addition to mother's milk and it was not possible to stop this custom.

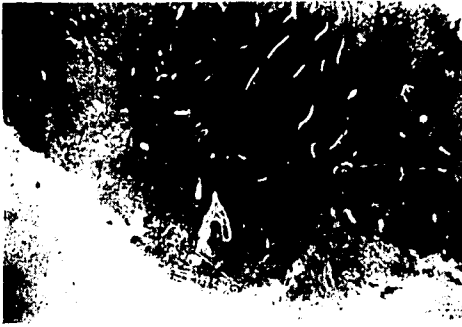


Fig. 1. This illustrates the endometrium four weeks after delivery, under low power. There is evidence of ovulation: the glands are dilated and tortuous and increased in number. The stroma is loose and shows early oedema.



Fig. 2. Same as Fig. 1, under medium power.



Fig. 3. Slide from a woman who had amenorrhoea for 11 cycles while using Lyndiol, 5 mg. Note the glands which are reduced in number and are simple and tubular. The stroma is scanty and avascular.

SUMMARY

One hundred and fifty women during the lactation period within 12 weeks after delivery were given different oral contraceptives. The majority of them were from a low income group and their nutritional status was below the average standard of the women in developed countries.

In 5.3% of the cases lactation ceased in the first cycle itself; in 29.7% there was marked suppression of lactation in 3 cycles; 33.3% of the women continued to lactate for 4-6 cycles; 18.3% lactated for 7-9 cycles; and 17.3% had no suppression of lactation for 10-12 cycles. A total of 37% lactated for a period of 7-12 cycles. This is compared with their previous periods of lactation.

From this study it would therefore appear that there is a certain degree of suppression of lactation which varies with the dose of progesterone in the preparation (since the amount of oestrogen in the different preparations is more or less the same). The higher the dose of progesterone used, the greater the degree of suppression of lactation.

The degree of suppression of lactation also varies with the duration of lactation in previous pregnancies. The shorter the duration of lactation in previous pregnancies the greater the degree of suppression of lactation by the Pill.

Of the women, 44% were of the opinion that oral contraceptives had no suppressive action on lactation, while 56% felt that they could have lactated longer had they not taken the Pill.

The period of postpartum amenorrhoea was definitely reduced in the trial group.

No side-effects like withdrawal bleeding or enlargement of breasts, etc., were found in the babies.

49. LONG AND SHORT-TERM SIDE-EFFECTS OF ORAL CONTRACEPTIVES

R. Nicholson

*Department of Gynaecology, University of El Salvador,
Buenos Aires, Argentina*

The dilemma we should like to resolve is whether the usefulness of the drugs used for regulating fertility outweighs their possible dangers and contraindications. Our results are based on observation of 355 private patients with a total of 4,652 cycles using the different products actually obtainable in Argentina, in whom 655 treatment programmes have been carried out.

We have not included the results of the Fertility Clinic of the Institute of Gynaecology at the University of Buenos Aires, to which we belong, so that we can compare the data obtained personally by us. The questioning procedure we have followed is to ask patients at each consultation whether they were able to tolerate the tablets or, without specifying, whether they experienced any symptoms. This form of questioning furnishes us with the symptoms for each medication.¹ To compare symptoms, we have grouped the medications according to the similarity of the drugs as follows:

1. Norethynodrel 10 mg. + mestranol 0.15 mg. (NE-M).
2. Lynoestrenol 2.5 mg. + mestranol 0.075 mg. (L-M).
3. Norethisterone acetate 4 mg. + ethnyloestradiol 0.05 mg. (EO).
4. Norethisterone diacetate + mestranol (DNE-M).
5. Norethisterone + mestranol (N-M).
6. Sequential, with mestranol + chlormadinone or acetoxyprogesterone (Seq.).

In the tables showing our results we have used the abbreviations to indicate the drug used. The finding that the difference in dosage does not substantially alter the effects of the products in each group, makes this grouping possible.

As an indication of the intensity of the symptoms, we have characterized tolerable symptoms as *light* and those which caused the suspension or change of medication as *intense*.

SHORT-TERM DISADVANTAGES

We shall outline the effects on the different systems and organs of the body shown by the products in use today.

EFFECTS ON THE DIGESTIVE SYSTEM

Nausea, vomiting. In combined therapy, we have always attributed these symptoms to the presence of oestrogens, but the fact that Goldzieher *et al.*² had only 2.5% of nausea and 0.4% of vomiting with sequential mestranol alone, leads us to doubt this. These results contrast with those of Balin and Wan³ who found 7.7%. Kopera *et al.*⁴ expressed the opinion that these symptoms were psychological, a throwback to pregnancy; García *et al.*⁵ had equal percentages with placebos and norethynodrel. Drill⁶ compared the statistics of 42 authors using different types of Pill, whose results varied between 2% and 73%. Nausea and vomiting are more frequent in the first days or weeks of treatment, then show spontaneous improvement.⁷

Epigastric symptoms. Cook *et al.*⁸ using norethynodrel for 518 woman-years gave the exceptionally high figure of 24%.

Heartburn.

Nausea.

Salivary disturbance.

Abdominal distension.

Gastroduodenal ulcer. Although we do not believe these drugs can cause this, we add it because we observed one case during treatment.

Intrahepatic cholestasis. Various authors⁹⁻²⁶ have employed different tests and dosages to discover the structure of the hepatic cell and its functions: cephaline-cholesterol flocculation, thymol turbidity, serum alkaline phosphatase level, bilirubinaemia, glutamic pyruvic and glutamic oxaloacetic serum transaminase, purification and retention of bromsulphalein.

Specific tests show that there is no real parenchymal effect; Gorodisch *et al.*,¹⁴ with the electron microscope, observed a pericanalicular pigmentary impregnation of a substance reminiscent of lipofuscin and a mitochondrial polymorphocytosis.

Occasionally jaundice of the obstructive type is produced by a predominantly centrilobular stasis with alteration of the permeability of the canaliculi and upset of biliary elimination. These observations have been more frequent in menopausal women and with mestranol alone or in association with norethynodrel or lynoestrenol. Effects are similar to those seen in pregnancy or with oestrogen treatment.

The elimination tests show changes with ovulation suppressants, which return to normal after interruption. We agree with Kirchhoff and Haller^{27,28} who recommend investigation with bromsulphalein every six months. We are also testing Paris green indocyanin.

We believe that the action of oral contraceptives is immediate and can only be investigated during the first month of ingestion, but we are still not sure of this.

Table I. Percentage of effects on the digestive organs

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Nausea and vomiting	4.2	7.2	10.0	3.7	9.5	4.1	2.8	5.6	—	7.4	3.8	6.7	6.7	5.3
Abdominal distension	0.5	—	3.7	1.2	2.4	1.2	—	—	—	3.7	—	1.0	1.5	0.9
Epigastric symptoms	—	0.5	2.5	—	1.6	0.4	—	2.8*	—	—	2.8	2.0	1.3	0.7
Sialorrhoea	—	—	—	—	0.4	—	—	—	—	3.7*	—	—	0.1	0.1
Anorexia	0.5	—	—	—	—	—	—	—	—	—	—	—	0.1	—
Nausea	—	—	1.2	—	—	—	2.8*	—	—	—	1.0	—	0.4	—
Heartburn	—	—	1.2	—	—	—	—	—	—	—	—	—	0.1	—
Gastroduodenal ulcer	—	—	—	—	—	0.4	—	—	—	—	—	—	—	0.1
Intrahepatic cholestasis	—	—	—	—	—	0.4	—	—	—	—	—	—	—	0.1
Hepatic insufficiency (BSF)	—	—	—	1.2	—	—	—	—	—	—	1.0	—	—	0.3
Total digestive effects	5.3	7.7	18.0	6.2	14.0	6.6	5.7	8.5	—	14.8*	7.6	10.5	10.3	7.9

L: Light or mild

I: Intense or serious

*: Statistical data not significant

Table I illustrates our personal experience with the effect of various products on the digestive system.

EFFECTS ON THE CENTRAL NERVOUS AND NEUROVEGETATIVE SYSTEMS

We have grouped under this heading a series of symptoms with the intention of linking them, even though at times they bear little relation to one another (Table II).

Nervousness.

Irritability.

Frigidity. We have observed this symptom on occasion, although we also agree with those authors²⁹ who find an improvement in conjugal relations owing to the security of this birth

Table II. Percentage of effects on the central nervous and neurovegetative systems

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Nervousness	5.3	2.9	13.7	2.5	6.1	2.8	2.8	5.7*	7.4*	7.4*	2.8	2.8	6.4	3.2
Headache	1.1	5.3	8.7	3.7	7.4	3.3	2.8	2.8	3.7	7.4*	8.6	3.7	5.8	4.1
Asthenia	1.8	0.5	2.5	1.2	4.5	1.2	—	8.5*	—	3.7	2.8	3.7	2.9	1.9
Frigidity	1.8	0.5	5.0	1.2	0.8	4.5	—	5.7	—	—	—	1.9	1.3	2.7
Hypersomnia	1.1	—	—	—	0.8	0.8	—	2.8*	—	—	1.0	1.0	0.7	0.6
Insomnia	1.1	—	1.2	—	—	—	—	—	—	—	1.0	—	0.4	0.1
Palpitations	0.5	0.5	—	—	0.8	—	—	—	—	—	—	—	0.3	0.1
Total nervous symptoms	13.1	10.1	31.2	8.7	20.6	12.7	5.7	25.7*	11.1	22.2*	15.3	14.4	18.0	12.9

L: Light or mild

I: Intense or serious

*: Statistical data not significant

control method. Zell and Crisp³⁰ carried out a psychiatric study on 250 patients before the suppression of ovulation, and found that the decrease in the sexual impulse during medication may be considered as a sign of important conflict in this sphere; the patients with adequate sexual equilibrium responded normally, as did those with marginal or unstable equilibrium. Nevertheless, we believe that these drugs must have some effect, since some of them, for example Deladroxate, produce 22% to 27% frigidity,³¹ which is higher than that previously calculated.

Insomnia.

Migraine. Results are contradictory. Cook *et al.*⁸ observed this in 28% of cases, and Rice-Wray *et al.*³² in 1.1% of cycles.

Palpitations.

CUTANEOUS EFFECTS

Falling out of hair.

Pruritus.

Hypertrichosis. We believe this to be very rare with present forms of medication and dosage. We have observed only one very mild case.

Acne. The oestrogens, by stopping the production of secreted matter, can improve cases of acne; the presence or worsening of this symptom may be related to certain norsteroids with some androgenic action, by stimulation of the sebaceous glands.

Table III. Percentage of cutaneous effects

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Falling hair	0.5	1.1	2.5	1.2	---	0.4	---	2.8*	---	---	1.0	1.0	0.6	0.0
Pruritus	0.5	---	---	---	0.8	0.4	---	2.8*	---	---	1.0	1.9	0.6	0.0
Hypertrichosis	0.5	---	---	---	0.4	---	---	---	---	---	---	---	0.3	---
Chloasma	0.5	---	1.2	---	0.8	---	---	---	---	---	---	1.0	0.6	0.0
Total cutaneous effects	2.3	1.1	3.7	1.2	2.0	0.8	---	5.7*	---	---	1.9	3.7	2.1	1.0

L: Light or mild

I: Intense or serious

*: Statistical data not significant

Chloasma. Its appearance may be related to racial, geographical or nutritional factors^{33,34} and could be improved with vitamin B.³²

Table III shows our own results.

EFFECTS ON THE VASCULAR SYSTEM

Flushing.

Acroparaesthesia.

Cramp.

Varicose congestion. Some research has shown that the vascular system undergoes modifications with these drugs similar to those observed during pregnancy, particularly in the third quarter. Goodrich and Wood³⁵ carried out experiments that show a diminution in the venous tone, with increase in the blood flow and a fall in the velocity of the venous current; this could bring about the possibility of thrombosis. We do not believe that the presence of varices is a contraindication since, as we see in Table IV, varicose congestion is rarely present, and in none of the numerous patients with varices have we found evidence of thrombophlebitis during treatment.

EFFECTS ON COAGULATION

Since de Costa's³⁶ contention that the norsteroids display a clear disposition towards venous thrombosis and subsequent embolism, on occasion fatal,³⁷ many investigations have been undertaken to discover whether any causal relationship exists.

From a statistical point of view, Drill,⁶ using different sources, has demonstrated that the incidence of thrombophlebitis in sexually mature women is 1.2 to 2.0 per 1,000 per annum, 0.55 per 1,000 in pregnant women and 0.53 per 1,000 among women using ovulation inhibitors over 53,021 woman-years.

Table IV. Percentage of effects on the circulatory system

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Sickness (vertigo)	0.5	1.8	3.7	—	0.4	0.4	2.8	—	—	—	1.0	1.9	1.0	0.9
Varicose congestion	0.5	0.5	1.2	—	1.6	0.8	—	—	3.7*	—	1.9	—	1.3	0.4
Cramp	—	—	1.2	—	0.4	—	—	—	—	—	—	—	—	0.3
Acroparaesthesia	1.1	—	1.2	—	0.8	—	—	—	—	—	—	—	0.7	0.1
Flushing	—	—	—	—	0.4	—	—	—	—	3.7*	—	—	0.1	0.1
Hypertensive crisis	—	0.5	—	—	—	—	—	—	—	—	—	—	—	0.1
Total circulatory symptoms	2.3	2.9	7.5	—	3.3	1.2	2.8	—	3.7	3.7	2.8	2.8	3.5	1.8

L: Light or mild

I: Intense or serious

*: Statistical data not significant

The USA Food and Drug Administration²⁸ found that the incidence of death in persons taking Enovid is 12.1 per 1,000,000 whereas the same index for the population in general is 8.4; but they considered the difference had no statistical significance.

Various investigators,^{27,28,39-47} and others cited by Drill,⁶ observed that factors V (proaccelerin), IX (Christmas) and XI (PTA) were unaffected, whereas factors I (fibrinogen), II (prothrombin), VII (proconvertin), VIII (antihæmophilic) and X (Stuart), cephalin time, and number of platelets, showed different results according to the products employed and the authors.

Rosenberg¹⁸ affirmed that this tendency is due to the conversion of some norsteroids to oestrogens, which increase the level of plasma hydrocortisone, and that the action of the suprarenal hormones could determine unspecified vasculitis.

Since in almost all patients who have suffered embolism, previous thrombophlebitis has been observed, this forerunner is considered a formal contraindication to the administration of these drugs. Nevertheless, recent studies seem to establish that in patients with thrombophlebitis,¹⁸ before or during medication,⁵⁰ there was no recurrence.

We have personally treated six patients with previous thrombophlebitis without any complication whatsoever; another patient, without earlier phlebitis, showed symptoms of pulmonary embolism, for which reason, even without a certain diagnosis, medication was stopped.

MAMMARY EFFECTS (TABLE V)

Mammary tension. Particularly frequent with Deladroxate.³¹

Mastalgia. The harmful effect depends on the oestrogens; products which have a predominance of progestogens have some value in treatment.⁵¹ Different authors^{3,6,52} indicate that between 0.1% and 9.4% of patients using anovulatory drugs suffer from mastalgia.

Table V. Percentage of mammary effects

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Mastalgia	1.1	1.8	1.2	—	2.0	1.6	—	8.5	1.1	—	1.0	—	1.8	1.5
Mammary tension	0.5	—	1.2	—	0.8	0.4	—	—	—	—	1.0	—	0.7	0.1
Total mammary effects	1.8	1.8	2.5	—	2.8	2.0	—	8.5	11.1	—	1.9	—	2.5	1.6

L: Light or mild

I: Intense or serious

Hypogalactia. During lactation, preparations containing oestrogens frequently produce hypogalactia.^{6,53} We have used norethisterone acetate alone in 39 patients (4 to 5 mg. daily) from the 5th to 6th week after birth (1st to 10th weeks as limits) with an average duration of 40.8 days (8 to 243 days). The most important effect was the appearance of metrorrhagia of medium intensity, observed in 21 cases, which receded spontaneously.

ENDOCRINE METABOLISM EFFECTS

Again we have grouped here under one heading different conditions having some relation to each other (Table VI).

Gain in weight. This may be due to anabolism or to oedema from water retention. The first is caused by the action of some norsteroids and continues until suspension of medication. Alteration of water metabolism can be produced by the oestrogens and may be accentuated

Table VI. Percentage of metabolic endocrine effects

	NE-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Oedema	4.2	1.1	3.7	2.5	4.1	3.7	2.8	2.8	—	3.7	1.9	1.9	3.6	2.5
Anabolism	2.5	1.1	6.2	10.0	4.1	2.0	—	—	—	3.7	1.0	6.7	3.0	3.5
Total weight gained	6.6	2.3	10.0	12.5	8.2	5.7	2.8	2.8	—	7.4	2.8	8.6	6.5	6.1
Loss of weight	0.5	—	—	—	0.4	—	—	—	—	—	—	—	0.5	—
Total metabolic effects	7.2	2.3	10.0	12.5	8.6	5.7	2.8	2.8	—	7.4	2.8	8.6	6.9	6.1

L: Light or mild
I: Intense or serious

in the premenstrual period, with a possibility of improvement with diuretics. Diuretics, on the other hand, do not alter protein anabolism.

Suprarenal function. As in pregnancy and treatment with oestrogens, we have observed a significant increase in plasma cortisol in patients treated with anovulatory drugs^{54,55} even for a few days.⁵² This may be due to an increase in the concentration of transcortin brought about by the oestrogen which inactivates the protein-bound cortisol cells; that is to say, a merely peripheral effect. In consequence, a diminution in 17-ketosteroids and 17-hydroxycorticoids is produced without alteration of the suprarenal function,^{56,57} perhaps by inhibition of the hypophyseal response.⁵⁸

Diabetes. Various authors⁵⁹⁻⁶¹ have observed a diminution of tolerance to glucose with medications containing mestranol, a response more marked in the climacteric period.⁶⁰ With norethisterone acetate alone or in association with ethynylloestradiol there was no effect whatsoever.⁶⁰ Spellacy and Carlson⁶² found an increase in glycaemia and plasma insulin with Enovid. Buchler and Warren⁶³ found that patients under treatment with diethylstilboestrol or norethynodrel with mestranol showed tolerance to diabetic glucose when it was administered orally, but had a normal reaction if given intravenously; they concluded that there may be a delay in intestinal absorption.

Thyroid function. There are no alterations in this, but there is an increase of protein-bound iodine, as observed with oestrogens and during pregnancy.⁶⁴

CHANGES IN THE MENSTRUAL CYCLE (TABLE VII)

Intermenstrual metrorrhagia. Under this heading we include "spotting" and "break-through bleeding"; for us there is not much difference, since what is important is the concern of the patients with these symptoms. It would appear to be caused by unbalanced action of the combination of two hormones, although we have also observed it in sequential treatment.

Table VII. Percentage of effects on menstrual pattern

	N-M		L-M		EO		DNE-M		N-M		Seq.		Total	
	L	I	L	I	L	I	L	I	L	I	L	I	L	I
Intermenstrual metrorrhagia	2.69	17.3	13.7	2.5	21.4	11.9	14.2	14.2	7.4	—	8.6	1.9	16.0	4.1
Hypermenorrhoea	5.9	2.9	7.5	2.5	2.8	0.4	2.8	—	—	—	5.7	3.7	4.5	1.8
Hypomenorrhoea	11.3	1.1	8.7	3.7	23.1	5.3	—	11.4*	3.7	3.7	2.8	—	13.2	3.5
Menstrual delay	4.2	3.5	3.7	12.5	3.7	4.9	2.8	5.7	—	—	4.8	5.7	3.8	5.4
Oligomenorrhoea	1.1	—	—	—	0.4	0.4	—	—	—	—	—	—	0.4	0.1

L: Light or mild
I: Intense or serious

*: Statistical data not significant

Hypermenorrhoea or hypomenorrhoea. These symptoms depend on the dosage of prepared oestrogens. Hypermenorrhoea naturally predominates, given the waste involved, whereas hypomenorrhoea is of no importance. It would therefore be prudent to warn patients that with certain specified products such symptoms may appear.

Menstrual delay. The lack of menstrual flow is important because of psychological repercussions, in that the patient thinks she may be pregnant. We must remember that on the 7th day after the last tablet a new cycle must begin if there has not already been endometrial

separation. In such cases, because of the possibility of pregnancy, we suggest preparations with sequential oestrogens only.

VAGINAL FLOW

Mucus. This is produced by the action of oestrogens on the endocervical glands; it appears quite often in sequential treatment. Balin and Wan³ observed it in 6.9% of cases. We ourselves have found it in 7%.

Candidiasis (moniliasis). Walsh *et al.*⁶⁵ observed 91.3% candidiasis in cultures from patients taking progestogens, whereas only 16.6% showed symptoms. This widespread effect may be linked to the diabetogenic response.⁶⁶

OTHER EFFECTS

Other short-term effects mentioned are cerebrovascular accidents,⁶⁷⁻⁷⁰ coronary thrombosis,⁷¹⁻⁷³ nodose erythema⁷⁴ and aggravation of illnesses related to fluid retention, such as cardiac insufficiency, asthma and epilepsy.⁶

MEDIUM OR LONG-TERM DISADVANTAGES

OLIGOMENORRHOEA

Very often one or various cycles subsequent to the suspension of these drugs are longer than those in the previous menstrual pattern of the patient. This occurs whatever the duration of ovulation suppression was.

It is important to explain this beforehand because married couples using the rhythm method must know that ovulation in such cycles will be late, while other patients may have the worry of believing themselves pregnant. In view of this, we suggest recording basal temperature up until ovulation.

MONOPHASIC CYCLE

Amenorrhoea. We observed this once in a patient who had taken the medication for only 4 months; after 3½ months of amenorrhoea the two-phase cycle returned on treatment with gonadotrophins.

Sterility from anovulatory relapse. We have never conclusively observed this. Nevertheless, since authors of good standing believe that there could be a permanent stoppage of the ovarian generative function, we advise a short suspension of treatment after two years of continual administration, in patients who desire to have more children. We have reduced the interval for those who began treatment from the puerperium, as they have suppressed ovulation during pregnancy as well. After interruption, the basal temperature is recorded and the treatment may be resumed in the cycle following ovulation. It is possible that single-phase cycles will follow for several months and these could be treated with progestogens on the 25th day of every cycle. The patients who do not desire more children could continue treatment provided there are no other contraindications.

Dysfunctional metrorrhagia. This is the most frequent of the clinical anatomic aspects which follow the suppression of ovulation. It is possible to prevent the metrorrhagical variety of pseudo-abortion with basal temperature control and correct progestogen treatment.

POSTPONEMENT OF THE MENOPAUSE

Ferin⁷⁵ has suggested that the suspension of ovulation by anovulatory drugs causes the ovary to rest, so that when medication is withdrawn, ovarian function can continue beyond the usual age. Nevertheless, he appears to demonstrate that the age of the menopause is not altered.⁷⁶

In patients at the climacteric age the menopause can occur during treatment; in order to examine this situation, we have interrupted medication every 12 months to see if the cycle reappeared spontaneously.

GENITAL CANCER

Studies carried out by various investigators^{6,29,77} show that the percentage of cancer found during treatment is less than expected.

BREAST CANCER

This possibility derives from the theory that it may be caused by oestrogens. In any case, on suppression of ovulation the endogenous production of oestrogens falls to such an extent that, added to the exogenous oestrogen, there is still less than in the normal cycle. Drill⁶ did not find a single case in the bibliography of eight authors who had studied nearly 6,000 patients in more than 120,000 cycles.

EVOLUTION

Table VIII shows that in 217 cases in which the evolution of the patients' menstrual cycles subsequent to the suspension of medication is known, 192 (88.5%) recovered the two-phase cycle within the first two months, as diagnosed either by basal temperature or by the history. The remaining 25 recovered their normal cycles in from three to 12 months.

Table VIII. Subsequent evolution. Time taken to recover the two-phase cycle

Time of recovery (months)	Prior inhibition in months								Total	%
	1-4	5-8	9-12	13-16	17-20	21-30	31-40	41-50		
1	59	41	17	5	8	9	—	—	139	64.1
2	12	19	9	2	2	9	—	—	53	24.4
3	1	8	2	—	—	1	—	—	12	5.5
4	3	—	—	—	—	1	—	—	4	1.7
5	—	2	—	—	—	—	1	—	3	1.5
6	—	—	—	—	1	1	—	—	2	1.0
8	—	1	—	—	—	—	—	—	1	0.5
10	—	1	—	—	—	—	—	—	1	0.5
11	—	1	—	—	—	—	—	—	1	0.5
12	—	—	—	—	—	1	—	—	1	0.5
Total	75	73	28	7	11	22	1	0	217	100.0
Previous pregnancies	45	38	13	4	7	1	1	1	124	

Among the 217 cases whose development is known, 124 became pregnant with normal gestation, spontaneous parturition, and normally healthy babies. These data can be added to by innumerable authors.

EVALUATION

As shown in Tables IX and X, 23.1% of the 355 cases were without symptoms. In patients who took various forms of oral contraceptives, one of these gave no symptoms in 27% of cases. If we take the 655 therapeutic programmes followed with different products, we see that 24.5% had no symptoms whatsoever.

Table IX. Case evaluation

	%
Cases without symptoms	23.1
Cases with one secondary effect	27.0
Cases with various effects	49.8

Table X. Evaluation of therapeutic programmes

	%
Therapeutic programmes without symptoms	24.5
Therapeutic programmes with mild effects	37.4
Therapeutic programmes suspended	38.1

Symptoms of mild intensity were experienced by 37·4%, while 38·1% of symptoms were sufficiently intense to require the medication to be stopped or changed.

In 20·5% there appeared one effect of a secondary nature, and if we include the 6·5% affected by hypomenorrhoea, which we regard as of minor importance, we see that 27% had one symptom only. There were 49·8% of women affected by more than one symptom.

COMMENT

In the final analysis we may say that the oral contraceptives presently in use to suppress ovulation are not a panacea, since unfavourable symptoms appear with some frequency. Nevertheless, we can state that the intensity of such symptoms is generally moderate, although it can be sufficient to bring about suspension of treatment or a change of product. In this case, we must consider whether the cause is the oestrogen or the progestogen in order to select the right substitute.

Morbidity in this form of treatment is usually minor and always reversible. The long-term disadvantages following treatment are seen to be of no importance.

We believe that the introduction of ovulation inhibitors into the regulation of fertility is fundamental and has brought into play a new factor of great importance: a married couple can engage in the marital act in a perfectly normal manner, fulfilling the conditions of nature without any interference of a mechanical kind.

The fact that sterility is assured and reversible, is also important in the evaluation and choice of these drugs.

We hope that this analysis of the disorders occasioned by ovulation inhibitors will stimulate research to produce an oral contraceptive which is entirely free of side-effects, in which case we shall have taken a step forward in the historic evolution of human perfection.

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50. RECENT DEVELOPMENTS IN THE TREATMENT OF INFERTILITY

B. Lunenfeld and E. Rabau

*Institute of Endocrinology and Department of Gynaecology and Obstetrics,
Tel-Hashomer Government Hospital, Israel*

Theoretically, a correct diagnosis should precede any treatment. It goes without saying that the aim of treatment should be full restoration of impaired function. To achieve this goal, the physiological background of the specific function must be known and the mechanism of action of the drugs to be used should be properly understood. Clinical research and laboratory experiments during the last 40 years have increased understanding of the reproductive processes. Development of new, efficient diagnostic methods has made possible more accurate diagnoses.

We must consider briefly the self-regulating, functional, closed circuit between the central nervous system, the pituitary gland, the ovary and the uterus. The conditions required for balanced and efficient functioning of this complex system are:

1. Each and every one of the stimuli arising from various parts of the system must act in a specific sequence, for a specific time and at a specific magnitude.

2. Each and every one of the target cells, tissues or organs, must respond to the acting stimuli in a specific and precise manner.

Releasing factors secreted by the hypothalamus in a predetermined sequence and specific magnitude and time must act on a normally responsive pituitary gland. The messages conveyed by the releasing factors must be correctly received and interpreted by the target cells and tissues in the hypophysis which must, in turn, release gonadotrophic hormones in the proper sequence, for a specific time and at a specific magnitude. Gonadotrophic hormones act on the ovary and stimulate two perfectly synchronized, although distinct, functions: the mitotic function and the steroidogenic activity of the ovary. The mitotic function—division and/or transformation of specific cells, or populations of cells, constituting the various functional compartments of the ovary—lies at the foundation of the constantly changing pattern of ovarian morphology. The steroidogenic activity comprises not only activation of enzyme systems required for the quantitative release of "steroidogenic cholesterol" for production of the specific steroids at the proper time and in the correct amounts, but also the replenishment of its reserves by *de novo* production, probably from acetate.

The steroidogenic function of the ovary resulting in the release of proper steroids at specific times, sequences and amounts, also constitutes a multipurpose system. It exerts specific actions upon the various functional ovarian compartments, including the vascular apparatus; it stimulates changes in the genital organs in preparation for the transportation and nidation of the fertilized egg; and it acts as a messenger system in the feedback mechanism which regulates the release of gonadotrophins. The latter function thus provides the last unit required for linking the closed circuit between the central nervous system, the pituitary gland, the ovary and the uterus.

The functioning of the reproductive closed circuit may be disturbed by outside factors—hormonal in nature—originating in glands such as the thyroid or the adrenals, or by noxious factors in the environment, as in college amenorrhoea or anorexia nervosa. In these cases the aim of treatment should be removal of the primary aetiological factors. However, this may not always suffice. At times the reproductive circuit itself may already be so deranged that even after the primary aetiological factor has been removed, further treatment is necessary to re-establish the normal function of the reproductive system.

Table I. Tentative

Clinical entity	Clinical symptoms	Pre-treatment findings			
		Endo- metrium	Basal body tempera- ture	Oestro- gens ($\mu\text{g}/24 \text{ hr}$)	Preg- nanediol ($\text{mg}/24 \text{ hr}$)
I. Gonadotrophic insufficiency					
Failure of production	sterility, amenorrhoea	atrophic	monophasic	10-15	<1
Failure of release	sterility, amenorrhoea	atrophic	monophasic	10-15	<1
II. Imbalance of FSH/LH ratio					
Failure of production	sterility	variable	monophasic	10-30	<1
Failure of release	sterility	variable	monophasic	10-30	<1
III. Anovulatory cycles					
Hypersensitive ovaries	sterility, oligomenor- rhoea, menorrhagia, metrorrhagia, with or without polycystic ovaries	proliferative	monophasic	10-150	<1
Hyposensitive ovaries	sterility, amenorrhoea or oligomenorrhoea	atrophic, proliferative	monophasic	10-30	<1
IV. Corpus luteum dysfunction					
Insufficiency	infertility	proliferative	atypical	normal	<2
Delayed onset	infertility	secretory, but off schedule	atypical	normal	3-6
Early regression	infertility	secretory	short, biphasic	normal	3-6
Lack of reserve	infertility	secretory	biphasic	normal	3-6
V. Ovarian agenesis					
	sterility, amenorrhoea	atrophic	monophasic	10-15	<1
VI. Acquired lesions destroying germinal epithelium					
	sterility, amenorrhoea	atrophic	monophasic	10-15	<1
VII. Post menopause-like ovaries					
	sterility, amenorrhoea	atrophic	monophasic	10-15	<1

Legend: HMG—Human menopausal gonadotrophins
HCG—Human chorionic gonadotrophins
HPG—Human pituitary gonadotrophins

Factors which disturb the functioning of the reproductive system from within may stem from any of the participating cells, or population of cells, in the central nervous system, the pituitary gland, the ovary or, perhaps, even the uterus. These factors may involve faulty stimulation (abnormal magnitude, sequence of appearance or time of action of stimuli) or faulty response of the target cells or organs. Each and every one of these factors, if sufficiently powerful, or when acting persistently for a prolonged period, leads to failure of the feedback mechanism and, consequently, to impaired fertility. Major or minor disturbances of the menstrual pattern, ranging from metropathia to amenorrhoea, usually accompany the abnormal feedback mechanism.

When mechanical or anatomical lesions are excluded, disturbances of the processes leading to ovulation and normal corpus luteum function comprise the main causes of infertility. In the great majority of these cases, some absolute or relative abnormality of the nature or magnitude of the gonadotrophic stimulus is apparent, regardless of the primary cause. Therefore, simplifying for the sake of convenience, we can divide these patients into two

classification

Progesterone on endometrium	Effects of						Recommended treatment
	HCG on			HMG on	Clomiphene		
	Oestrogens ($\mu\text{g}/24 \text{ hr}$)	Preg-nanediol ($\text{mg}/24 \text{ hr}$)	17-KS ($\text{mg}/24 \text{ hr}$)	oestrogens ($\mu\text{g}/24 \text{ hr}$)	Oestrogens ($\mu\text{g}/24 \text{ hr}$)	Preg-nanediol ($\text{mg}/24 \text{ hr}$)	
NR	NR	NR	NR	I	NR	NR	HMG (HPG) followed by HCG Clomiphene [similar response also with HMG (HPG) followed by HCG]
NR	NR	NR	NR	I	I	I	
variable	I	I	NR	I	NR	NR	HMG (HPG) followed by HCG Clomiphene
variable	I	I	NR	I	I	I	
WB	variable	variable	I	I	I	I	Clomiphene or HMG (HPG) followed by HCG (small dosage and caution recommended!)
variable	NR	NR	NR	I	I	I	HMG (HPG) followed by HCG
WB	I	I	NR	variable	variable		Treatment same as in Group II HCG 10,000 IU on alternate days, starting on day of expected ovulation. If unsuccessful, treatment same as in Group II HCG 10,000 IU on alternate days, starting 2-3 days after BBT rise Treatment same as in Group II
WB	I	I	NR	variable	variable		
WB	I	I	NR	variable	variable		
WB	NR	NR	NR	variable	variable		
NR	NR	NR	NR	NR	NR	NR	
NR	NR	NR	NR	NR	NR	NR	
NR	NR	NR	NR	NR	NR	NR	
NR	NR	NR	NR	NR	NR	NR	
NR	NR	NR	NR	NR	NR	NR	
NR	NR	NR	NR	NR	NR	NR	

NR—No response

WB—Withdrawal bleeding

I—Increase

groups: those with gonadotrophic insufficiency following primary failure in production of gonadotrophins and those with an abnormal gonadotrophic stimulus following impaired release of gonadotrophic hormones.

Human gonadotrophins and clomiphene, two recent newcomers to the therapeutic arsenal in the treatment of infertility, should prove to be of definite value for the two abovementioned groups of patients. Treatment with gonadotrophic hormones will be beneficial in both categories—those with failure in production of gonadotrophins, as well as those with abnormal release of gonadotrophins, whereas clomiphene will be effective only in the latter group. Gonadotrophic or clomiphene treatment are of no value in cases of ovarian agenesis, acquired lesions severely damaging the germinal tissue of the ovary, or postmenopausal-like ovaries. Clinical symptoms in cases belonging to these groups are: amenorrhoea with an atrophic endometrium, elevated urinary gonadotrophins and low, noncyclic urinary oestrogens and pregnanediol.

Proper choice of patients for gonadotrophic preparations and for clomiphene, in addition

to precise design of the dosage schedule, will be decisive in the overall results (Tables I and II).

Each of these therapeutic agents will now be dealt with separately, their mechanism of action will be discussed briefly and the general experience which has accumulated since their introduction will be described.

Table II. HMG—HCG and clomiphene treatment

	HMG and HCG		Clomiphene	
	Amenorrhoea (MPA negative)	Hormonal sterility (except MPA negative)		Corpus luteum insufficiency*
Patients	100	34	57	46
Courses	189	67	209	302
% of courses which induced ovulation	88.3	85.0	71.3	—
% of pregnancies	65.0	44.0	47.5	15.2
Outcome of terminated pregnancies—Total	52	14		
Single	48.1	43.0		
Twin	21.1	14.0		
Triplets	3.9	—		
Quads	1.9	—		
Abortion	25.0	43.0		
Adverse reactions (as %):				
Mild	5.3	3.0		
Severe	2.6	3.0		

*Corpus luteum insufficiency or luteinization in absence of ovulation.

GONADOTROPHIC TREATMENT

During the last 35 years, gonadotrophic hormones have been extracted from various sources: mammalian pituitary glands, serum of pregnant mares, urine of pregnant women and, more recently, postmortem human hypophyses and human postmenopausal urine. Numerous authors have applied these extracts in clinical trials to stimulate the ovaries, in order to induce ovulation and corpus luteum formation, followed by pregnancy (see extensive reviews of Zondek and Sulman,¹ Loraine,² Albert,³ Kotz and Herrmann,⁴ Netter and Bellaisch,⁵ and Lunenfeld and Donini⁶).

To avoid therapeutic failures from the formation of neutralizing antibodies, gonadotrophins from human sources should be used. Treatment with human chorionic gonadotrophins will be effective only in cases of absolute or relative luteinizing hormone deficiency. In these cases, human chorionic gonadotrophins will be effective only after sufficient follicle stimulation. Proper timing and dosage are therefore essential.

In patients with pituitary gonadotrophic insufficiency or deficient ovarian response to normal gonadotrophic stimulation, effective treatment will require gonadotrophic preparations capable of evoking the sequence of normal ovarian changes (follicle stimulation, follicle ripening, ovulation and corpus luteum formation). This has been achieved during recent years by the use of gonadotrophic extracts of human postmortem pituitary glands or human postmenopausal urine, in conjunction with human chorionic gonadotrophins. Numerous pregnancies have resulted from such treatment (see reviews of Gemzell,⁷ Lunenfeld and Donini,⁶ and Shearman⁸).

When gonadotrophic preparations derived from either human pituitary glands or menopausal urine were administered to the same patients, Crooke *et al.*⁹ and Diczfalusy *et al.*¹⁰ observed similar responses, as judged by steroid excretion patterns and by vaginal and endometrial morphology.

From these reports it can be concluded that gonadotrophic preparations from postmenopausal urine act as ovarian stimulators, in a similar way to gonadotrophic extracts of postmortem human pituitary glands. Both these preparations, in combination with human

chorionic gonadotrophins, can induce ovulation. During repeated courses no evidence of refractiveness or antibody formation was noted.

Tables III and IV summarize the diagnoses and results of gonadotrophic treatment in 121 patients having 230 courses of treatment.

Theoretically, the problem of dosage is disarmingly simple: to secure follicular maturation and steroidogenesis with human pituitary or human menopausal gonadotrophins and then induce ovulation with human chorionic gonadotrophins. In practice, it is complex, often difficult and sometimes dangerous.

Table III. HMG—HCG treatment

Diagnosis	Cases	Courses	Ovula- tion	Preg- nancy	Outcome				
					Single birth	Twin birth	> Twin birth	Abor- tion	Still- born
Primary amenorrhoea	23	41	32	12	7	2			3
Primary amenorrhoea and galactorrhoea	4	11	11	5	1			4	
Secondary amenorrhoea	34	61	51	17	6	3		4	4
Secondary amenorrhoea and galactorrhoea	31	66	63	24	9 + 1 sb*	5	2	1	6
Postpartum amenorrhoea	7	9	9	6		1	1	4	
Sheehan's syndrome	1	1	1	1	1				
Total	100	189	167	65	24 + 1 sb*	11	3	13	13

*Stillbirth

Table IV. HMG treated clinical cases and results

Diagnosis	Cases	Courses	No response	Pregnancies				
				Total	Deliveries Single	Twin born	Still- born	Abor- tions
Secondary amenorrhoea (MPA +)	7	16	0	5	2	0	0	3
Delayed follicular phase	2	5	0	1	1	0	0	0
Prolonged follicular phase	9	12	2	6	3	2	1	0
Anovulation	16	34	8	3	0	0	0	3
Total	34	67	10	15	6	2	1	6

The extent of variation in individual response is sufficient to warrant acceptance of the fact that there is no such thing as a general definite dosage schedule applicable to all patients. Efforts to adjust dosage have varied from retrospective assay of urinary steroids,¹ clinical evaluation of ovarian function with assessment of vaginal smears, cervical mucus, and endometrial biopsies,¹²⁻¹⁴ to attempts at predetermining individual sensitivity.^{9,15} Lunenfeld *et al.*,¹⁶ Lunenfeld,¹⁷ and Brown¹⁸ all suggested that better control might be obtained by adjusting gonadotrophic dosage according to individual response, as indicated by daily concurrent oestrogen assays. Even this degree of control does not entirely eliminate the risk of overdosage, since no completely satisfactory method of avoiding overstimulation has yet been developed.

CLOMIPHENE TREATMENT

The second therapeutic agent to be discussed, in the light of accumulated experience, is clomiphene. It is a nonsteroidal substance with both oestrogenic and anti-oestrogenic properties.

Clomiphene citrate is indicated for the treatment of ovarian insufficiency, particularly in cases in which stimulation of pituitary function seems to be the most logical approach to therapy. Clomiphene therapy is ineffective where primary pituitary failure precludes the possibility of stimulating normal function. In such patients, treatment with gonadotrophins

will be effective. The action of clomiphene is successful in cases where the pituitary is capable of normal physiological function and the ovary contains follicular elements responsive to gonadotrophic stimulation. The presence of ovarian activity, indicated by endogenous oestrogen production (as estimated by cervical mucus, vaginal smear, endometrial biopsy, urinary oestrogen determination, or bleeding in response to progesterone or medroxy-progesterone acetate [MPA]), provides a favourable prognosis for treatment with clomiphene.¹⁹

The ovulatory response to clomiphene therapy appears to be mediated through increased release of pituitary gonadotrophins which, in turn, stimulate the maturation and endocrine activity of the ovarian follicle, ovulation and the subsequent development and function of the corpus luteum. The role of clomiphene in stimulating pituitary gonadotrophic secretion is a controversial subject, although urinary excretion of total gonadotrophins (TG) has usually been reported to be increased during and immediately after clomiphene therapy.

Tentatively accepting as a working hypothesis that clomiphene increases the level of gonadotrophins, it may be interesting to speculate on the mechanisms involved. Preliminary work²⁰ suggests that clomiphene may act at least in part by blocking the uptake of oestradiol by the pituitary gland or the hypothalamus. A direct action on the ovary, or on oestrogen synthesis and metabolism, cannot be excluded.²¹⁻²⁶ It must therefore be concluded that the mechanism of action of clomiphene is still unclear, although indications point to an action on gonadotrophic release in humans through a probable antagonistic effect upon oestrogens. Despite the uncertainty of the exact nature of clomiphene action, this compound has been extensively used by many investigators to improve ovarian function (see reviews of Greenblatt,²⁷ Kistner *et al.*,²⁸ Shearman²⁹).

Johnson *et al.*²⁹ analysed the data of 2,616 individual case reports submitted up to August 1965. If we accept pregnancy as the only absolute proof of ovulation, then 429 patients out of the total of 2,616 undoubtedly ovulated (16.3%). This figure is probably an underestimate, since some of these patients very likely ovulated without becoming pregnant later.

It should be of interest to analyse individually tabulated data of some authors, with patient series of about 100 cases, in order to verify the effectiveness of clomiphene treatment.

Bishop³⁰ deduced from his experience with 102 patients that clomiphene is unlikely to be effective in primary amenorrhoea, that it has an approximately 50% chance of inducing ovulation in long-standing secondary amenorrhoea, and that it is a rather promising form of therapy in amenorrhoea following pregnancy, oligomenorrhoea, and metropathia. The overall pregnancy rate reported by Bishop (15%) was similar to the overall pregnancy rate (16%) reported by Johnson *et al.*²⁹ in their analysis of 2,616 patients. Beck *et al.*³¹ obtained 23 pregnancies (18%) in their series of 129 patients during 299 treatment cycles. This figure is also similar to the overall success rate. The pregnancy rate reported by these authors should actually be considered as 19%, since 8 patients with proven primary ovarian failure were included in the study. Greenblatt³² reported on a series of 179 patients during 956 treatment cycles, during which 28 conceptions occurred (15.6%). Therefore, these three extensive studies arrived at a pregnancy rate similar to the overall studies reported by Johnson *et al.*²⁹ Pregnancies were not obtained in cases of primary ovarian failure or primary amenorrhoea in any of these series.

In analysing the overall data, one might speculate that clomiphene is unlikely to be effective in primary amenorrhoea, but that cases of secondary amenorrhoea, oligomenorrhoea and anovulation indicate a favourable prognosis with such therapy, provided that endogenous oestrogen activity can be shown to be present before treatment.

Figures 1 and 2 are analyses of clomiphene treatment in 52 patients having 209 treatment courses, by Rabau, Salomy and Lunenfeld.³³ We only treated patients whose prognosis was favourable, according to the criteria mentioned previously. Hence the 47.5% pregnancy rate (Table II), which is higher than that reported by other authors, is probably due to preselection of patients. A similar group of patients, comprising 34 cases chosen at random, was treated with human menopausal gonadotrophins and human chorionic gonadotrophins. Of these patients, 44% conceived (Table II). The identical results obtained in this specific group of patients, point to confirmation that both agents are equally effective in cases of gonadotrophic insufficiency following failure of release.

Regarding dosage and treatment schedules, investigators have experimented with a number of regimes. The recent trend to lower dosage and shorter treatment courses^{23,25,31,34-39} has resulted in a decrease of the more serious side-effects related to ovarian overstimulation, while the overall pregnancy rate has not been affected significantly. In the determination of a recommended starting dosage schedule, efficiency must be balanced against potential side-effects. In our clinical investigations,³³ and taking into consideration individual sensitivity, we generally administer 50 mg. of clomiphene for 7 days. Only those who do not respond to this dosage (with either a rise in the basal body temperature or an increase in urinary pregnanediol)

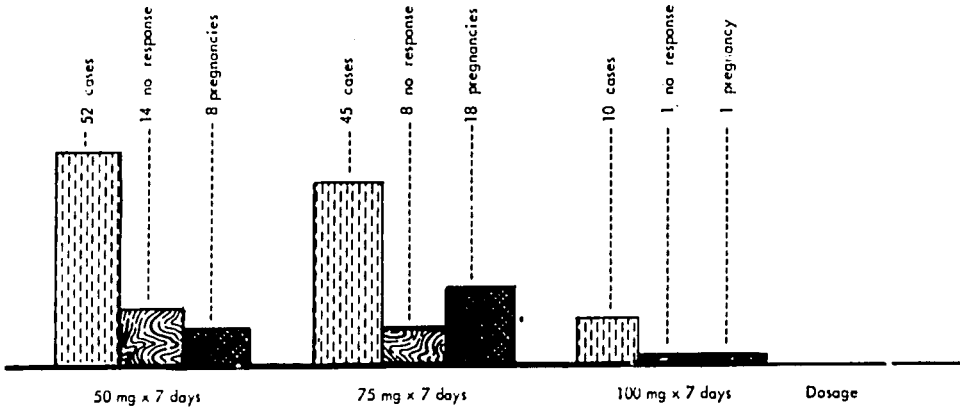


Fig. 1. Analysis of clomiphene treatment.

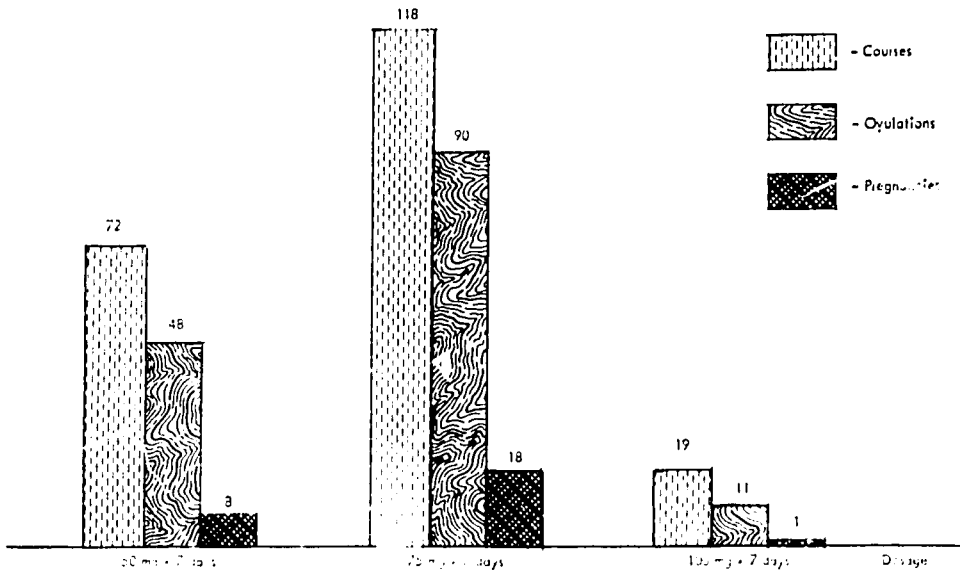


Fig. 2. Analysis of clomiphene treatment.

are given 75 mg. for 7 days. Those who still do not respond are then given a trial dose of 100 mg. for the same length of time. If there is no response after two trials of this regime, the patients are classified as unsuitable for clomiphene therapy and are scheduled for treatment with human gonadotrophins.

CONCLUSIONS

Significant progress has been made in the diagnosis and treatment of sterility during the past decade. Methods for assaying gonadotrophins and steroids have been refined and are

becoming routine procedures in many centres. The therapeutic arsenal of the sterility clinic has been strengthened by such potent drugs as synthetic analogues of cortisol, oral progestins, human gonadotrophins and clomiphene. The two latter agents have made possible the planned induction of ovulation in anovulatory women, thus improving tremendously the results of treatment where pregnancies are concerned. In properly chosen cases, pregnancy can be expected in 40–70% of the patients. For some years now, ovulation and conception have been reported occasionally in patients with animal gonadotrophins, or with large doses of oestrogens or progesterone. It is the *consistency* of results achieved by the judicious use of human gonadotrophins and clomiphene which marks our progress in the treatment of female sterility.

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Session 11

INTRA-UTERINE DEVICES

51. INSERTION OF IUDs AFTER ABORTION— PRELIMINARY REPORT

Lidija Andolšek,
*University Clinic of Obstetrics and Gynaecology,
Ljubljana, Yugoslavia*

In September 1964 we started using intra-uterine devices (IUDs) in Yugoslavia. We made use of the knowledge that had been gained up to then concerning the indications, the technique and the time of insertion. As a rule, we insert IUDs during the last two days of menstruation, or immediately after the menstrual period. In postabortal women, however, they were then inserted at the time of the second menstruation. We know now that women who had been weakly motivated towards contraception, found it more acceptable soon after abortion. In order to protect these women against further abortions, we began to consider how to shorten the interval between the abortion and the insertion of the IUD. For this reason we began to insert the postabortal IUDs at or just after the end of the first menstrual period following the abortion. On evaluating these cases we found that there were no more complaints than expected. For this reason we decided to insert the IUDs immediately after the evacuation of the uterus, even though we knew of Ishihana's^{1,2} opposition to this procedure. We felt that the study would be of great practical importance if it succeeded in proving that the frequency and intensity of complications did not alter essentially with the earlier time of insertion.

This was the aim of the studies which were undertaken at about the same time in some gynaecological hospitals in Chile and at the University Clinic of Obstetrics and Gynaecology in Ljubljana, Yugoslavia.

INSERTION OF IUDs AFTER ARTIFICIAL ABORTIONS

This is performed at two different time intervals: (1) immediately after an artificial abortion, and (2) early in the postabortal period.

Insertion of IUDs immediately after an artificial abortion is practised in our institution. In other countries where abortion is legal or permitted under certain conditions, the accepted insertion time is used (at the second menstruation). Certain gynaecologists in Poland^{3,4} started to insert IUDs in the early postabortal period, between the 3rd and 13th day after the interruption of pregnancy.

Before we discuss the results of our study, let me say a few words about selection of the women and our method of work. We motivate women for insertion as soon as they come to ask for an interruption of pregnancy. The social worker's duty is to motivate the women towards family planning with modern contraceptives. If they decide on an IUD, she finds out, in her capacity as a nurse, whether there are any obvious contraindications to insertion.

Before the intervention the length of pregnancy is determined (women not more than 12 weeks' pregnant are included in the study), the women are colposcoped, stained smears for cytological examination and wet films to establish the type of vaginal flora are taken. Contraindications are rechecked. Particular care is necessary where the woman has had pelvic inflammatory disease during the past two years.

The artificial abortion is performed under general anaesthesia, either by dilatation and curettage (D and C) or by suction, and Lippes loop C or D is inserted, the cases being selected at random. The programme is carried out by four gynaecologists, who also determine the treatment following the interruption. We cover some of the IUD insertions with wide-spectrum antibiotics or with sulphonamides; some of the insertions, however, are not so covered and they get the usual dose of an ergot preparation or nothing at all.

For a uniform interpretation of the events during the three-day hospitalization after the intervention, the same doctor is in charge of all the women. Before they are discharged from hospital, the gynaecologist examines them with a speculum, prescribes a combination of calcium and vitamin C, and orders them to return for follow-up after the first menstruation.

According to the described criteria, we inserted IUDs from October 1965 to March 1967 in 405 women. Our report includes the data for the first 340 insertions, 28 February 1967 being the cut-off date. Among these women there are multiparae, mostly aged 20-40 years (95%), who before this abortion had had several full-term pregnancies as well as other abortions.

At the time of the abortion 267 women or 78% had been pregnant up to eight weeks and the remaining 73 women (22%) for 8-12 weeks. In 197 cases (58%) we interrupted the pregnancy by suction, and in the remaining 143 cases (42%) by D and C (Table I).

RESULTS

During the time of hospitalization, women who have had IUDs fitted bleed a little more than normal on the first day, but by the second day bleeding is the same as after simple interruption of pregnancy, irrespective of the drug therapy they receive. On the third day we usually note slight bleeding or a sero-sanguinous discharge that continues in 60% until the first menstruation, which is always heavy. As the bleeding during hospitalization is measured according to the number of sanitary pads only, such an evaluation is only approximate. While hospitalized, 94% of patients were afebrile, and 6% were mildly pyrexial, but none of these 6% came back later because of infections. When they left the hospital, we always verified that the IUD was *in situ*. On 28 February 1967, there were still 310 (91%) active cases (Table I).

Table I. Number of insertions, active and closed cases related to the method of interruption of pregnancy

Method of interruption	Number of first insertions	Closed cases	Active cases	Number of reinsertions
Suction	197	17	180	0
D and C	143	13	130	4
Total	340	30	310	4

The 30 closed cases (Table I) were made up as follows: in 21 cases we removed the IUD for medical or personal reasons, 5 cases were closed because of expulsion, and 4 because of pregnancy. The IUD was reinserted in 4 out of 9 expulsions.

Table II. Duration of use for total and active cases

Duration of use (months)	Total cases	Active cases	
		No.	%
0-1	149	143	96
2-3	64	56	88
4-6	33	26	79
7 and more	94	85	90
Total	340	310	91

Most of the women (Table II) are in the group which has used the IUD for less than 1 month. The next largest group includes the women using IUDs for more than 7 months. After the insertion of the first 100 IUDs we stopped inserting them, to follow the eventual complications of the pilot group. After an interval we started the insertions again.

The events related to months of use (Table III) are discussed below:

Expulsions. Nine cases were noted; of these 5 were total and 4 partial; more than half occurred in the first three months. As mentioned already, IUDs were successfully reinserted in 4 cases.

Table III. Events related to the months of use

Months of use	Expulsions	Removals	Pregnancies	Pelvic inflammatory disease
Up to 1 month	2	2	0	1
2-3	3	8	2	2
4-6	1	4	1	2
7 and more	3	7	1	1
Total	9	21	4	6

Removals. These were necessary for the following reasons: 12 for medical reasons (mostly because of intermittent bleeding), and 9 for personal reasons.

Pregnancies. We noted 4 cases with IUDs *in situ* (three Lippes loop C and one Lippes loop D).

Pelvic inflammatory disease (PID). Six cases of PID were noted. Most of these infections were mild and were managed successfully without removal of the device. Removal was necessary in only 1 case, partly at the patient's own request.

Table IV. Events related to the size of the IUD

Size of IUD	Total number of insertions	Expulsions	Removals	Pregnancies	PID
Lippes loop D	217	3	8	1	1
Lippes loop C	123	6	13	3	5
Total	340	9	21	4	6

It can be seen from Table IV that there are less events in the cases where Lippes loop D was inserted, but the observed cases are too few for the differences to be statistically significant.

Table V. Events related to medical treatment

Therapy	Expulsions		Removals		Pregnancies	PID
	Partial	Total	Medical	Personal		
Antibiotics or sulphonamides	1	4	3	5	2	4
Ergot	1	1	4	2	0	2
No therapy	2	0	5	2	2	0
Total	4	5	12	9	4	6

Since different forms of cover against infection were given at random, we do not think that giving either antibiotics or sulphonamides had a marked effect on the occurrence of infection (Table V).

Table VI. Net cumulative rates per 100 first insertions at end of selected periods, by type of termination (calculated by Dr. C. Tietze)

Type of termination	3rd month	6th month	9th month	12th month
Pregnancy	0.8	1.5	1.5	2.4
Expulsion	2.0	2.6	5.2	5.2
Removal:				
Medical	3.0	4.3	5.1	6.1
Personal	0.8	2.0	5.5	6.5
Total events	6.6	10.4	17.3	20.2
No event to end of period	93.4	89.6	82.7	79.8

The rates for the 12th month (Table VI) are based on 1,817 woman-months of use. The expulsion rate is remarkably low, especially since no patients have been lost to follow-up.

Dr. Tietze commented on Table VI: "The cumulative rate of removals for personal reasons is higher (at 12 months) than the removal rate for medical reasons, although the number of removals for personal reasons is lower than the number of removals for medical reasons."

INSERTION OF IUDs AFTER INCOMPLETE ABORTIONS

Having strict criteria for insertion of IUDs after incomplete abortion (the abortion must be aseptic and afebrile) and having decreased the number of incomplete abortions as well, our study is still on a pilot type basis. However, in the first 30 cases where insertion of IUDs was done immediately after curettage, no complications were observed.

IUDs after incomplete abortions are also inserted at two different times: (1) immediately, i.e. right after the curettage is performed, and (2) early, i.e. during the first or second post-abortion day, before discharge of the patient from hospital.

Not having enough experience of our own to comment adequately on insertion after incomplete abortion, I am taking the liberty of summarizing the results reported by Gostin.⁵ The conclusions of Avendano⁶ are very much the same.

Lippes loops or Zipper rings were inserted in 100 women in the early postabortal period. Among these there were 45% febrile abortions. The incidence of complications, whether mild or severe, was 24%. There was no relationship between the previous febrile condition and the incidence of complications. By February 1967 91% of these women continued using the IUD.

DISCUSSION

The patients' motivation is probably too weak in our study. This supposition is supported particularly by the fact that these women are affected much more by the usual difficulties of using IUDs than other women who have them inserted. It may be possible that some of the women consent to immediate insertion after abortion because they think this is the decision of the State Commission. This supposition is also supported by the fact that there are more removals for personal reasons than in the group in whom insertion is performed at a later time.

Contraindications must be carefully observed; a history of pelvic inflammatory disease is most important. This fact was stressed as of general importance in all the studies referred to.

The interruption of pregnancy, or curettage after incomplete abortion, must be complete. We have to accept that there are certain differences in the technique of the operation, because in the Yugoslavian study there are four gynaecologists carrying out the programme. Their technique must surely differ to some extent.

The interpretation of complications, too, is more difficult than usual, as sometimes we do not know whether we should ascribe the complication to a badly performed abortion or to the insertion of the IUD.

A careful follow-up of these women is essential, since they belong to experimental groups. I should emphasize that we have not lost any cases to follow-up.

Finally, we must stress the fact that the Yugoslavian study is still too small to make it possible for us to evaluate the differences in the complications with regard to the technique of the abortion, the postabortal treatment, the influence of the size of the IUD, the duration of pregnancy, the previous parity, and the woman's age.

The insertion of the IUD while the patient is still in hospital offers an immediate, effective protection for this group of women, otherwise weakly motivated towards contraception.

We have not observed any serious complications. The only comparable factor between the women who have had abortions without insertion of IUDs, and the women in whom IUDs were inserted after the abortion, is infection. We did not observe more infections in the group where IUDs were inserted. In addition, the number of other events was not higher than in a group of women in whom IUDs were inserted at the usual time.

Up to now the results are so encouraging that we shall continue our studies and try to confirm these favourable results in a larger group of women. For better comparison it will be necessary

to accept the same methodology and follow-up procedure to make statistical evaluation of the studies possible.

This study is being carried out with the financial help of the Population Council. Their assistance is deeply appreciated.

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52. OPTIMUM INSERTION TIME FOR THE IUD AFTER DELIVERY

Tye-Hin Lean

*Department of Obstetrics and Gynaecology,
Kandang Kerbau Hospital, Singapore*

INTRODUCTION

There is already a voluminous and rapidly growing literature relating to intra-uterine contraceptive devices (IUDs), including comprehensive bibliographies. The WHO Scientific Group in a recent publication on the *Basic and clinical aspects of intra-uterine devices*,¹ describes the widespread and steadily increasing acceptance of IUDs in many parts of the world and in all strata of varying societies, showing that they are generally considered to be effective and safe. However this Group exercises caution, stating that the importance and the impact of modern IUDs as a method of conception control have yet to be fully recognized. Among its recommendations on research needs are included systematic studies of women following insertion of a device immediately postpartum or during the first few days after delivery.

The need for and the apparent advantages of early insertion of the IUD in the postpartum period are shown by the following points of discussion:

1. The relatively easier motivation and the easier preparation of the minds of expectant mothers, who are now being confined in increasingly large numbers in hospitals in almost all countries. The trend of increasing hospital confinements will be more apparent with the increasing affluence being promised by elected governments in all parts of the world.
2. Early insertion of IUDs in highly fertile women is most needed in less sophisticated and less affluent countries which have a greater pressure of population problems and more need for their control.
3. The loss of potential mothers and women in the higher fertility group to inaccessible or relatively inaccessible environments will be minimized by early insertion.
4. The hazards of pregnancy occurring in those groups of women who return early to sexual intercourse after parturition will be very much reduced.
5. The technical advantages and the relative ease of insertion of IUDs during the postpartum period are apparent.

PRESENT STUDY AND REPORT

This report is based on a study of an aggregate of 8,935 insertions of IUDs among women recently delivered at the Kandang Kerbau Hospital, Republic of Singapore. This hospital handles an average of 40,000 obstetric deliveries a year and is said to be the hospital with the largest turnover of deliveries in the world. Three prime Asian races, viz. Chinese, Indonesian-Malays, and Indians, together with a sprinkling of Eurasians and people of European and British stock, make up the bulk of the population of 1.9 million in the Republic of Singapore; and the Kandang Kerbau Hospital is the only public hospital in the Republic.

The study covers a period of approximately 12 months, from 18 October 1965, when insertions were begun, to 30 September 1966. The bulk of the insertions were in Chinese patients, and the insertion programme was conducted and supervised by a committee consisting of the clinical heads of the hospital units as well as a medical statistician from the Department of Public Health of the University of Singapore. The programme was part of a study plan initiated by the Population Council, termed "The IUCD Post-Partum Project" and funds were generously provided by the Population Council for this purpose. It needs to be stressed that this report is only a preliminary observation of the outcome of these IUD

insertions within the first 12 months, and the rates quoted cannot be strictly equated with the rates in reports that incorporate cumulative rates of use and which are calculated by a modified life-table procedure.

The total of 8,935 insertions was carried out at various times in three groups of mothers after delivery as shown in Table I.

Table I. IUD insertions—distribution

Group	Insertion time postpartum	Insertions	
		No.	%
A	Immediate up to 1 week	3,267	36.6 (5% inserted at 2-3 weeks after delivery)
B	4 to 6 weeks	4,233	47.3
C	8 weeks	1,387	15.5
Unverified group		48	0.6
Total		8,935	100.0

Insertions represented 23.3% of total deliveries (38,527), but this percentage is not relevant to this report.

Lippes loop D was used in most women in this trial, and the IUDs were all inserted by qualified doctors who were not gynaecologists.

It is pertinent to point out that there was a very high rate of follow-up; no less than 93% of the women had at least one follow-up visit.

It should also be pointed out that insertions in Group C (Table I) only began in mid-July 1966, so naturally this group has the shortest period of observation and follow-up.

OBSERVATIONS ON MOTIVATION AND RESPONSE

The mothers delivered at the Kandang Kerbau Hospital showed a very great interest in family planning in general. A sample survey of these mothers regarding their attitude to family planning showed that no less than 89% of those interviewed were interested. In the course of the present study when women were being motivated, about 95 to 98% expressed interest.

A team of qualified midwives was used for motivational work, and all obstetric patients, as far as possible, who were delivered in hospital in the period involved were interviewed immediately after delivery. A sample response to this motivation for IUD insertion in particular was as follows: yes, 40%; maybe, 40%; no, 20%. In those who indicated "yes", immediate insertions were carried out as far as possible. In those women in whom insertions were not possible immediately after delivery and also in those who indicated "maybe", appointments were made for them to return in from 4 to 6 weeks for insertion of the IUD. From mid-July, a third group of appointments was made for insertions at about 8 weeks after delivery. No appointment was made for those who indicated "no".

Altogether 30,918 women were interviewed immediately after delivery in the present study, and when 8,935 insertions were taken into consideration, the insertion rate among those interviewed stood at 28.8%. Observations disclosed that when the project was at its best in terms of response, the insertion rate among the positive responders averaged about 52%.

In June 1966 some of the women who had had IUDs inserted earlier began to believe strange stories about the fate of their IUDs. Some of them thought that the loop had migrated to the stomach or the heart. The circulation of these stories at this time led to a dramatic drop in the response to motivation and in the insertion rate among women having babies at the Kandang Kerbau Hospital. For instance, in March 1966 there were 1,172 insertions following 3,369 deliveries, while in July 1966 there were only 603 insertions following 3,314 deliveries. However, motivation was poor generally in July 1966 and patients were beginning to be given appointments for IUD insertion 8 weeks after delivery (Group C, Table I).

This drop in response to motivation and in IUD insertions seems more common in closed

communities such as that of the Republic of Singapore and the patients of the Kandang Kerbau Hospital, in which about 70% of all Singapore deliveries are carried out.

Similar difficulties in carrying out an efficient IUD insertion programme have been reported from both India and Hong Kong. There have been tales about the nylon thread attached to the Lippes loop "electrifying" males in India. Unfair comment on the number of ectopic pregnancies following IUD insertions appeared in the lay press in Hong Kong, and this had an undesirable effect on the insertion programme there. Perhaps a "counter-enlightenment" or reassurance campaign by family planning workers would be of help in such situations.

EVENTS FOLLOWING FIRST INSERTIONS, AND RELATED COMMENTS

I. EXPULSIONS

Altogether 1,162 expulsions were recorded among the 8,935 insertions, but 854 women (73.4%) had the IUD reinserted following the first expulsion, and 66 (6.1%) following the second expulsion. The expulsion distribution among the three groups of women, together with the respective reinsertions, is shown in Table II.

Table II. Expulsions of IUDs and reinsertions

Group	Expelled		Reinsertion 1		Reinsertion 2	
	No.	%	No.	%	No.	%
A	741	22.7	602	81.2	31	4.4
B	344	8.1	210	61.0	29	9.3
C	74	5.3	40	54.0	6	8.1
Unknown	3	—	2	—	—	—
Total	1,162 = 13% of insertions		854 = 73.4% of expulsions		66 = 6.1% of expulsions	

This total of spontaneous expulsions represents a rate of 20.7 per 100 woman-years of use. It has become apparent that the spontaneous expulsion rate appears to be highest among women in Group A, viz. those in whom the IUDs were inserted during the immediate postpartum period up to one week after delivery. This rather high spontaneous expulsion rate in this particular group is predictable in view of the great disparity between the size of the postpartum uterine cavity and the Lippes loop—even the D loop as was used in the series. Also, the intense and near-violent movements of the involuting uterus no doubt contribute to this high expulsion rate.

In the women in Group B, viz. where the IUD insertions were carried out at 4 to 6 weeks after delivery, this spontaneous expulsion rate was comparatively low. A total of 344 expulsions occurred among 4,233 insertions—a rate of 8.1%. This can be anticipated as the involuting uterus is much calmer at this time of the puerperium; also, there is a great reduction in the disparity between the relative sizes of the uterine cavity and the loop.

Table III. Insertion-expulsion intervals

Interval	Group A	Group B	Group C	Unknown
1-2 days	90	7	8	0
3-6 days	64	4	1	0
7-13 days	85	10	9	0
14-20 days	45	10	5	0
21-27 days	20	1	4	0
30 days	257 (561)	78 (110)	13 (40)	0 (0)
60 days	26 (587)	27 (137)	7 (47)	0
90 days	108 (695)	134 (271)	20 (67)	2
180 days	28 (723)	52 (323)	10 (77)	1 (3)
360 days	1	0	0	0
Unverified	17	21	1	0

Women in Group C, where the IUDs were inserted at about 8 weeks after delivery, when involution is usually complete, should have the lowest rate of spontaneous expulsion. Although observed only over a period of about 12 weeks, 74 women spontaneously expelled the IUD among 1,387 who had insertions, giving a rate of 5.3%, thus confirming this view.

It is interesting to set out the insertion-expulsion intervals in the above-mentioned cases in the three groups, as in Table III.

It can be seen that within the first 30 days after insertion, 561 cases (75.7%) in Group A had the loop spontaneously expelled as compared with 110 cases (32%) in Group B and 40 cases (54%) in Group C. By the 90th day after initial insertion of the IUD, the comparative rates of spontaneous expulsion among the three groups had reached 93.7% of total expulsions in Group A, 78.6% in Group B, and 90.4% in Group C.

All the expulsions in all three groups were virtually completed by the 180th day after the primary insertion.

2. REMOVALS

A total of 1,658 women had the IUD removed, giving an approximate removal rate of 18.5% of the total insertions among all groups. Expressed in terms of the average woman-years of use, this gives an approximate rate of 29.6 per 100 woman-years of use.

The distribution of removals among the three groups is shown in Table IV.

Table IV. IUD removals

Group	Insertions	Removals	
		No.	%
A	3,267	557	17.4
B	4,233	862	20.4
C	1,387	238	17.4
Unknown	48	1	—
Total	8,935	1,658	or 18.5% of total insertions

The removal rates reached a greater momentum after the spread of the undesirable stories among the mothers regarding the fate of their IUDs.

A study of the various reasons for the apparently high removal rate is summarized in Table V.

Table V. Reasons for IUD removals

Reasons	Group A	Group B	Group C	Unknown	Total
Husband's request	76	121	39	1	237
Relative's advice	3	3	2	—	8
To have baby	27	64	13	—	104
Pelvic infection	4	14	1	—	19
Pelvic pain	60	91	30	—	181
Vaginal bleeding	110	179	48	—	337
Vaginal discharge	—	4	2	—	6
Fear	85	107	22	—	214
Method change	11	33	8	—	52
Unknown	180	247	73	—	500
Total	556	863	238	1	1,658

It should be observed that the removal rate as listed for Group C is not strictly comparable with the rates for Group A and Group B, since Group C cases had a shorter period of observation and their insertions began almost *pari passu* with the undesirable gossip already mentioned. The number of 238 cases or 17.4% will in fact be much higher after a longer period of observation.

Three reasons, viz. husband's request, fear, and unknown reasons, accounted for a total of 951 cases, or approximately 57.3% of the overall removals. It appeared reasonable to assume that various rumours circulating and the stories of the migration of the IUDs helped largely towards the big part played by these factors in the removal rate.

3. PELVIC INFECTION

When this series was started, a fear had been expressed that IUD insertions during the postpartum period, both immediate and delayed, might result in an increased number of cases of puerperal and pelvic infection, considering the greater hazards of infection at this time.

Experience in the present series, however, showed the pelvic infection rate to be remarkably low. Only 29 clinically significant cases of pelvic infection were documented, and this gave a rate of 0.33 per 100 first insertions, or 0.52 per 100 woman-years of use.

No serious infection was found, and only 19 of the 29 women needed to have the device removed because of infection. It could be that the Singapore women perhaps complain less and tend to minimize their symptoms.

The distribution of pelvic infection among the three groups, together with the respective number of removals, is shown in Table VI.

Table VI. Pelvic infection

Group	Insertions	Infections	Removals for infection
A	3,267	7	4
B	4,233	20	14
C	1,387	2	1
Unknown	48	0	0
Total	8,935	29	19

The WHO Scientific Group quotes an incidence of 2.2 to 3.5 cases of pelvic inflammatory disease (PID) per 100 women during the first year of insertion of all types of IUD.¹ The severe variety of such PID occurred in less than 1% of these women. Clearly, it is difficult to say if this incidence is any higher than the general incidence of pelvic infection in a gynaecological service.

However, the problem of pelvic inflammation in these situations remains a minor one. The low rate in the present study indicates that the parturient uterus, even during involution, has a definite and efficient barrier against the possible pelvic infection which should logically occur with the amount of vaginal, cervical and uterine manipulation that takes place during the insertion of the IUD.

4. MENO-METRRORRHAGIA

Limited bleeding, both in amount and duration, is to be expected after insertion of an IUD. Slight vaginal bleeding or sero-sanguinous discharge may indeed continue for a time after insertion, especially during the puerperium. However, bleeding of proportions sufficient to be labelled meno-metrorrhagia can be serious, and may be troublesome and intense enough to alarm both the patient and the doctor. No specific rates for this complication have been quoted in most of the available reports. In the present study, a total of 337 cases of clinically significant meno-metrorrhagia were recorded, and all of them had the IUD removed. This gives a rate of 3.7 per 100 first insertions, or an aggregate of 6.0 per 100 woman-years of use. None of the women, however, had such severe bleeding that hospital admission or blood transfusion was needed.

It is interesting that there is no appreciable difference in the incidence of this event among the three groups of cases, as shown in Table VII.

Table VII. Meno-metrorrhagia

Group	Insertions	Meno-metrorrhagia	
		No.	%
A	3,267	110	3.4
B	4,233	179	4.2
C	1,387	48	3.5
Unknown	48	—	—
Total	8,935	337	

Overall, 3.7 cases per 100 insertions or 6 per 100 woman-years

5. PREGNANCIES

It is conceded that the IUD does not confer the virtually complete protection against an unplanned pregnancy that can be obtained with oral contraceptives. Pregnancies will naturally occur if the IUD is not in utero, such as in unnoticed expulsions. It will also occur if the loop is lying in an ectopic extra-uterine position (Fig. 1). Pregnancy can also occur with the IUD in utero, but in such situations the loop will appear to be disadvantageously placed, such as in an oblique, transverse or upside-down position (Fig. 2). If one accepts the theory of an anti-nidation factor, it is reasonable to see how a disadvantageously placed loop within the uterine cavity can allow the successful nidation of a conception to occur. However, a hasty conclusion should not be made, for it could be that a successfully implanted pregnancy in utero can displace a loop originally ideally placed inside the uterine cavity. A view is held, too, that the use of a larger size of loop—if one was available—could minimize the incidence of loops becoming disadvantageously placed, and therefore could effect a reduction in the incidence of unplanned pregnancies. But an oversize loop can be shown to



Fig. 1. Plain abdominal X-ray showing 36-week pregnancy with a Lippes loop in a suspected extra-uterine ectopic position.



Fig. 2. Oblique view of a 36-week pregnancy with a Lippes loop lying in an oblique to transverse position.

have inherent dangers such as "perforation" and subsequent translocation, which will be discussed later.

In the present study, 182 unplanned pregnancies were documented. This gives an overall rate of 2.03 per 100 first insertions, making an aggregate of 3.3 per 100 woman-years of use. A recent comprehensive evaluation based on 22,400 first insertions of all types of IUDs gives a cumulative rate for unintended pregnancies of 2.9 ± 0.3 per 100 first insertions for the Lippes loop (7,399 insertions).²

The distribution of the 182 pregnancies among the three groups of cases is shown in Table VIII.

Table VIII. Unplanned pregnancies

Group	Insertions	Pregnancies	
		No.	Rate per 100 insertions
A	3,267	25	0.76
B	4,233	111	2.60
C	1,387	46	3.30
Unknown	48	—	—
Total	8,935	182	

2.03 pregnancies per 100 first insertions, or 3.3 per 100 woman-years of use

It is evident that insertions in Group A cases were followed by the lowest risk of an unplanned pregnancy; then came insertions among Group B patients, about $3\frac{1}{2}$ times the risk in Group A. Group C cases appear to have the highest risk, at 3.3 per 100 insertions, and indeed, this risk will be much higher once the cases have been observed for a comparable period.

Of the total of 182 pregnancies, 13, or 7.1% have aborted.

A total of 27 cases, 23 in Group B and 4 in Group C—representing 14.8% of the total—showed definite evidence of the Lippes loop lying in an extra-uterine ectopic position. These pregnancies, which are being closely followed, are progressing satisfactorily.

In 41 cases (22.5%) the Lippes loop was still in utero when the pregnancies were diagnosed within the first 12 weeks. The Lippes loops were removed vaginally. This practice may be considered unwise for fear that an abortion may be produced. Fortunately no such event occurred and the pregnancies are reported to be progressing satisfactorily.

In 114 cases (62.6%) the position of the Lippes loop could not be verified at the time of assessment. The nylon threads were not felt vaginally in these cases. Of these 114 cases, 36 were being traced for further follow-up. A plain X-ray of the abdomen-pelvis at or about the 24th week of gestation will help to locate the loop, or at least it will perhaps indicate that the loop had already been expelled unnoticed.

It is worth pointing out that no case of an ectopic or extra-uterine pregnancy had been documented in this entire series. The Cooperative Statistical Program reported 7 ectopic pregnancies in 99 pregnancies—a rate of 1 in 14.² Even this rate is considered by Tietze to be only 10% of what could be expected.

6. EXTRA-UTERINE ECTOPIC IUD (LOOP)

The WHO Scientific Group described an extra-uterine and intra-pelvic position of the IUD as a uterine perforation, usually a complication of insertion of the IUD.¹ It stated that this complication occurred once in approximately 2,000 insertions or about 0.5 per 1,000. Tietze indicated a cumulative rate of this complication as 0.6 per 1,000.²

Present experience with the parturient uterus and IUD, viz. loop insertions in the three groups already mentioned, has begun to show that the loop as found in an ectopic position outside the uterus and within the pelvis is not really a sequel to a mechanical perforation of the uterus followed by an escape of the loop. Rather, an area of lowered resistance in the uterine wall is "pick-axed" by the "spearhead" of the Lippes loop during the recoiling process as it is being introduced into the uterine cavity. This can be viewed in some cases on

the X-ray screen during the course of insertion immediately following a hystero-gram. The present studies show that the point of least resistance in the uterine cavity appears to be centred in the lower segment of the uterus, and almost all the cases of extra-uterine ectopic loops in the study had a point of exit here. It could be that the lower segment of the uterus, especially during the period 4 to 6 weeks postpartum, also provides a very tight corner for the positioning of the Lippes loop, as it is recoiling in utero at the time of insertion. The lower segment of the uterus is perhaps also thinner compared to the rest of the uterus.

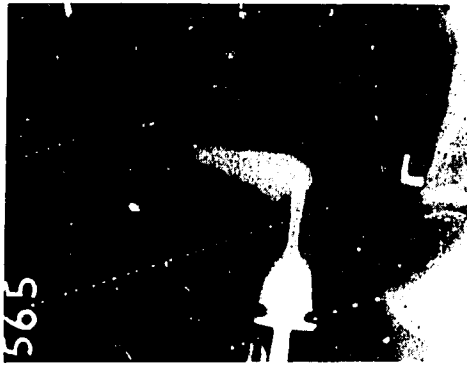


Fig. 3. X-ray hystero-gram showing a Lippes loop lying in a completely extra-uterine and intrapelvic position.

It is felt that the dynamics of uterine involution during the puerperium will later enhance the migratory burrowing process of the loop, starting from the point of least resistance which had already been "pick-axed" through the soft uterine wall, and then into the pelvic cavity, either intraperitoneally or extraperitoneally (Figs. 3-7).



Fig. 4. X-ray hystero-gram showing a Lippes loop lying in a completely extra-uterine and intrapelvic position. Note point of escape (arrowed).



Fig. 5. X-ray hystero-gram showing almost complete extrusion of a Lippes loop.

Perhaps in the cases where the time of IUD insertion is far removed from the time of delivery or the puerperium, uterine movements during the menstrual period may simulate these involutional movements. In 14 cases in the present study a laparotomy was done for the dual purpose of removing the loops and doing studies on them, and also for tubal ligation. In all the cases except one, the "spear-head" of the Lippes loop was the leading point. In the single case in which the tail-end of the Lippes loop was the leading point, the migration process was incomplete and half the loop was found in an upside-down position within the uterine cavity, in the lower segment. It has been felt that the use of larger sizes and stiffer

loops like the Lippes loop D as used in the present study, will result in a higher incidence of this complication.

No doubt, more work needs to be done on the relative sizes of the Asian uteri and also more studies will be needed to ascertain the exact dynamics and force of postpartum involution. There also appears to be a suggestion that the choice of an optimal size of loop, as well as a more resilient material, together with some modification of the present configuration of the head of the Lippes loop, may minimize the high trend towards ectopic loops found in this series. Present studies in Singapore cannot confirm the "perforation" theory, as it is hard to



Fig. 6. Showing partially extruded Lippes loop at laparotomy. Note point of exit. Nylon thread is being removed from the pouch of Douglas.



Fig. 7. Showing Lippes loop partially extruded from the uterus, lying retroperitoneally.

believe that the doctors employed in the present study are particularly perforation-prone. Besides, not a single case presented with symptoms of an acute abdomen, which must occur at least in one or some cases where an involuting uterus has been perforated. The particular softness and vulnerability of the uterine tissue during the postpartum and post-abort periods need not be stressed again.

The present series confirmed the almost symptomless clinical situations in all the ectopic loop cases, as observed by other authorities. The minimum tissue reactions observed in those cases where a laparotomy had been carried out could account for these symptomless clinical situations. Indeed, it will be interesting to follow-up closely those cases in which extra-uterine ectopic loops have not yet been removed, and to observe the long-term events that may occur.

It has been suggested that perhaps more cases were diagnosed in our present study because of the good follow-up rate and because we had been particularly on the look-out for such cases. No effort was spared to confirm or deny the suspect cases, and Beo-locators together with radiological assistance, including hystero-grams, were used in confirming the diagnosis.

Altogether, 61 documented cases were found to have extra-uterine ectopic loops during the present period of observation, viz. 18 October 1965 to 30 September 1966. This gives an

overall rate of 6.81 per 1,000 first insertions—about 13 times the rate given by the WHO Scientific Group (0.5 per 1,000 insertions). Expressed in terms of woman-years of use, the present study rate aggregates 1.1 per 100 woman-years of use.

The distribution of ectopic loops among the three groups of cases is shown in Table IX.

Table IX. Extra-uterine ectopic loops

Group	Insertions	Ectopic loops	
		No.	Rate per 1,000 first insertions
A	3,267	3	0.91
B	4,233	50	11.81
C	1,387	8	5.70
Unknown	48	—	—
Total	8,935	61	

Overall 6.8 per 1,000 first insertions or 1.1 per 100 woman-years of use

As viewed from present Singapore experience, it would appear that insertion of Lippes loop D 4 to 6 weeks postpartum will encounter the highest incidence of extra-uterine ectopic loops. The rate of 11.8 per 1,000 first insertions is about 23 times the rate of 0.5 per 1,000 quoted by the WHO Scientific Group.

Group A cases, where insertions were done immediately after delivery and up to one week postpartum, had the lowest rate among the three groups, 0.91 per 1,000. Group C cases are not comparable with those in Group A and Group B as they have only been observed for about three months; even then, over this limited period, a high rate of 5.7 per 1,000 insertions was recorded. This rate is less than the overall combined rate, but nevertheless it is about 11 times the rate quoted by the WHO Scientific Group.

A search for the nylon threads of the Lippes loop in the vagina failed to show them in 37 cases; this suggested that perhaps these loops had become ectopic. However, in 24 cases where the nylon threads had been felt vaginally, extra-uterine ectopic loops were confirmed in later investigations by Beo-locators as well as by X-rays and X-ray hystero-grams. X-ray hystero-grams assisted in confirming 26 cases of such extra-uterine ectopic loops.

Laparotomy has so far confirmed 14 ectopic loops. In 27 cases there were symptoms suggestive of an early pregnancy; and subsequently pregnancy and an ectopic loop were diagnosed. However, in the other cases, no such symptoms were apparent.

SUMMARY

1. The need for and the apparent advantages of early insertion of the IUD in the postpartum period are described.

2. A preliminary report on the outcome of IUD insertions in 8,935 recently delivered women at the Kandang Kerbau Hospital, Republic of Singapore, is presented. Three groups of women had the IUD inserted during the postpartum period, as follows:

Group A—Immediate to 1 week postpartum: 3,267 (5% had insertions at 2 to 3 weeks).

Group B—4 to 6 weeks postpartum: 4,233.

Group C—8 weeks postpartum: 1,387.

Unverified group: 48.

The rates quoted are based on an approximate figure of 5,600 woman-years of use, and the high follow-up rate of 93.8% (at least one follow-up visit) is emphasized.

Qualified doctors, but not gynaecologists, were employed in the insertions, and Lippes loop D was used as the IUD.

3. Women recently delivered at the Kandang Kerbau Hospital were interested in family planning of one form or another, and about 89–98% expressed an interest at the time of interview after delivery.

Altogether, 30,918 women were interviewed with a view to IUD insertion during the postpartum period, giving an insertion rate of about 28.8%. When the programme was at its

best and enthusiasm for the IUD was highest, the insertion rate averaged about 52%, but when the programme hit a setback in the form of undesirable gossip about the supposed fate of the IUDs—principally the “migration” possibility of the IUD to the stomach and the heart—a fall in the acceptance and insertion rates of the IUD was observed.

4. A total of 1,162 spontaneous expulsions was recorded and this represented 13% of all the insertions, or an average of 20.7 per 100 woman-years of use. Group A cases had the highest number of spontaneous expulsions, at 22.7% of first insertions; 81.2% of these expulsions had the IUD reinserted.

Group B cases had a lower rate of expulsions, at 8.1%, and 61% of these expulsions had the IUD reinserted.

Group C cases had the lowest rate of expulsions, but Group C cases were observed for only three months. The rate recorded was 5.3%. Within the first 30 days after initial insertions, 75.7% of the Group A expulsions occurred, followed by 54% of Group C and 32% of Group B expulsions.

Within 90 days after the initial insertions, 93.7% of the Group A expulsions had occurred, followed by 90.4% of Group C and 78.6% of Group B expulsions. All the expulsions in all three groups had been virtually completed by the 180th day after primary insertion.

5. A total of 1,658 women had the IUD removed for various reasons in the present study. This gives a rate of 18.5% of all insertions, and an approximate rate of 29.6 per 100 woman-years of use.

Of the initial insertions in Group A cases, 17.4% had the IUD removed. The same percentage was recorded for Group C cases, and 20.4% for Group B cases.

The removal rate was accelerated with the onset of the undesirable gossip in July 1966. Three reasons, viz. husband's request, fear, and unknown reasons, accounted for 57.3% of the total removals, but it was thought that the gossip played a large part in these three reasons.

6. A low pelvic infection rate was recorded for the entire series. Only 29 clinically significant cases were documented—giving a rate of 0.52 per 100 woman-years of use. In 19 cases the IUD was removed because of this complication. It would appear that the parturient uterus still provides an efficient barrier against possible ascending pelvic infection.

7. Altogether, 337 cases of clinically significant meno-metrorrhagia were recorded, and all cases had the IUD removed for this complication. This gives a rate of 6 per 100 woman-years. No significant differences in the incidence of this complication among the three groups of users were observed.

8. Unplanned pregnancies occurred in 182 cases, giving a pregnancy rate of 3.3 per 100 woman-years of use. The highest risk appeared to be among Group C cases, followed closely by Group B cases. Group A cases appeared to have the lowest risk.

Thirteen pregnancies ended in spontaneous abortion. There were 27 cases associated with extra-uterine ectopic loops, while 41 cases had the loops in utero, but these were removed on diagnosis of pregnancy. Another 114 cases are being followed-up with the position of the loop undetermined at this time.

No case of an ectopic gestation was recorded in the whole study.

The relationship of the IUD (loop) position and the possibility of pregnancy is discussed.

9. The term “ectopic extra-uterine loop” has been suggested to define a situation where the loop has been found outside the uterine cavity. The Singapore experience suggests that this situation is not really a sequel to a mechanical perforation of the uterus at the time of IUD insertion, followed by an escape of the loop. Rather, involuntal movements of the uterus set up a migratory burrowing process of an inserted loop led by its head, which has “pick-axed” into a point of least resistance of the uterine wall. All the cases had the migration points in the lower segment of the uterus and in all cases but one, the head of the Lippes loop was the “spear-head” in this event. It is suggested that more studies should be carried out to determine the size and shape of Asian uteri and whether modifications of the size, shape and resilience of the present Lippes loop could minimize the high rate of this complication at present encountered in the Singapore study.

Altogether, 61 cases with this complication were documented. This gives a rate of 1.1 per 100 woman-years of use. Also, an overall rate of 6.81 per 1,000 first insertions is about 13 times the rate given by the WHO Scientific Group at 0.5 per 1,000 first insertions. The

highest incidence of this complication was among Group B cases, where insertions were done at 4 to 6 weeks—the rate of 11·81 per 1,000 first insertions is about 23 times the rate given by the WHO Scientific Group. Group C cases, with insertions done at about 8 weeks post-partum and observed for only about three months, had a rate of 5·7 per 1,000 first insertions. Group A cases appeared to have the lowest rate of this complication, at 0·91 per 1,000 first insertions. Clinical suspicion, assisted by the use of Beo-locators, X-rays and X-ray hystero-grams, helped to make the diagnosis. Fourteen cases of this nature had a laparotomy done for the purpose of removing the loop as well as for tubal ligation. The good follow-up rate and the fact that the doctors in the study were keenly on the look-out for such complications, are suggested as reasons for this apparently high recorded rate.

The compilation of the observations in this report would not have been possible without the encouragement and assistance of the entire Committee of the Joint Government-University Unit supervising this project at the Kandang Kerbau Hospital, Singapore. Thanks are due to this Committee, whose members are:

Chairman: Professor S. H. Tow
Members: Mr. T.-H. Lean
Dr. S. M. Goon
Dr. D. Wolfers
Dr. S. S. Ratnam

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The photographs were prepared by Mr. Anthony Khoo of the Department of Obstetrics and Gynaecology, University of Singapore.

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53. THE NYLON RING—A DEVICE WITH A HALF-LIFE OF EIGHT YEARS

J. Zipper, M. L. Garcia, and L. Pastene,
R. Barros Luco Hospital, Santiago, Chile

INTRODUCTION

Our work published in 1962 and 1964 in the First and Second Conferences on Intra-uterine Devices,^{1,2} allowed us to make assumptions of a clinical and demographic nature which have been amply confirmed by analysis of the last two years of use of the original 3,000 IUDs inserted between October 1959 and June 1963.

When, in 1959, we decided to perfect our own intra-uterine device,^{3,4} we wanted to develop an IUD which could be both made and inserted by medical or paramedical personnel. There has been an incredible change in attitude by our health authorities and government in the face of the problems of illegal abortion and population growth, in line with the world change in the attitude to the population explosion. Even so, we still believe that our initial premise of simplicity in the spread and use of contraceptive techniques, coupled with low motivation on the user's part, is seen in the demographic effect in the developing countries, mainly those of Latin America.

Table 1. Net annual and cumulative rates of events and closure per 100 cases, by type of termination: Barros Luco Hospital, five years of use

Type of termination	Annual rates					Cumulative rate				
	1st year	2nd year	3rd year	4th year	5th year	1st year	2nd year	3rd year	4th year	5th year
Events:										
Pregnancies	4.3	2.3	1.9	1.3	1.3	4.3	6.6	8.5	9.8	11.1
Expulsions:										
First	17.0	2.6	1.5	1.0	0.9	17.0	19.6	21.1	22.1	23.0
Later	3.4	1.1	0.5	0.4	0.1	3.4	4.5	5.0	5.4	5.5
Removals:										
Bleeding and/or pain	4.2	1.6	1.8	0.6	0.8	4.2	5.8	7.6	8.2	9.0
Other medical	2.1	1.4	1.0	1.4	0.4	2.1	3.5	4.5	5.9	6.3
Planning pregnancy	0.1	0.8	0.8	0.9	1.3	0.1	0.9	1.7	2.6	3.9
Other personal	2.0	1.8	1.7	1.1	0.7	2.0	3.8	5.5	6.6	7.3
Closures:										
Pregnancies	3.0	1.8	1.0	1.0	1.0	3.0	4.8	5.8	6.8	7.8
Expulsions:										
First	5.2	1.1	0.3	0.3	0.6	5.2	6.3	6.6	6.9	7.5
Later	1.6	0.3	0.3	0.0	0.2	1.6	1.9	2.2	2.2	2.4
Removals:										
Bleeding and/or pain	2.8	1.1	1.1	0.5	0.3	2.8	3.9	5.0	5.5	5.8
Other medical	1.3	0.9	0.7	1.0	0.2	1.3	2.2	2.9	3.9	4.1
Planning pregnancy	0.0	0.5	0.7	0.6	1.1	0.0	0.5	1.2	1.8	2.9
Other personal	1.7	1.4	1.3	0.8	0.8	1.7	3.1	4.4	5.2	6.0
Total closures						15.6	22.7	28.1	32.3	36.5
Active at end of year						84.4	77.3	71.9	67.7	63.5
Woman-months of use	28,737	23,036	18,813	11,366	4,938	28,737	51,773	70,586	81,952	86,890

Our present knowledge of methodology in contraception, which can be summed up in the concept of the continued use or half-life of a method, together with an analysis of the causes for discontinuing, allows us to evaluate approximately the possible demographic effectiveness of the different methods under development.

ANALYSIS OF FINDINGS

Analysis of the results of 3,000 insertions at the R. Barros Luco-Trudeau Hospital from October 1959 to June 1963 was carried out with the cooperation of Dr. C. Tietze and the National Committee on Maternal Health. The latest data available are for June 1966.

The results, which are explained separately, are shown in Table I. We refer the reader to a previous paper² for a complete explanation of the projections of these results.

FINDINGS

(a) *Pregnancies with the ring in situ, undetermined*: Fig. 1 shows the percentage indices of pregnancies from the 1st to the 5th year. The cumulative index for the 5th year is 11.1.

(b) *Primary and secondary expulsions*: Fig. 2 shows the percentage indices from the 1st to the 5th year. Reinsertion reduced expulsion in the first year from 17.0 to 3.4.

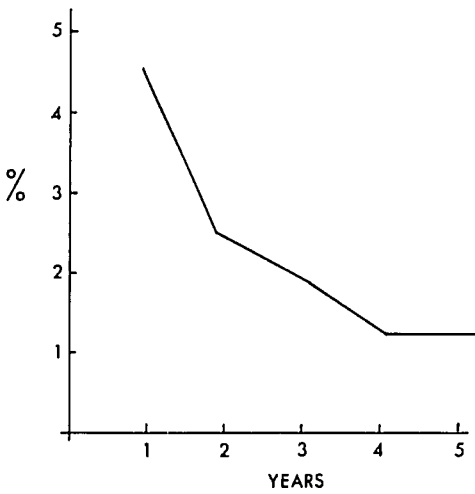


Fig. 1. Pregnancy with ring *in situ* and undetermined.

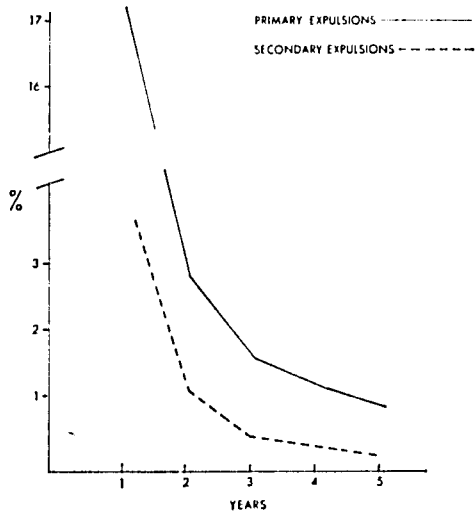


Fig. 2. Primary and secondary expulsions.

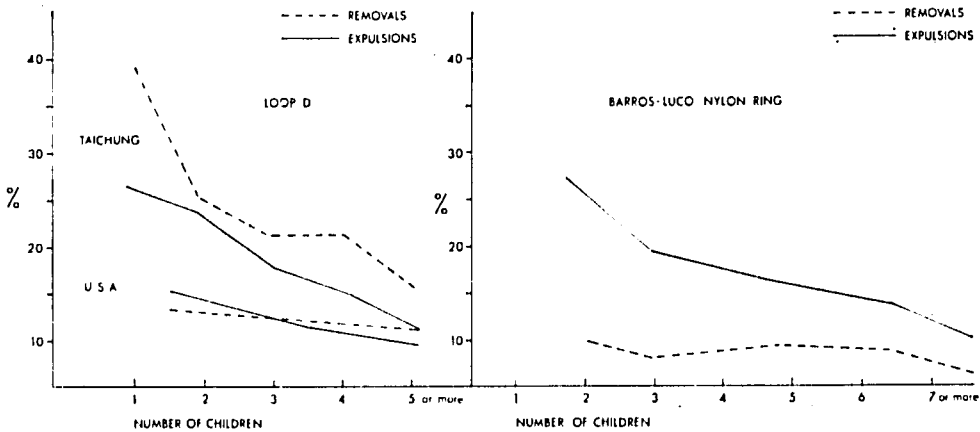


Fig. 3. Expulsions and removals for medical reasons (metrorrhagia and pain), by parity.

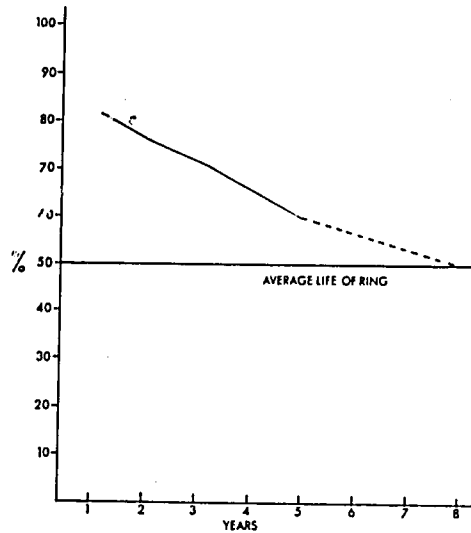


Fig. 4. Active cases per year.

(c) *Expulsions and removals for medical reasons (metrorrhagia and pain) during the first year, by parity:* Fig. 3 compares the ring with curves for Lippes loop D in the USA and Taichung.

(d) *Continuing cases per year:* Fig. 4 shows the percentage of continuing cases, or retention index, per year. It can be seen that 63.5% of the women under study were still using the IUD at the end of the 5th year. Assuming a later decrease of 4.5% annually, the half-life of the device can be estimated at about eight years.

(e) *Table II:* This gives the comparative retention indices in the 4th year for Lippes loop D (results of all investigators analysed by Tietze) and the nylon ring.

Table II. Indices of expulsion and removal in 4th year of nylon ring and Lippes loop D

4th year	Nylon ring	Lippes loop D
Index of expulsion and removal	32.3	48.4
Index of retention	67.7	51.6

(f) *Table III:* This shows expulsions and removals for medical reasons, by parity.

Table III. Expulsions and removals for medical reasons, by parity

Parity	Number of cases	Expulsions		Removals	
		Number	Index*	Number	Index*
0	2	0	NC	1	NC
1	63	13	NC	3	NC
2	287	69	26.4 ± 2.9	23	8.5 ± 2.0
3	617	110	18.9 ± 1.7	39	6.3 ± 1.1
4 or 5	1,044	161	16.8 ± 1.2	83	6.7 ± 0.9
6 or 7	545	72	14.0 ± 1.6	38	6.0 ± 1.8
8 or more	397	38	10.1 ± 1.6	19	3.7 ± 1.1
Unknown	45	5	NC	1	NC
Totals	3,000	468		207	

NC = Not computed.

* Cumulative index per 100 cases in the first year after insertion.

(g) *Table IV*: This shows monthly indices for pregnancy, expulsion, and removal for medical reasons, by time from insertion.

Table IV. Monthly indices for pregnancy, expulsion and removal for medical reasons, by period after insertion

<i>Period after insertion (months)</i>	<i>Pregnancies</i>	<i>Expulsions</i>	<i>Removals (medical)</i>
0-1	0.1	7.3	2.4
1-2	0.6	3.0	0.6
2-3	0.5	2.0	0.3
3-6	0.5	0.8	0.4
6-9	0.4	0.9	0.3
9-12	0.2	0.4	0.4
12-18	0.2	0.2	0.2
18-24	0.1	0.3	0.5
24-36	0.2	0.2	0.4
36-48	0.1	0.1	0.3

COMMENTS

The analysis of these data and comparison with those of Dr. Tietze for other types of IUD, especially the Lippes loop D, allows us to draw the first conclusions of real value regarding the future development and use of the Zipper ring.

PRIMARY AND SECONDARY EXPULSIONS

The high incidence of primary expulsions with this IUD—17% in the first year—discouraged many investigators from using it even though it was clearly demonstrated in 1964 that 80% of those in the first year took place in the first four months, and that reinsertion of the device lowered the rate to 4.5% at the end of the second year. At the present time, at the end of the 5th year of analysis, the cumulative index for primary expulsion is 23% and reinsertion lowers this figure to 5.5%.

We believe that expulsion in the first four months should not be regarded negatively in evaluating the effectiveness of the device, but rather as a physiological phenomenon of uterine adaptation to the foreign body, as metrorrhagia is in the early months.

The phenomenon of adaptation reflects negatively on the demographic effectiveness from another point of view; it increases the period of motivation for use from one session to four or five months.

RELATION BETWEEN EXPULSION AND PARITY

In 1964 we demonstrated clearly with this device an inverse relation between parity and expulsion, a fact that did not show up in experience gained in the USA and Puerto Rico. However, the phenomenon has now been repeated in other countries, as in the Taichung (Taiwan) study. Fig. 3 shows the curves for the Taichung study with loop D, compared with our own.

REMOVAL OF THE DEVICE FOR MEDICAL REASONS

This is the essential factor making for effectiveness of an IUD and requires a follow-up of several years to establish. In the 5th year (60 months), 15.3% of our group had had the device removed for medical reasons. This index for Lippes loop D is reached after 18 months.⁶

The reasons we have deduced to explain this difference are that the nylon device is more elastic and has less contact with a very small and less reactive portion of the endometrium, i.e. at its border.

On the other hand, other devices which have a high removal rate for medical reasons, such as the Margulies spiral or Lippes loop D, are in contact with the whole endometrial surface, anterior and posterior edges and surfaces. Although this increases the contraceptive effect it also increases irritation in the endometrium, producing metrorrhagia and pain. This

must be taken into account in the development of new devices. Regarding factors related to expulsion, we continue to hold the views expressed in 1964.²

THE DESIRE FOR FURTHER PREGNANCIES

At the end of the 5th year, the cumulative index of women wanting a further pregnancy is only 3.9. This fact is extremely important in the development of slowly reversible or irreversible techniques, which would unquestionably be accepted by the great majority of women in our study.

MANUFACTURE

This device can be made by anybody interested, at an insignificant cost. This was a decisive factor, at least in Chile, in the spread of its use without the need for setting up distributing networks, which in practice is quite a complex operation. We believe this to be true anywhere in Latin America.

PROSPECTS FOR THE IUD

The demonstration that an IUD can have a half-life of eight years makes this the most important method of demographic control in existence.

Although not all the devices have an equal half-life, owing to their form and the aims underlying their development, the premises developed in this study will perhaps make possible the creation of new devices with a greater useful life.

We should like to quote from our article in 1964: "Nevertheless there is a serious obstacle which we think decreases the demographic effectiveness of this method. Its wide application depends on its use by doctors in a strong co-operative health programme". This is a difficult premise to fulfil in Latin America in the near future, Chile being perhaps the only exception.

Because of this, the development of methods which will be highly sophisticated from the viewpoint of basic research, but extremely simple so as to be usable on a large scale by the health authorities, is of great urgency if the objectives for which we are meeting here are to be achieved.

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54. PROGRESS REPORT ON INTRA-UTERINE DEVICES

C. Tietze

Bio-Medical Division, The Population Council

This Seventh Progress Report on the Cooperative Statistical Program (CSP) for the Evaluation of Intra-uterine Devices, conducted by the National Committee on Maternal Health, covers 39 months of the programme's operations, from 1 June 1963 up to 30 September 1966. With the transfer of the National Committee on Maternal Health to the Bio-Medical Division of the Population Council on 1 January 1967, the CSP is being continued under the auspices of the Population Council.

The Report is based on data from 28 investigators who submitted individual case records for 23,948 women, with an aggregate experience of 381,627 woman-months. Seventeen additional participating investigators, with a total of about 11,500 cases, had been dropped during the course of the programme, generally because of inadequate follow-up.

Of the 28 investigators, 24 are institutional and 4 are gynaecologists in private practice. The institutional participants include those working at 11 outpatient clinics in hospitals, mostly associated with medical schools, and 13 at extramural clinics, of which 7 are affiliated to the Planned Parenthood Federation of America. Twenty-five of the investigators work in the USA, including one in Puerto Rico; 3 are located elsewhere.

Most of the data are presented for 4 types of intra-uterine devices (IUDs): the Lippes loop, Margulies spiral (Gynekoil), Birnberg bow, and stainless steel ring of Hall and Stone. Rates were not computed for a residual category of "other devices", including experimental models abandoned after a period of trial and new devices recently added to the testing programme. No rates were computed either for all types of IUDs combined, because of the heterogeneous nature of the experiences.

Of the 4 major devices, the loop has been studied in 4 sizes, designated A, B, C, and D, in order of increasing magnitude. While loop C is only slightly smaller than loop D, it is more resilient, owing to a flattening of the polyethylene rod in the curves of the double S. The spiral and bow each appear in two sizes, small and large, and the stainless steel ring in a single size. On the basis of the experience gathered in the trials, the smaller sizes are now generally recommended for nulliparous women only.

Since late 1965, the bow and its introducer have been modified in several important respects, primarily in an effort to reduce the incidence of perforation of the uterus and of difficult removal, which had been reported for this device, without sacrificing the low expulsion rate. The CSP does not include adequate numbers of women using the "new bow" and no rates have been shown for this device.

This report presents data on 23,948 women, of whom 11,909 were classified as active users on 30 September 1966; another 2,630 had been released from observation as users at an earlier date, and 9,409 were classified as non-users or closed cases. Of the latter group, 6,839 had ceased to be users because of pregnancy, expulsion, or removal of the IUD, while 2,570 had been lost to follow-up. About 28% of the women (6,650) had remained under observation for more than 2 years. The median duration of use for the active users was 22.4 months.

At the time of their first insertion, two out of three women were under 30 years of age and most of the remaining third under 40 years (Table I). The overwhelming majority (97%) had given birth to one or more children, with an average of 3.2 live births per mother.

Table II shows the number of first and later insertions and aggregate woman-months of use by type and size of device. Four-fifths of the total of 29,753 insertions were first insertions (23,948) and one-fifth second and later insertions (5,805). Loop D was by far the most

Table I. Number of women by age and parity at first insertion

Age (in years)	Number	Parity	Number
15-19	1,983	0	703
20-24	7,558	1	4,163
25-29	6,722	2	6,301
30-34	4,300	3	4,913
35-39	2,345	4	3,324
40-44	887	5	1,860
45-49	153	6 or more	2,684
Total	23,948		23,948

popular of the devices, accounting for about one-third of all insertions and woman-months of use. Loops C and D together accounted for close on one-half of the insertions and of the woman-months.

PREGNANCIES, EXPULSIONS, AND REMOVALS

Table III presents the number of reported events (pregnancies, expulsions, and removals), cross-classified by type and size of device. The total of 1,094 reported pregnancies includes all conceptions after insertion of an IUD and before an expulsion noticed by the wearer or before a removal. The great majority of these pregnancies are known to have occurred with the device *in situ* at the time of conception. All other pregnancies have been classified as "pregnancy with device undetermined". The expression "pregnancy after unnoticed expulsion" is not used since, by definition, the date of an unnoticed expulsion cannot be determined and, therefore, cannot be related to the date of conception.

Table II. First insertions, later insertions, and total insertions, and woman-months of use, by type and size of device

Device	Insertions			Woman-months of use
	First	Later	Total	
Loop A	1,019	261	1,280	20,800
Loop B	1,065	99	1,164	8,565
Loop C	3,636	1,115	4,751	49,400
Loop D	7,814	2,035	9,849	136,284
Small spiral	448	94	542	7,060
Large spiral	2,187	306	2,493	35,243
Small bow	1,470	168	1,638	20,413
Large bow	2,273	645	2,918	43,472
Steel ring	1,728	369	2,097	35,710
Other	2,308	713	3,021	24,680
Total	23,948	5,805	29,753	381,627

Because tailed IUDs, such as the spiral and the loop, can be palpated or seen at the time of a clinic visit, it is conceded that for these devices most pregnancies with device undetermined may actually be pregnancies which occurred after an unnoticed expulsion. No such conclusion may be drawn in cases of pregnancy involving the bow and the stainless steel ring, which have no appendages accessible to inspection or palpation. Since it is not customary to probe the uterus or to do an X-ray examination after a pregnancy has been diagnosed, the determination of the presence or absence of these devices in cases of pregnancy must await the time of confinement or abortion. It should be noted that most women in the CSP are seen by the investigators at shorter intervals than would be feasible in a public health setting, or even in private practice. These frequent visits favour early detection of expulsions not noticed by the wearer, and thus reduce the risk of accidental pregnancy.

The total of 3,864 expulsions reported by the participating investigators includes complete expulsions into or from the vagina and partial expulsions requiring removal from the cervix, whether noticed or unnoticed by the wearer. The number of expulsions for tailless devices

may be understated because their absence may not be discovered unless or until a conception has occurred.

A total of 3,071 devices were removed because of bleeding (including spotting) and pain (including cramps, backache, and other kinds of discomfort), often reported together. Other medical reasons, accounting for 1,145 additional removals, run the gamut from medical necessity, as perceived by the investigator, to complaints related to the IUD by the wearer or her family doctor. They also include pre-existing and intercurrent conditions requiring treatment, but clearly unrelated to the use of the device, as well as cases of discomfort to the male partner attributed to the transcervical appendage of an IUD. Removals after a partial expulsion and removals after conception are classified, respectively, as expulsions and as pregnancies and are, therefore, not included in this category.

Table III. Events by type of termination, by type and size of device

Device	Pregnancies	Expulsions	Removals by reason				Investigator's choice	All events
			Bleeding and/or pain	Other medical	Planning pregnancy	Other personal		
Loop A	87	248	123	60	45	59	340	962
Loop B	20	137	87	37	9	21	6	317
Loop C	104	689	394	125	73	62	15	1,462
Loop D	269	1,159	1,150	385	211	256	103	3,533
Small spiral	20	171	51	21	21	50	11	345
Large spiral	41	580	392	232	69	112	36	1,462
Small bow	178	73	174	47	39	67	766	1,344
Large bow	162	70	347	126	62	68	158	993
Steel ring	130	341	173	54	84	53	29	864
Other	83	396	180	58	40	67	533	1,357
Total	1,094	3,864	3,071	1,145	653	815	1,997	12,639

Removals of the IUD for personal reasons include 653 removals because the couple wanted a child and 815 classified as "other personal reasons". Some of the reasons in the latter group are relevant to the acceptability of intra-uterine contraception (fear of cancer or other injury, lack of confidence, objection of husband or family doctor without a specific complaint, religious scruples, etc.); others, such as separation from husband, are not. Also included are a few IUDs removed at the wearer's request for unstated reasons.

Altogether, 1,997 removals were made at the investigator's choice, in connection with research procedures, such as endometrial biopsy, or because of the decision to replace the device by another type or size considered more effective. This category also includes a small number of removals because the women left the locality of the study and could not be transferred to another investigator. Since these types of removals are peculiar to a research programme and not related to the effectiveness, acceptability, or safety of the IUDs, they are not included in the computation of event rates and closure rates.

Table IV shows the number of closed cases classified by reason for termination. Because many expulsions and removals are followed by a reinsertion, the number of cases in each cell of Table IV is smaller than in Table III. The largest difference between events and closures occurred in cases of removals at the investigator's choice, where 68 cases were closed out of a total of 1,997 removals. In cases of expulsions, 1,244 cases were closed compared with 3,864 occurrences.

EVENT RATES AND CLOSURE RATES

Cumulative event and closure rates by type and size of device and type of termination, at the end of a two-year period, are shown in Table V. Closure rates are lower than event rates because, as has just been stated, there are fewer closures than events. For instance, by the end of the second year, 11.0% of all women wearing loop D had experienced a first expulsion, but only 3.4% had discontinued its use for this reason. By subtracting the closures (3.4%)

Table IV. Closures by type of termination, by type and size of device

Device	Pregnancies	Expulsions	Removals by reason					All closures
			Bleeding and/or pain	Other medical	Planning pregnancy	Other personal	Investigator's choice	
Loop A	71	82	81	31	30	48	7	350
Loop B	19	37	80	28	9	19	0	192
Loop C	96	196	356	92	65	59	2	866
Loop D	232	395	1,018	280	174	231	19	2,349
Small spiral	16	51	36	15	16	42	2	178
Large spiral	33	185	265	123	61	94	4	765
Small bow	150	17	104	33	34	59	9	406
Large bow	136	29	298	104	55	56	14	692
Steel ring	120	114	148	48	66	51	8	555
Other	66	138	147	44	28	60	3	486
Total	939	1,244	2,533	798	538	719	68	6,839

from the expulsions (11.0%) it can be seen that 7.6% of the women wearing loop D (almost 7 out of 10 women with a first expulsion) had the loop reinserted after a first expulsion. Since only 2.2% of all cases were closed as a result of a later expulsion, it follows that 5.4% of the women, or one-half of those with a first expulsion, continued to wear the loop after one or more reinsertions for at least two years after the first insertion.

Using as criteria the most important events in terms of frequency and rate of occurrence, no one device appears consistently in first place. As shown in Table V, pregnancy rates ranged from 2.2 per 100 for the large spiral to 16.1 per 100 for the small bow. They were lower for

Table V. Net cumulative rates of events and closures per 100 cases, by type of termination: all devices by type and size, two years of use

Type of termination	Loops				Spirals		Bows		Steel ring
	A	B	C	D	Small	Large	Small	Large	
Events:									
Pregnancies	9.3	4.8	4.0	4.1	4.5	2.2	16.1	7.1	9.0
Expulsions:									
First	22.9	17.7	15.1	11.0	33.4	23.5	4.7	1.8	18.1
Later	4.9	4.4	5.7	4.2	10.0	7.1	1.3	1.1	4.5
Removals:									
Bleeding and/or pain	13.0	16.8	15.1	16.5	13.2	20.5	16.5	15.7	11.9
Other medical	6.7	6.3	4.7	5.7	5.5	11.4	4.1	5.6	3.2
Planning pregnancy	4.0	2.2	3.3	2.8	3.4	3.0	4.4	2.6	4.3
Other personal	6.6	2.9	2.4	3.8	12.1	5.8	7.0	3.0	3.3
Closures:									
Pregnancies	8.0	4.6	3.7	3.5	3.2	1.7	13.7	6.0	8.2
Expulsions:									
First	6.9	4.7	4.1	3.4	9.7	7.6	1.0	0.7	5.3
Later	2.5	2.1	2.1	2.2	3.5	2.1	0.3	0.4	2.2
Removals:									
Bleeding and/or pain	8.6	15.3	13.6	14.6	8.8	13.8	9.5	13.3	10.1
Other medical	3.1	4.8	3.6	4.1	3.9	6.3	3.2	4.6	2.9
Planning pregnancy	2.3	2.2	3.0	2.2	1.8	2.6	4.1	2.2	3.4
Other personal	5.1	2.7	2.3	3.4	10.0	4.7	6.2	2.6	3.2
Total closures	36.5	36.4	32.4	33.4	40.9	38.8	38.0	29.8	35.3
Active at end of 2nd year	63.5	63.6	67.6	66.6	59.1	61.2	62.0	70.2	64.7
Woman-months of use	13,428	8,045	43,474	109,946	5,883	28,890	18,987	40,411	25,163

the larger sizes of each device than for the smaller sizes. Among plastic IUDs of comparable size, the spirals had the lowest pregnancy rates, followed by the loops and bows. The stainless steel ring, a comparatively small device, was also associated with a high pregnancy rate.

Rates of first expulsions varied even more widely than pregnancy rates, ranging from 1·8 per 100 women for the large bow to 33·4 for the small spiral. Here again, the rates declined steeply with increasing size of IUD. For comparable sizes, expulsion rates were lowest for bows, intermediate for loops, and highest for spirals.

Removal rates for bleeding and/or pain were markedly higher for the large spiral than for the smaller model, and slightly lower for loop A than for the larger loops. Removals for other medical reasons were significantly associated with size for the spiral only. Rates of removal for planning pregnancy tended to be higher for the smaller devices, which were more often inserted in women of low parity, who are more likely to want to have more children. All in all, loop D appears to have had the most favourable all-round experience, with low, but not the lowest, rates of pregnancies, expulsions and removals.

In terms of retention rates at the end of the two-year period, the results were quite similar for the various devices. About 2 out of 3 women continued to wear the IUD after 2 years.

Because of the extensive experience with loop D, rates of events and closures for a four-year period are presented for that device in Table VI. The first panel shows annual rates per 100 cases active at the beginning of *each* year of use. These rates represent most accurately the trends during successive years. First expulsions dropped from 9·1 per 100 during the first year to 0·4 per 100 in the fourth year, and later expulsions, from 3·0 to 0·3 per 100. This trend is largely due to the gradual elimination of women who cannot tolerate the device and

Table VI. Net annual and cumulative rates of events and closures per 100 cases, by type of termination: loop D, four years of use

Type of termination	Annual rates per 100 cases active at beginning of each year				Annual rates per 100 cases active at beginning of first year				Cumulative rates per 100 cases			
	1st year	2nd year	3rd year	4th year	1st year	2nd year	3rd year	4th year	1st year	2nd year	3rd year	4th year
Events:												
Pregnancies	2·6	1·9	1·1	1·3	2·6	1·5	0·8	0·7	2·6	4·1	4·9	5·6
Expulsions:												
First	9·1	2·5	1·5	0·4	9·1	1·9	1·0	0·3	9·1	11·0	12·0	12·3
Later	3·0	1·5	1·1	0·3	3·0	1·2	0·7	0·2	3·0	4·2	4·9	5·1
Removals:												
Bleeding and/or pain	10·8	7·2	6·3	4·4	10·8	5·7	4·2	2·6	10·8	16·5	20·7	23·3
Other medical	3·4	2·9	2·2	1·6	3·4	2·3	1·5	0·9	3·4	5·7	7·2	8·1
Planning pregnancy	0·9	2·4	2·5	2·5	0·9	1·9	1·6	1·5	0·9	2·8	4·4	5·9
Other personal	2·2	2·1	0·8	2·0	2·2	1·6	0·6	1·2	2·2	3·8	4·4	5·6
Closures:												
Pregnancies	2·3	1·5	1·0	1·3	2·3	1·2	0·6	0·8	2·3	3·5	4·1	4·9
Expulsions:												
First	2·7	0·8	0·5	0·4	2·7	0·7	0·3	0·3	2·7	3·4	3·7	4·0
Later	1·7	0·6	0·6	0·3	1·7	0·5	0·4	0·2	1·7	2·2	2·6	2·8
Removals:												
Bleeding and/or pain	9·7	6·2	5·4	3·9	9·7	4·9	3·6	2·2	9·7	14·6	18·2	20·4
Other medical	2·5	2·1	1·7	1·2	2·5	1·6	1·2	0·7	2·5	4·1	5·3	6·0
Planning pregnancy	0·7	2·0	2·2	2·5	0·7	1·5	1·5	1·5	0·7	2·2	3·7	5·2
Other personal	1·9	1·9	0·8	2·0	1·9	1·5	0·5	1·2	1·9	3·4	3·9	5·1
Total closures	21·5	15·1	12·2	11·6	21·5	11·9	8·1	6·9	21·5	33·4	41·5	48·4
Active at end of year	78·5	66·6	58·5	51·6	78·5	66·6	58·5	51·6	78·5	66·6	58·5	51·6
Woman-months of use	67,850	42,096	19,120	5,089	67,850	42,096	19,120	5,089	67,850	109,946	129,066	134,155

expel it. Over the same four-year period, pregnancy rates declined from 2·6 to 1·3 per 100 and rates of removals for medical reasons, from 14·2 to 6·0 per 100. Rates of removals for planning pregnancy, on the other hand, increased from 0·9 per 100 during the first year to about 2·5 in later years. There was no clear-cut trend, either up or down, in the removals for other personal reasons.

The second panel of Table VI shows annual event and closure rates per 100 cases active at the beginning of the *first* year of use, i.e. per 100 first insertions. Except for the first year, these rates are uniformly lower than those in the first panel, because fewer cases remain at risk during successive years.

Addition of the *annual* rates in the second panel produces the *cumulative* rates in the third panel. These cumulative rates show a drop-out of 2 out of 10 cases by the end of the first year,

more than 3 out of 10 by the end of the second year, 4 out of 10 by the end of the third year, and almost 5 out of 10 by the end of the four-year period. Three-quarters of the total loss was due to removals.

AGE AND PARITY

The extensive experience with loop D has also made it possible to tabulate events and closures during the first year of use by age of the women at the time the device was inserted (Table VII). The decline in expulsions with advancing age of women was extremely marked. First expulsions dropped from 19.8 per 100 in the 15-19 years age group to 4.4 for women 40-44 years of age. Second and later expulsions fell from 7.3 per 100 for the youngest women to zero for the oldest. Accidental pregnancies also declined with age, as might be expected. Removals did not appear to be related to age.

Table VII. Cumulative rates of events and closures per 100 cases by type of termination and age: loop D, one year of use

Type of termination	Age					
	15-19	20-24	25-29	30-34	35-39	40-44
Events:						
Pregnancies	3.1	3.7	3.0	1.5	1.7	0.0
Expulsions:						
First	19.8	12.8	7.7	5.2	4.4	4.4
Later	7.3	4.4	2.8	1.8	0.6	0.0
Removals:						
Bleeding and/or pain	13.8	10.8	11.0	10.7	9.2	10.0
Other medical	4.0	3.9	3.4	2.8	3.1	3.7
Planning pregnancy	1.3	1.7	0.9	0.4	0.2	0.4
Other personal	1.6	2.4	2.4	1.9	1.6	2.9
Closures:						
Pregnancies	2.8	3.1	2.6	1.4	1.7	0.0
Expulsions:						
First	5.7	3.5	2.3	1.9	1.7	1.2
Later	4.4	2.8	1.5	0.7	0.4	0.0
Removals:						
Bleeding and/or pain	12.1	9.7	9.8	9.8	8.2	9.2
Other medical	3.3	2.8	2.4	1.9	2.4	2.5
Planning pregnancy	0.9	1.3	0.5	0.3	0.0	0.4
Other personal	1.6	2.0	2.1	1.8	1.4	2.4
Total closures	30.8	25.2	21.2	17.8	15.8	15.7
Active at end of year	69.2	74.8	78.8	82.2	84.2	84.3
Woman-months of use	4,369	20,138	19,202	13,261	7,671	2,642

Table VIII shows for loop D a distribution of events and closure rates by parity. Although expulsion rates for both first and subsequent expulsions declined with parity, the drop was not nearly as sharp as with age. Rates of removals for bleeding and/or pain also declined with parity—from 14.8 per 100 cases for women with one child to 6.0 per 100 for women with eight or more children. Pregnancies and most other events did not appear to follow a pattern in relation to parity.

The greater impact of age on the rate of expulsion and of parity on removals for bleeding and/or pain is clearly illustrated in Tables IXa and IXb, which show the distribution of rates of events and closures for the first year of use of loop D within each age group by parity, and within each parity group by age.

Generally speaking, within each age group, rates of removals for bleeding and/or pain declined with parity while pregnancy rates increased with parity. Expulsion rates showed a

marked downward trend within age group by parity for women younger than 30 years of age only. Within parity groups, pregnancy and expulsion rates declined sharply with age, while the rates of removals for bleeding and/or pain exhibited an irregular pattern.

Table VIII. Cumulative rates of events and closures per 100 cases by type of termination and parity: loop D, one year of use

Type of termination	Parity							
	1	2	3	4	5	6	7	8 or more
Events:								
Pregnancies	3.9	2.0	2.4	2.8	3.5	2.0	2.2	2.2
Expulsions:								
First	13.8	10.3	8.2	8.0	5.6	4.7	6.0	5.0
Later	5.2	3.1	2.9	2.5	3.1	1.4	0.5	0.8
Removals:								
Bleeding and/or pain	14.8	11.3	10.5	10.1	10.1	6.5	4.1	6.0
Other medical	4.6	3.2	2.7	3.9	3.0	2.9	3.3	3.7
Planning pregnancy	2.6	1.1	0.5	0.4	0.2	0.0	0.6	0.4
Other personal	1.6	2.2	2.3	1.6	2.5	2.9	1.6	4.2
Closures:								
Pregnancies	3.6	1.8	1.9	2.8	2.4	2.0	2.2	1.9
Expulsions:								
First	4.1	3.0	2.2	2.8	1.2	0.9	3.5	1.5
Later	3.2	2.0	1.7	1.5	1.4	0.3	0.5	0.0
Removals:								
Bleeding and/or pain	13.6	9.9	9.3	9.0	8.9	5.9	3.5	5.6
Other medical	3.6	2.5	1.7	2.3	2.4	2.6	1.6	2.6
Planning pregnancy	1.8	0.8	0.2	0.4	0.2	0.0	0.0	0.4
Other personal	1.6	1.9	1.9	1.3	2.2	2.6	1.6	3.5
Total closures	31.5	21.9	18.9	20.1	18.7	14.3	12.9	15.5
Active at end of year	68.5	78.1	81.1	79.9	81.3	85.7	87.1	84.5
Woman-months of use	9,820	17,844	15,343	10,243	5,625	3,282	2,046	2,857

Table IXa. Net cumulative rates of events and closures per 100 cases, by type of termination, by age and parity at first insertion: loop D, one year of use

Type of termination	15-24 years			25-29 years			30-34 years			35-49 years		
	Para 1 or 2	Para 3 or 4	Para 5 or more	Para 1 or 2	Para 3 or 4	Para 5 or more	Para 1 or 2	Para 3 or 4	Para 5 or more	Para 1 or 2	Para 3 or 4	Para 5 or more
Events:												
Pregnancies	3.5	3.2	5.3	2.4	2.9	4.1	1.2	2.1	1.2	0.6	1.0	2.0
Expulsions:												
First	15.0	12.9	10.4	9.9	7.5	5.1	5.9	4.9	5.1	4.7	3.7	4.1
Later	5.6	4.4	1.7	2.6	3.1	2.8	2.7	0.8	2.2	0.0	0.9	0.3
Removals:												
Bleeding and/or pain	12.9	8.8	6.7	12.2	11.1	8.0	12.8	11.4	8.1	11.6	10.4	6.5
Other medical	3.8	4.3	3.1	3.8	3.2	2.8	2.7	1.8	4.2	4.7	2.6	2.3
Planning pregnancy	2.2	0.6	0.0	1.4	0.8	0.3	0.9	0.0	0.5	0.4	0.3	0.0
Other personal	2.3	1.8	4.5	2.0	2.7	2.5	1.1	1.0	3.3	1.4	2.0	2.1
Closures:												
Pregnancies	3.2	2.7	2.5	2.3	2.6	3.3	1.2	1.9	1.2	0.6	1.0	2.0
Expulsions:												
First	3.8	3.8	4.7	3.8	2.0	0.7	1.7	2.3	1.8	2.7	0.6	1.2
Later	3.5	2.7	1.0	1.5	1.7	1.3	1.5	0.2	0.7	0.0	0.9	0.0
Removals:												
Bleeding and/or pain	11.4	7.9	5.9	11.1	9.7	6.9	11.3	10.4	7.7	11.0	9.0	5.5
Other medical	2.8	3.0	3.1	3.1	1.9	1.5	2.4	0.4	3.2	3.3	1.8	2.0
Planning pregnancy	1.5	0.6	0.0	1.2	0.3	0.0	0.6	0.0	0.5	0.0	0.3	0.0
Other personal	2.1	1.4	4.5	1.8	2.3	1.8	1.1	1.0	3.1	1.4	1.7	1.7
Total closures	28.3	22.1	21.7	24.8	20.5	15.5	19.8	16.2	18.2	19.0	15.3	12.4
Active at end of year	71.7	77.9	78.3	75.2	79.5	84.5	80.2	83.8	81.8	81.0	84.7	87.6
Woman-months of use	14,790	8,084	1,273	6,165	8,562	4,313	3,554	5,093	4,521	3,153	3,851	3,702

Table IXb. Net cumulative rates of events and closures per 100 cases, by type of termination, by parity and age at first insertion: loop D, one year of use

Type of termination	Para 1 or 2				Para 3 or 4				Para 5 or more			
	15-24 years	25-29 years	30-34 years	35-49 years	15-24 years	25-29 years	30-34 years	35-49 years	15-24 years	25-29 years	30-34 years	35-49 years
Events:												
Pregnancies	3.5	2.4	1.2	0.6	3.2	2.9	2.1	1.0	5.3	4.1	1.2	2.0
Expulsions:												
First	15.0	9.9	5.9	4.7	12.9	7.5	4.9	3.7	10.4	5.1	5.1	4.1
Later	5.6	2.6	2.7	0.0	4.4	3.1	0.8	0.9	1.7	2.8	2.2	0.3
Removals:												
Bleeding and/or pain	12.9	12.2	12.8	11.6	8.8	11.1	11.4	10.4	6.7	8.0	8.1	6.5
Other medical	3.8	3.8	2.7	4.7	4.3	3.2	1.8	2.6	3.1	2.8	4.2	2.3
Planning pregnancy	2.2	1.4	0.9	0.4	0.6	0.8	0.0	0.3	0.0	0.3	0.5	0.0
Other personal	2.3	2.0	1.1	1.4	1.8	2.7	1.0	2.0	4.5	2.5	3.3	2.1
Closures:												
Pregnancies	3.2	2.3	1.2	0.6	2.7	2.6	1.9	1.0	2.5	3.3	1.2	2.0
Expulsions:												
First	3.8	3.8	1.7	2.7	3.8	2.0	2.3	0.6	4.7	0.7	1.8	1.2
Later	3.5	1.5	1.5	0.0	2.7	1.7	0.2	0.9	1.0	1.3	0.7	0.0
Removals:												
Bleeding and/or pain	11.4	11.1	11.3	11.0	7.9	9.7	10.4	9.0	5.9	6.9	7.7	5.5
Other medical	2.8	3.1	2.4	3.3	3.0	1.9	0.4	1.8	3.1	1.5	3.2	2.0
Planning pregnancy	1.5	1.2	0.6	0.0	0.6	0.3	0.0	0.3	0.0	0.0	0.5	0.0
Other personal	2.1	1.8	1.1	1.4	1.4	2.3	1.0	1.7	4.5	1.8	3.1	1.7
Total closures	28.3	24.8	19.8	19.0	22.1	20.5	16.2	15.3	21.7	15.5	18.2	12.4
Active at end of year	71.7	75.2	80.2	81.0	77.9	79.5	83.8	84.7	78.3	84.5	81.8	87.6
Woman-months of use	14,790	6,165	3,554	3,153	8,084	8,562	5,093	3,851	1,273	4,313	4,521	3,702

55. BACTERIOLOGICAL FINDINGS IN UTERINE CAVITY AFTER INSERTION OF LIPPES LOOP

D. R. Mishell, Jr., J. H. Bell,
R. G. Good, D. L. Moyer

Division of Reproductive Biology, Departments of Obstetrics and Gynecology and Pathology, Harbor General Hospital, Torrance, California; and the University of California, Los Angeles

INTRODUCTION

In 1928, Gräfenberg¹ described the successful utilization of an intra-uterine contraceptive device (IUD). Its use was denounced, however, by nearly all gynaecologists until recently. One of the major reasons for this nearly universal condemnation of the Gräfenberg ring was the occurrence of serious, and occasionally fatal, pelvic infections associated with IUDs in the pre-antibiotic era.

Since 1959, new modifications in material and design of the IUD have been accompanied by an increasing acceptance by both doctors and patients.² Nevertheless, as stated by Gusberg,³ the very universality of this reliable, inexpensive, and simple method of contraception forces us to assess its possible hazards carefully. In view of the older, unfavourable reports, the relationship of the IUD to bacterial infection of the upper genital tract must be examined and reassessed. This relationship deserves additional emphasis since the devices in general use today have appendages protruding from the endometrial cavity into the nonsterile vagina.

In a recent study of the effect of the Margulies spiral on the bacterial flora of the endometrial cavity, Willson and his associates,⁴ using transcervical culture methods, showed that there was no significant change in the flora of the endometrial cavity after insertion of the IUD. However, the incidence of positive endometrial cultures was very high both before (60%) and after insertion (58%). In a preliminary study of endometrial biopsies obtained with the IUD in place, Moyer and Mishell⁵ found that about half the specimens showed histological changes. These changes ranged from mild subepithelial leucocyte infiltration to a diffuse inflammatory exudate.

The findings of these two studies raised two major questions: (1) Is the endometrial cavity of the nonpregnant uterus commonly contaminated by bacteria as suggested by Bollinger⁶ and by Willson and his associates,⁴ or is it usually sterile, as stated by Butler?⁷ (2) Is the presence of endometrial infiltration by lymphocytes and leucocytes, associated with the IUD, a true bacterial infection or only a sterile reaction to the foreign body itself as suggested by Lippes?⁸ In an attempt to answer these questions, the following study was performed.

MATERIALS AND METHODS

Bacterial and histological studies were performed on endometrium obtained by two methods in two different groups of patients. Endometrial samples were obtained transfundally in those patients having a hysterectomy, and transcervically in the remainder.

HYSTERECTOMY GROUP

The first group consisted of 75 patients, scheduled to have elective vaginal hysterectomies in association with colporrhaphy for symptomatic uterine and vaginal relaxation. These women were all multiparous within the reproductive age group, and had had a Lippes loop D inserted at intervals ranging from 4 hours to 7 months before hysterectomy. The majority

were from two to six months postpartum, white, between 25 and 35 years of age, and had from 3 to 7 children (Table I).

The loops and introducers were prepared by placing them in a fresh solution of benzalkonium (1:750 concentration) for a minimum of 24 hours. Before insertion the benzalkonium was removed by a sterile water rinse. All handling was performed with sterile gloves. There was no special cleansing of the vagina or cervix before insertion of the IUD. However, a sample of endocervical mucus was obtained and cultured in thioglycolate broth.

Table I. Pertinent data on 75 patients having hysterectomies

<i>Characteristic</i>	<i>Number</i>
<i>Age (in years)</i>	
25 and younger	9
26-35	50
36 and older	16
<i>Months postpartum</i>	
2 or less	8
3-6	41
7 or more	26
<i>Parity</i>	
3 or less	4
4-7	55
8 or more	16

Immediately after surgical removal of the uterus, it was placed in a sterile towel and taken directly to the bacteriological laboratory. Standard wire-loop inoculations of the endocervical mucus were made into eight culture media: serum broth, PPLO (pleuropneumonia-like organisms) agar, cooked meat broth, thiol, blood agar, chocolate agar, thioglycolate, and Casman's medium. The first five media were incubated under aerobic conditions, and the last three were incubated anaerobically. Since the endocervical mucus is universally contaminated with bacteria,⁸ these cultures served as a control of the culture method.

The anterior uterine surface was then thoroughly scar-sterilized with multiple hot metallic spatula applications. The myometrium was incised longitudinally with a sterile scalpel through the sterilized area down to the uterine cavity. A sterile bone curette was then carefully introduced into the incision and a specimen of endometrium was obtained. The specimen was homogenized gently in a tissue grinder with 3 ml. of normal saline. Divided portions of this homogenate were then applied by pipette to the eight culture media. The combined media were incubated and only considered as negative, or sterile, if no growth appeared after a five-day interval. All media showing growth were studied for identification of organisms by standard subculture methods.

From three of the specimens, cultures were also obtained from the IUD itself. After the specimen of endometrium was removed, the myometrial incision was enlarged and small segments of the distal and proximal ends of the loop, as well as the portion of nylon strings lying within the endometrial cavity, were carefully resected. Cultures of these segments were made in the eight culture media. After the cultures were obtained, the uterus was fixed and sections of endometrium were examined histologically.

A cleansing preparation of the vagina is performed as a routine before vaginal hysterectomy. This preparation consists of a benzalkonium douche followed by insertion of an antimicrobial suppository on the evening before surgery. In the operating room, the vagina is cleansed with pHisoHex and benzalkonium. It was found early in the study that patients prepared in this manner consistently had negative cervical cultures.⁹ Thus, in order to establish bacteriological culture controls, the pre-operative vaginal preparation was later limited to cleansing the vagina with sterile dry sponges before surgery.

CONTRACEPTIVE GROUP

In an attempt to correlate histological and bacteriological findings at periodic intervals, another group was studied. This second group consisted of 253 patients who elected to use

the IUD as a contraceptive. At the initial visit, 202 of these patients were within the three-month postpartum period. Approximately half this group, 120 patients, had at least one menstrual period before their first visit. Before insertion of the IUD, a sample of endocervical mucus was obtained with a sterile cotton swab, which was then immediately placed in thioglycolate broth. After taking the culture, the cervical os and endocervix were cleansed with benzalkonium solution and then wiped dry with a sterile cotton applicator. A sterile Rock-Garcia curette was then carefully placed into the endometrial cavity through the cleansed and dried endocervical canal and a specimen of endometrium was obtained by suction. A portion of this endometrium was placed in thioglycolate broth while the remainder was fixed for histological study. After the specimens were obtained, cleansed Lippes loops, prepared in the manner described above, were inserted.

The cervical and endometrial specimens were incubated in thioglycolate media for 48 hours. If growth was observed, it was then subcultured into the appropriate media. All bacteria grown were identified and recorded. If no growth was observed in 48 hours, the culture was considered sterile.

At intervals after insertion of the IUD, the patients returned and had repeat cultures and biopsies, obtained by the method as described above. It was not necessary to remove the IUD to obtain the endometrial samples.

RESULTS

HYSTERECTOMY GROUP

Cultures were obtained from 75 hysterectomy specimens. Of these, 61 were studied after the routine bactericidal vaginal preparation was discontinued. The largest group, 49, had negative endometrial and positive cervical cultures. In 6 of the 10 specimens with positive endometrial and positive cervical cultures the loop had been in place less than 48 hours, and in the other 4 it had been in place from 6 to 30 days. Two additional specimens with negative endometrial and negative cervical cultures did not conform to the criteria of bacteriological culture control and were excluded from the study. The time interval that the loop had been in place in the 49 women with negative endometrial cultures varied from 43 hours to 7 months.

The percentage of positive endometrial cultures diminished steadily with increasing duration after insertion (Fig. 1). All 5 specimens obtained in the 24-hour interval following inser-

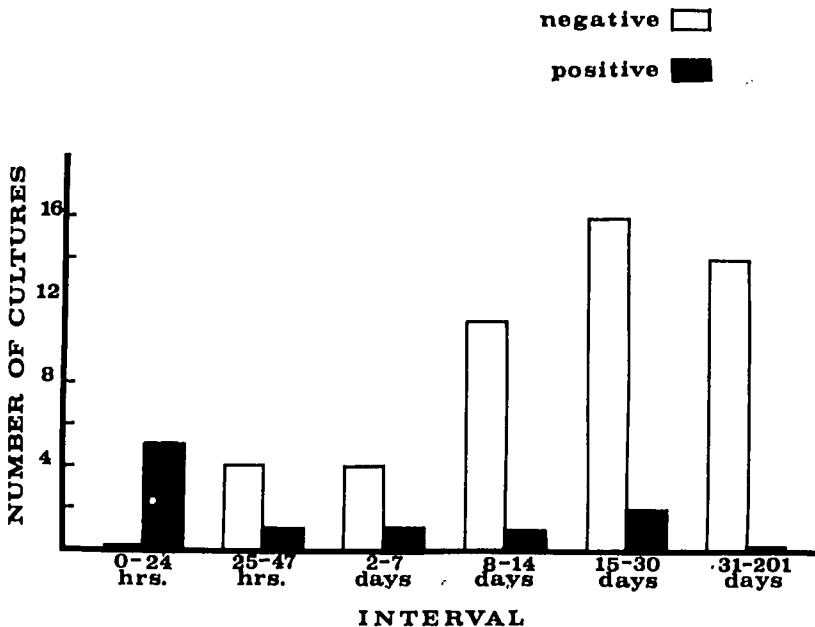


Fig. 1. Negative and positive endometrial cultures at intervals between IUD insertions and hysterectomy.

tion yielded positive endometrial cultures, while all 15 uteri removed after the loop had been in place for longer than 30 days yielded sterile endometrial cultures.

Over all, the endometrial cultures were sterile in 49 of the 54 uteri removed after the loop had been in place for 24 hours or longer. Interestingly, the cultures obtained from the 14 patients who had pre-operative antibacterial preparation showed approximately the same incidence of negative endometrial cultures as those from patients without such preparation, among whom the only positive endometrial culture was obtained from a uterus removed 44 hours after insertion of the IUD.

The separate cultures of the loop and nylon threads were performed on specimens obtained from patients who had no pre-operative bacteriological preparation. Cervical mucus cultures obtained from these three specimens were all positive, while the endometrial homogenate cultures were all negative. In addition, all the cultures obtained from the proximal and distal portions of the loops, as well as the portion of nylon threads within the endometrial cavity, were sterile.

The bacteriological identification of the positive cultures from the 61 hysterectomy specimens without pre-operative preparation revealed that *Staphylococcus epidermis* was the most

Table II. Bacterial identification of cultures from hysterectomy specimens

Organism	Cervix	Endometrium
<i>Bacillus subtilis</i>	1	—
<i>Bacteroides fragilis</i>	1	—
Coliform group		
<i>Alcaligenes faecalis</i>	1	1
<i>Alkalescens-dispar</i>	1	—
<i>Escherichia coli</i>	4	—
<i>Escherichia intermedium</i>	1	—
<i>Proteus vulgaris</i>	2	—
Diphtheroid	12	3
<i>Haemophilus</i>		
<i>Aphrophilus</i>	1	1
<i>Vaginalis</i>	1	—
Species unidentified	2	—
<i>Lactobacillus</i>	3	—
<i>Neisseria gonorrhoeae</i>	1	1
<i>Staphylococcus</i>		
<i>Aureus</i>	1	—
<i>Epidermis</i>	21	5
<i>Streptococcus</i>		
<i>Anaerobius</i>	9	—
<i>Anginosus</i>	1	—
<i>Equisimilis</i>	1	—
<i>Faecalis</i>	1	—
<i>Mitis</i>	5	—
<i>Sanguis</i>	10	2
<i>Thermophilus</i>	2	—
<i>Zymogenes</i>	3	—

common organism identified from both the cervical and endometrial cultures (Table II). In the 6 specimens in which there was a positive endometrial culture with the IUD in place for less than 48 hours, the organism identified was also present in cultures of the endocervical mucus, except for the diphtheroid in one specimen (Table III). The endocervical and endometrial bacteriological identification was also similar in 3 of the 4 specimens having positive cultures after the IUD had been in place longer than 48 hours.

No correlation was obtained between the histological interpretation and the bacteriological findings. Of the 75 hysterectomy specimens, 34, including 23 with negative endometrial and positive cervical cultures, were interpreted as showing chronic endometritis, according to the classic criteria of plasma cell infiltration, in addition to the presence of lymphocytes and

Table III. Bacterial identification with positive endometrial cultures by interval between insertion of IUD and reading

Duration	Cervix	Endometrium
Less than 48 hours		
4 hours	Streptococcus sanguis Diphtheroid	Streptococcus sanguis Diphtheroid
11 hours	Streptococcus equisimilis	Streptococcus equisimilis Diphtheroid
18 hours	Alcaligenes faecalis	Alcaligenes faecalis
24 hours	Staphylococcus epidermis Streptococcus mitis Proteus vulgaris	Staphylococcus epidermis
24 hours	Staphylococcus epidermis Streptococcus zymogenes Alkaescens-dispar	Staphylococcus epidermis
47 hours	Haemophilus vaginalis	Haemophilus vaginalis
More than 48 hours		
6 days	Streptococcus mitis	Diphtheroid
10 days	Neisseria gonorrhoeae	Neisseria gonorrhoeae
18 days	Streptococcus sanguis	Streptococcus sanguis
30 days	Staphylococcus epidermis	Staphylococcus epidermis

leucocytes. Of the 10 specimens with positive endometrial cultures, only one, from the patient infected with the gonococcus, showed chronic endometritis, and of the remaining 9, 6 specimens were obtained within 48 hours of the insertion of the loop (Table II).

There was also no correlation between either the bacteriological findings or the histological diagnosis of endometritis and the stage of the menstrual cycle (Table IV). Thirty of the 75 specimens were obtained in the secretory phase. Of the 34 showing endometritis, only 13 were likewise in the secretory phase. Of the 10 positive endometrial cultures, 4 were in the secretory phase.

Table IV. Relationship of histological and bacteriological findings to time of menstrual cycle in hysterectomy specimens

Group	Total	Histology	
		Proliferative	Secretory
Total specimens	75	45	30
Chronic endometritis	34	21	13
Negative endometrial culture	49	29	20
Positive endometrial culture	10	6	4

CONTRACEPTIVE GROUP

A total of 222 pre-insertion positive cervical cultures were obtained from the group of patients who were not scheduled for hysterectomy. Endometrial cultures obtained at the same time showed no growth in 97 (44%), growth with the same organisms as found in the cervix in 102 (46%), and growth with different bacteria in only 23 (10%). A total of 305 repeat biopsies and cultures were obtained at intervals ranging from 3 days to 9 months after insertion of the device. Of the postinsertion endometrial cultures, 170 (56%) showed no growth, 108 (35%) grew organisms similar to those in the cervix, while the remaining 27 (9%) had growth with organisms different from those in the cervix. There was no significant change from these overall percentages at any specific time interval after insertion of the IUD.

The diagnosis of chronic endometritis was made in only 15 of the postinsertion biopsies. Here again, there was no correlation between the bacteriological and histological findings. Eleven of these 14 biopsies were obtained with an endometrial culture showing no growth.

Of the total of 253 patients who chose the IUD as their contraceptive method, 5 developed signs and symptoms of acute pelvic inflammatory disease. The culture before the development

of the infection revealed no endometrial growth in 2, the same growth as in the cervix in 2, and growth different from that in the cervix in only 1.

COMMENT

Although there have been numerous studies involving bacteriological investigations of the upper genital tract, the results reported are quite variable and difficult to correlate.⁶⁻¹¹ Difficulties arise partially because of differences in methods of obtaining endometrial cultures, and partially because of differences in culture methods and in the criteria used for identification of isolated organisms.

It is generally assumed by most gynaecologists that the endometrial cavity is usually sterile. However, studies by various transcervical culture methods reveal the incidence of positive endometrial cultures to be as much as 60% or higher.⁴⁻¹¹ Methods of obtaining endometrial cultures transcervically have involved the use of a modified form of Little's tube,¹¹ a sterile finger cot punctured by a wire loop,¹² or a Teflon sheath with a removal plug attached over the aspirator.⁶ In this study, the bacteriological cultures of samples of endometrium obtained transfundally immediately after hysterectomy reveal that the endometrial cavity is nearly always sterile, even with the Lippes loop type of IUD in place, provided that a time period greater than 24 hours has elapsed since the insertion. Since all 5 endometrial cultures obtained during the first 24-hour period after insertion of the IUD grew bacteria, and in each specimen the same organism was identified in cultures obtained from the endocervical mucus, it seems likely that the insertion of the IUD through the constantly contaminated endocervix results in mechanical transfer of bacteria to the usually sterile endometrial cavity. However, within about 48 hours after insertion, the bacteria have been eliminated from the endometrium in about 80% of the uteri. Thereafter, the percentage of positive endometrial cultures steadily diminishes as the duration after insertion increases. The transfundal method of obtaining endometrial cultures is of value both for establishing the rigid criteria necessary for evaluating transcervical culture techniques and for obtaining basic information about the bacteriological status of the endometrial cavity.

It was also hoped, however, to develop a transcervical culture technique of reasonable validity in order to establish some correlation between the bacteriological and histological findings, on the one hand, and the clinical course of patients utilizing the IUD for long-term contraception, on the other. It was thought that the incidence of positive endometrial cultures that grew organisms different from those cultured from the endocervix might be an indication of the true incidence of endometrial bacterial growth. However, the hysterectomy study showed that in those instances where the endometrial cavity was contaminated, the organism identified was the same as that grown from the endocervical mucus. The total incidence of positive endometrial cultures obtained transcervically before insertion of the loop was 56% (125 out of 222). After the loop was in place, it had dropped slightly to 44%. These figures are similar to those obtained in other studies,^{4,6} but are much higher than the true incidence (8%, or 4 out of 53) of positive endometrial cultures as determined by the transfundal approach (after 48 hours).

In the hysterectomy group of patients, there was no relationship between histological findings of chronic endometritis, as judged by the classical plasma cell infiltration of the endometrium, and the presence of viable bacteria in the endometrium. The finding of chronic endometritis in almost half the specimens examined may be due to several factors. First, in comparison to endometrial biopsies, a much greater amount of the total endometrium was sampled and studied histologically, and, thus, the likelihood of finding plasma cells in the hysterectomy specimen was greater. The diagnosis of chronic endometritis was made when plasma cells were found in any area of the endometrium. Secondly, since probably all the endometrial cavities were contaminated with bacteria at the time of insertion, the plasma cells were most likely the residual from this temporary invasion of bacteria. Thirdly, since in 21 of the 34 patients whose uteri showed chronic endometritis, menses had occurred at least once following insertion, the persistent finding of plasma cells may be due to a sterile tissue reaction caused by the plastic foreign body. However, in view of the fact that the endometrium does not completely slough off in each menstrual cycle, the plasma cell infiltrations may be the residual of infiltrations occurring in previous cycles. Failure to observe plasma cells in

endometrium obtained from 9 of the 10 specimens with positive endometrial cultures is most likely due to the fact that insufficient time had elapsed to allow the migration of plasma cells to the area of infection after bacteria had been introduced into the uterus.

The findings obtained in this study, in contrast to those of another report,⁴ indicate that the stage of the menstrual cycle has no influence on the incidence of endometrial infection with bacteria.

Finally, the results of the study confirm the statements of others^{6,13,14} that the occurrence of clinical infection of the upper genital tract in patients using the IUD with nylon strings protruding into the vagina, is usually due to an unrelated cause such as coital infection. Even when the threads passed through contaminated endocervical mucus, sterile cultures were obtained from the portion of the threads within the endometrial cavity, as well as from the loop itself. In this small series of hysterectomy cultures, one of the 75 had a postinsertion gonococcal infection. The preinsertion cervical culture failed to grow the gonococcus.

On occasion, insertion of an IUD or any other gynaecological procedure that causes passage of contaminated endocervical material into the sterile endometrial cavity, such as an endometrial biopsy, may cause a clinically manifest infection. The clinical diagnosis of acute pelvic inflammatory disease, occurring in 5 of the 253 patients who had IUDs inserted and who did not have a hysterectomy, an incidence of 2.0%, is comparable to that found in other studies of patients of similar socio-economic status.^{5,15} In 3 of these patients, the clinical disease occurred after one month had elapsed since insertion of the IUD; this is a time when the endometrial cavity, as found in this study, is sterile. In the other 2 patients, acute pelvic inflammatory disease developed 48 hours and 2 weeks after insertion, respectively. It must be assumed that insertion of the IUD was related to the infection of the upper genital tract in these patients. Thus, there is a slight risk of causing an acute infection of the upper genital tract after insertion of the IUD. However, this risk is minimal in terms of absolute incidence. In true perspective, this small risk is certainly justified, especially when it is weighed against the high incidence of patients who develop severe sepsis, and even die, as a result of septic, induced criminal abortion.

SUMMARY

Bacteriologic cultures of the endometrial cavity were obtained from two groups of women using intra-uterine contraceptive devices. Cultures were obtained transfundally after hysterectomy in the first group and transcervically in the second. The incidence of sterile endometrial cultures was significantly greater when the transfundal method was employed. Using the transfundal method of obtaining cultures, it was found that positive endometrial cultures were obtained from all uteri in which the IUD had been inserted within the previous 24-hour period. The incidence of positive endometrial cultures rapidly diminished as the time after insertion increased, so that after one month had elapsed since insertion of the IUD, all the endometrial cavities examined were sterile. The relationship of these findings to pelvic infection is discussed.

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56. EFFECT OF THE IUD ON THE ENDOMETRIUM

Eneida Aguilera

*Department of Gynaecology, Hospital Clinico
José J. Aguirre, Santiago*

INTRODUCTION

Many investigators have tried to explain the way in which intra-uterine contraceptive devices (IUDs) act.¹⁻⁵

We believe that these devices are able to alter the normal functioning of various parts of the female genital tract, causing functional or anatomical disturbance of one or several of them simultaneously.

Despite existing disagreement, we believe that this foreign body acts directly, or perhaps by a neuro-endocrine reflex, on the mucous membrane of the uterus, to bring about a functional imbalance of the endometrium.^{1,6,7}

This paper is based on a histological study of the endometrium in women using the Zipper ring over a considerable period.

MATERIAL AND METHOD

Biopsies were performed on the endometria of 325 women chosen at random, for whom the only requirement was that they had used the Zipper ring as a means of contraception for more than six months.

The women were fertile, aged between 18 and 45 years, multiparae with from 2 to 20 pregnancies each, and considered gynaecologically healthy at the time treatment began.

Specimens for examination were obtained with a Randal curette and were fixed in alcohol, to be later treated with various stains: haematoxylin-eosin, Van Giesson, Best's carmine, and Pappenhein-Unna—the last-named for the purpose of identifying plasmocytes whose recognition is considered essential to the diagnosis of a condition of inflammation.

All biopsies were carried out with the IUD in the uterus.

The time between insertion of the nylon ring and the performance of the biopsy varied from 6 to 60 months (0.5 to 5 years). The device was retained in place for between 12 and 60 months by 77.5% of the women (Table I).

Table I. Length of retention of IUD

<i>Period used (months)</i>	<i>Women</i>	
	<i>No.</i>	<i>%</i>
6 to 12	75	22.4
12 to 24	166	51.6
25 to 36	67	21.0
37 to 48	14	4.0
49 to 60	3	1.0
Total	325	100.0

In reviewing the clinical evolution of the women studied, we distinguish two groups: those who remained without any symptoms using the method (83.3%), and those affected by some symptom such as menorrhagia and metrorrhagia (16.7%) attributable to the IUD (Table II).

Table II. Effects of IUDs

<i>Effects</i>	<i>Women</i>	
	<i>No.</i>	<i>%</i>
No symptoms	267	83.3
Symptoms	58	16.7
Total	325	100.0

When our research began in 1963, our main purpose was to look for inflammation of the uterine mucous membrane, and we carried out a number of biopsies in the first half of the cycle. Later we decided to investigate the functional state of the endometrium in the presence of a foreign body, for which purpose we took samples in the second half of the cycle (Table III).

Altogether 341 biopsies were carried out on the 325 women; in 16 cases the examination was repeated after an interval of 1-2 years.

Table III. Timing of biopsies

<i>Time of biopsy</i>	<i>Biopsies</i>	
	<i>No.</i>	<i>%</i>
1st half of cycle	16	4.7
2nd half of cycle	281	82.4
During menstruation	10	2.9
Not known	34	10.0
Total	341	100.0

RESULTS

Microscopic study of the endo-uterine mucous membrane established the functional state of the endometrium in 320 biopsies (Table IV). In 17 no histological conclusion was reached and in 4 the appearance of the tissue was that of a state of pregnancy.

Table IV. Histological findings

<i>Histological report</i>	<i>Biopsies</i>	
	<i>No.</i>	<i>%</i>
Proliferative endometrium	33	10.3
Secretory endometrium	273	85.3
Menstrual endometrium	13	4.1
Mixed endometrium	1	0.3
Total	320	100.0

The day of the menstrual cycle was compared with the histological age of the endometrium in accordance with the classical concepts of Noyes, Hertig and Rock.⁸ The results are given in Table V.

Table V. Comparison of maturation of the endometrium and its histological age

	<i>Biopsies</i>	
	<i>No.</i>	<i>%</i>
Concordance	190	55.7
Discordance	124	36.3
Not established	27	8.0
Total	341	100.0

Of the 124 biopsies showing a marked change in endometrial maturation, 14 endometria were classified as proliferative, 109 as retarded progesteronic with a chronological difference from 4 to 14 days, and 1 as mixed (Figs. 1-4).

Focal or diffuse endometritis was encountered in 111 of the biopsies studied, which gives a frequency of reactionary inflammation of 34.5%. Plasmolympocytic infiltration of the

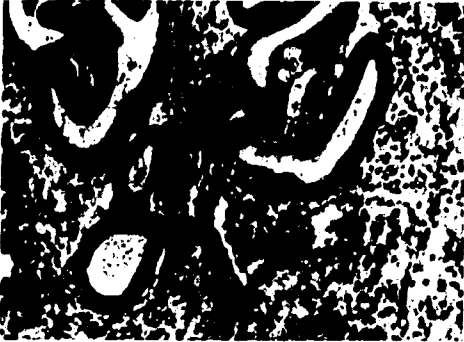


Fig. 1. G.M.M., 20 years. Zipper ring for 13 months. Asymptomatic evolution. Endometrial biopsy performed on 23rd day. Histological findings: endometrium at the end of proliferative phase.

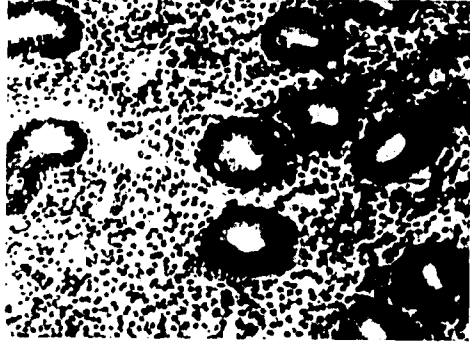


Fig. 2. M.O.V., 21 years. Zipper ring for 9 months. Asymptomatic evolution. Endometrial biopsy performed on the 23rd day. Histological findings: secretory endometrium, 16th day of cycle.



Fig. 3. M.G.M., 36 years. Zipper ring for 10 months. Asymptomatic evolution. Endometrial biopsy performed on the 28th day of cycle. Histological findings: secretory endometrium, 17th day of cycle.



Fig. 4. M.A.V., 22 years. Zipper ring for 13 months. Asymptomatic evolution. Endometrial biopsy performed on the 28th day of cycle. Histological findings: secretory endometrium, 18th day of cycle.

stroma was always present, sometimes with luminal glandular infiltration. In all cases there was congestion and oedema of the interstitium (Figs. 5-7).

In three cases endometritis was associated with the histological elements of a state of pregnancy (Fig. 8).

The biopsy showed, in 41 out of 58 women with menstrual disturbances (70%), an anatomico-pathological condition linking the abnormality to the IUD. In the remaining 17 cases (30%) the endometrium was normal (Table VI).

Among the total of 267 women without symptoms, histological endometritis was encountered in 78, functional alteration of the mucous membrane in 109, and in 1 case, decidua.

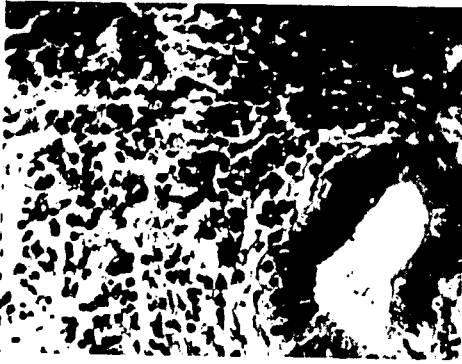


Fig. 5. F.S.S., 21 years. Zipper ring for 12 months. Metrorrhagia. Histological findings: endometrium in final proliferative phase; chronic endometritis.

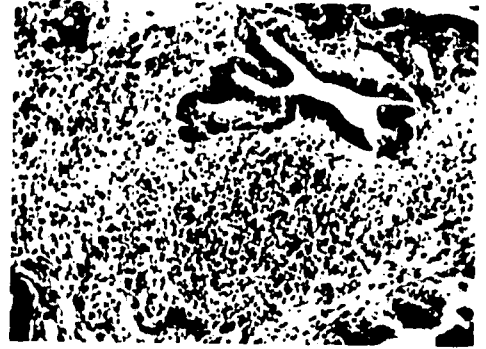


Fig. 6. D.C.E., 35 years. Zipper ring for 30 months. Metrorrhagia. Histological findings: reactivated chronic endometritis.

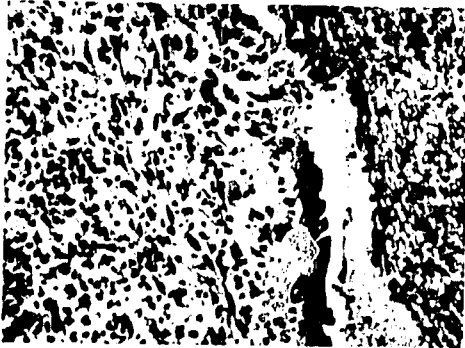


Fig. 7. M.L.A., 33 years. Zipper ring for 16 months. Metrorrhagia. Histological findings: reactivated chronic endometritis.



Fig. 8. H.R.R., 33 years. Zipper ring for 16 months. Metrorrhagia. Histological findings: ovular traces; chronic endometritis.

Table VI. Endometrium in women with menstrual disorders

Histological report	Cases	
	No.	%
Endometritis	23	39.7
Functional change in the endometrium	8	13.8
Endometritis and functional change	7	12.0
Endometritis and pregnancy	3	5.2
Normal endometrium	17	29.3
Total	58	100.0

Histological changes in the endometrium capable by themselves of preventing implantation of the ova, were found in 61% of the women without symptoms (163 cases).

The examination of 16 women shown to have normal endometria by microscopic study, was repeated after from 1 to 2 years. In 10 cases the structure of the endometrium remained normal. In 6 cases there was marked discordance between the chronological age and the endometrial function, and one of these was associated with endometritis.

COMMENT

Studies were made of the histological changes in the endometria of women fitted with the Zipper ring for contraceptive purposes, the extraneous body remaining in place for between 6 and 60 months.

Functional alteration of the endometrium was found in 36.3% of cases, corresponding to non-ovulating cycles and particularly to a lack of concordance between the day of the cycle and the degree of progesterone maturity. We do not know whether this arises from a lack of response to the normal hormonal stimulus on the part of the endometrium or if the IUD creates some neuro-endocrine reflex effect, as Vorys *et al.*⁹ have suggested.

Endometritis was demonstrated in 34.5% of cases. Such a percentage of inflammation seems extraordinarily high compared with the 1 or 2% reported by our histopathological laboratory in reviewing all the endometrial biopsies of the gynaecological service.

On the basis of this study we are unable to prove whether the inflammatory reaction is due solely to irritation of the tissues by a foreign body, or whether in addition an infection is involved. There are clinical reasons for suspecting that in a good number, if not all cases, there is infection of the uterine cavity and mucous membrane. In five women, the taking of the biopsy coincided with the beginning of a pelvic inflammation which in two cases was extremely serious.

SUMMARY

A study was made of 325 women using the Zipper ring for a period of from 6 to 60 months.

The method produced no menstrual symptoms in 83% of these women, and changes in menstruation in 17%.

Microscopic examination of the endometrium showed endometritis in 34.5% of cases.

In 36.3% of biopsies, no relation was found between the day of the cycle and the histological appearance of the endometrium.

In 61% of those using the ring without difficulty, histological changes in the endometrium were found which could prevent implantation of the ovum.

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57. EFFECT OF THE IUD AND OTHER CONTRACEPTIVE METHODS ON LACTATION

C. Gómez-Rogers, A. A. Ibarra Polo, A. Faúndes
and E. Guiloff

*Department of Physiological Obstetrics, Faculty of Medicine,
University of Chile*

INTRODUCTION

Since 1962, the Obstetric Clinic of the University of Chile has been carrying out a birth-control programme in the northern district of Santiago.

A considerable number of the women taking part began using the various contraceptive methods while they were still breast feeding. The relation of these contraceptive methods to lactation has not been studied to any extent.

Breast feeding is of medical, economic and social importance in the protection of mother and child. Obviously the problem is much more important in the under-developed countries and in communities with small resources. Because of this, Chile has recently passed legislation allowing a working mother who is breast feeding to extend her maternity rest period.

The variety of contraceptive methods used by our Service for nursing mothers, their uniform socio-economic level and the fact that no selection was made according to method used, has provided us with ideal subjects for a comparative study of the development of lactation according to the contraceptive method employed, in a population whose cultural, economic and social conditions are a representative sample of the Latin America "habitat".

SUBJECTS STUDIED

DEVELOPMENT OF LACTATION

Lactation in 276 women using birth-control methods was studied by monthly medical examination for periods longer than one year. The duration of lactation was measured as the time to the final weaning of the child with the complete ending of milk secretion. All the mothers had more than one child and had nursed one or more children previously. Of these, 81 used intra-uterine devices (IUDs), and their results—*Group I*—were compared with the following groups using different methods (Table 1):

Group II consisted of 103 patients using long-acting gestogens, 500 mg. of medroxyprogesterone acetate (MPA), were given injections every six months.

Table 1. Contraceptive methods used

<i>Method</i>	<i>No. of cases</i>	<i>Began therapy (days)</i>	<i>Dose</i>
IUD	81	49.5	—
MPA	103	48	500 mg. every six months
Combined	40	51	Norethisterone acetate 1 mg. Ethinylloestradiol 0.05 mg. 20 days per month
Sequential	52	55.5	Mestranol 0.08 mg. for 14 days Chlormadinone 1.5 mg. } for 7 days Mestranol 0.08 mg.
Untreated	150	—	—

Group III consisted of 40 patients given combined treatment (norethisterone, 1 mg., and ethinyloestradiol, 0.05 mg.), administered in the classic manner during 20 consecutive days each month.

Group IV consisted of 52 women getting sequential therapy who were given 0.08 mg. of mestranol for 14 days each month and 1.5 mg. of chlormadinone plus 0.08 mg. of mestranol for a further 7 days.

Group V. Besides the 276 patients referred to, lactation was studied in a group of 150 multiparous women not undergoing contraceptive treatment. They were chosen at random and their lactation compared with the other groups.

STUDY OF NEUROENDOCRINE FUNCTION IN NURSING MOTHERS USING CONTRACEPTIVES

A study of the ejectolactic reflex was carried out on eight lactating women from Group I, using the technique described by Guiloff *et al.*,¹ to obtain information regarding neuroendocrine function as measured by the excretion of pituitary oxytocin.

METHOD

STUDY OF LACTATION DEVELOPMENT

All patients in lactation underwent monthly checks in which the presence or absence of milk secretion was determined manually. The number of times the woman nursed in 24 hours was recorded, as well as whether the natural milk was supplemented with prepared foods. A weight curve for the child was kept.

The most objective data, and those which were used as a basis for measuring the length of lactation, were the times at which lactation ended completely.

The duration of lactation observed was compared with that in the pregnancy immediately before, as given in the history.

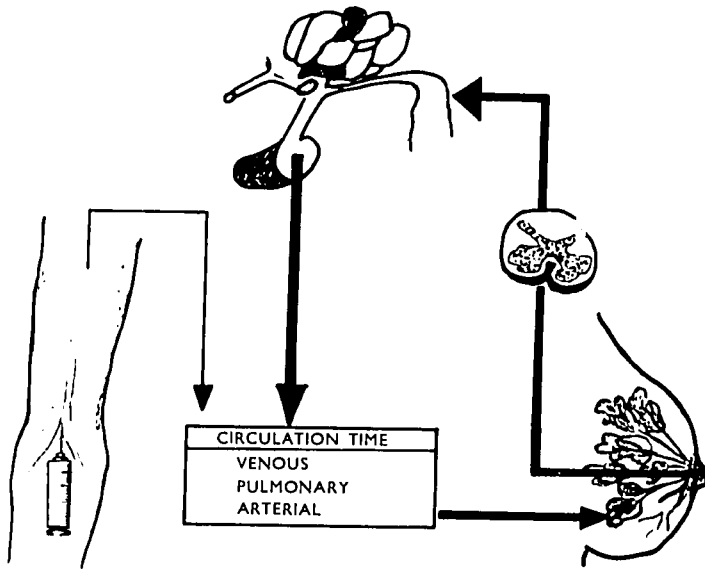


Fig. 1. Ejectolactic reflex. This figure is a diagram of the ejectolactic reflex which can be divided into two components: a neuroendocrine one, which goes from the nipple to the neurohypophysis, and another, the circulatory-mammary one, which has first a venous pathway, then a pulmonary, and finally an arterial section to the effector.

The circulatory-mammary component can be studied in an indirect way by injecting several doses of exogenous oxytocin through the antecubital vein. The latent period of the mammary gland to all these stimuli is inversely proportional to the dose of oxytocin.¹

If the latent period of all the reflex and the circulatory-mammary times is known, it is possible to deduce the duration of the neuroendocrine component, which will be shorter or longer according to the efficiency of the reflex.

For each group, the "lactation half-life" (LHL) was calculated—the time in which 50% of the women stopped nursing. The following comparative study was then made:

(a) LHL for each group using contraception compared with previous lactation (without treatment).

(b) Comparison of LHL between the different groups using contraception.

(c) Comparison with the untreated group.

Comparison was made of the period of lactation and LHL for each group and also with the group of 150 untreated women.

STUDY OF THE NEUROENDOCRINE REFLEX IN WOMEN USING IUDs (Fig. 1)

The ejectolactic reflex was studied by the measurement of intramammary pressure using the method of Sica-Blanco *et al.*² Contractions of the mammary gland were induced by stimulating the ejectolactic reflex by suction and by administration of oxytocin. The period of lactation was measured under both experimental conditions.

RESULTS

Contraceptive therapy was always begun about one month, or 28 days, after childbirth. In all cases lactation was definitely taking place.

CHARACTERISTICS OF THE COURSE OF LACTATION IN THE CONTROL GROUPS

The course of lactation in the 150 women chosen at random showed an LHL of 4 months, 21 days, very similar to the group of 276 women from whom the data were obtained retrospectively (5 months, 18 days) (Fig. 2). Statistical study showed no significant differences between them ($\chi^2 = 3.90$ at 4 months, $p > 0.25$ and $\chi^2 = 2.32$ at 6 months, $p = 0.10$).

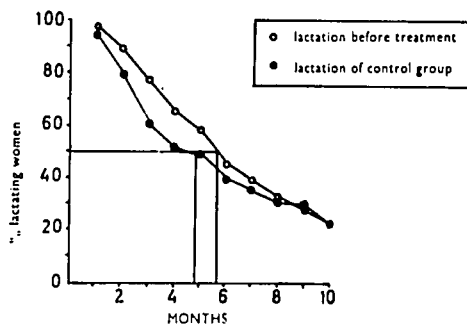


Fig. 2. Galactopoiesis. Duration of lactation in cases without treatment. The curves represent the percentage of mothers who were lactating during the monthly follow-ups.

The group represented by black dots corresponds to the lactation of 150 mothers chosen at random. The other group (white dots) represents the development of lactation after the previous birth. This evolution was deduced by retrospective questioning. (The evolution of the present lactation of these women was controlled when they were under the various contraceptive methods in our study.)

Both groups show a similar average lactation time (5 months, 18 days and 4 months, 21 days); statistically there are no significant differences ($\chi^2 = 3.90$ at 4 months, $p > 0.25$, and $\chi^2 = 2.30$ at 6 months, $P = 0.10$).

COMPARISON OF DURATION OF PRESENT LACTATION WITH CONTROL GROUP

Mothers using IUDs were able to feed their children for longer periods (Fig. 3). The LHL for this group was 7 months, 21 days. Statistical study showed significant differences from the control group (Table II).

If the same comparison is made with the 150 women chosen at random, instead of with the previous lactation, and if in addition we take as the point of departure, not the time of delivery but the time when use of contraceptives began, the significant differences are larger. In the groups with combined and sequential therapy, lactation was shorter than in the control groups (Figs. 4 and 5).

Table II. Course of lactation—significant differences

Months after delivery	No. of mothers still nursing		χ^2	<i>p</i>
	IUDs	Controls		
0	81	81	—	—
3	77	69	5.9	0.014
5	62	55	4.5	0.02
7	48	35	4.17	0.04

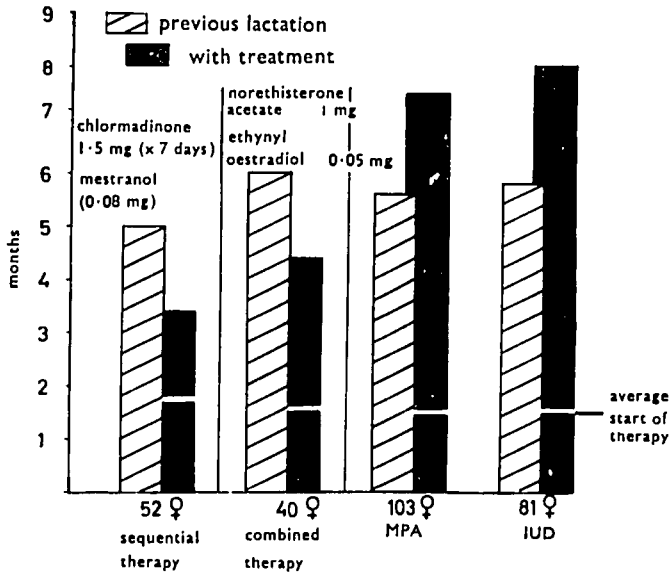


Fig. 3. Average period of lactation with contraceptive treatment. Each column shows the average lactation period during the use of the corresponding contraceptive method. The white column represents the previous average time of lactation, without any contraceptives. The horizontal line shows the average start of contraceptive therapy for each group.

As can be observed, in all groups the beginning of therapy was slightly less than 2 months post-partum. All groups had similar previous lactation periods, around 5 months. In the groups under combined and sequential therapy the average lactation period (ALP) was shorter than in their previous lactations and approximately 50% shorter than in the group with IUDs and long-acting injectable gestogens. If the duration of lactation is taken from the start of the contraceptive therapy, the differences are still greater and are statistically significant. In the group using IUDs, the ALP was more than 2 months longer than the time of the previous lactation.

Note: 103 patients were treated with MPA.
81 patients used IUDs.

COMPARISON OF THE COURSE OF LACTATION BETWEEN GROUPS USING DIFFERENT METHODS

Lactation in the IUD group followed a course and duration similar to that of women treated with MPA. Examination of the significant differences between them showed that in this respect lactation was identical ($\chi^2 = 1.5$, $p > 0.157$ and less than 0.317, six months after delivery) (Figs. 4 and 5).

A comparison was made of the significant difference between these groups (IUD and MPA) and the groups using oestrogen orally (combined and sequential), using the χ^2 test with two samples at three, five and seven months after delivery. The difference turned out to be highly significant (Figs. 4 and 5 and Table III).

Table III. Course of lactation—significant differences

Months after delivery	No. of mothers still nursing		χ^2	p
	IUD	Sequential		
0	81	52	—	—
3	77	35	18	< 0.0005
5	62	15	28	< 0.0005
7	48	9	23	< 0.0005

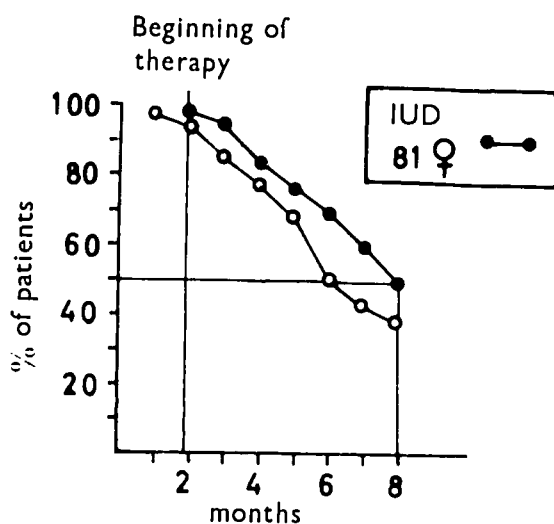


Fig. 4. Galactopoiesis. The black dots represent the percentage of mothers using IUDs according to the monthly follow-ups made. This is compared with the length of the previous lactation in the same group of patients when they were under no fertility control; this group is represented by white dots.

It can be seen that eight months after birth (six months after the beginning of therapy) 50% of the mothers whose fertility was controlled were lactating, a percentage which is higher than in the same group for previous lactation.

STUDY OF THE EJECTOLACTIC REFLEX BY SUCTION IN WOMEN USING IUDS

Study of the neuroendocrine component in the ejectolactic reflex as an index of the efficiency of oxytocin release showed no significant differences between the group of eight women using IUDs and the control group of nursing mothers without treatment. The latency time before the appearance of milk for the IUD group was 2.68 ± 4.1 secs. (S.D.) and for the control group 25.3 ± 5.6 secs. (Fig. 6).

DISCUSSION

We have taken the end of lactation to be the point at which milk secretion finally ends. We have not attached importance to the amount of milk nor to the giving of supplementary feeds to the child, because as long as milk secretion exists, however little it may be, the neuro-hormonal mechanisms are still functioning.

In the socio-economic environment to which these women belong, breast feeding is the most economic and simple way of feeding the child. For this reason it is of great importance to them, and they remember accurately when it ends. Thus, although these data were obtained in interviews, we consider them valuable in the analysis of the duration of previous lactation in the different groups.

Besides this we have the confirmation that lactation in the 150 women without treatment was of equal duration to that in retrospective data from the 276 patients undergoing treatment.

It is noteworthy that among patients using IUDs, lactation was longer than for those not using contraceptives. It may well be that the mechanical stimulus of the IUD creates a neuro-endocrine reflex which increases the secretion of endogenous oxytocin. Chaudbury³ finds

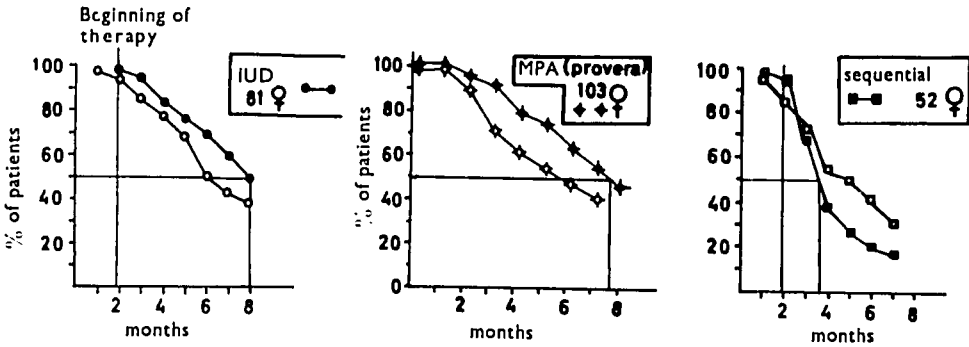


Fig. 5. Evolution of lactation in the groups of mothers using IUDs and treated with MPA and sequential. The curves represent the percentage of mothers continuing lactation in the monthly follow-ups. The groups represented by black dots, stars or squares refer to lactation while using a contraceptive. The white dots refer to lactation following previous births.

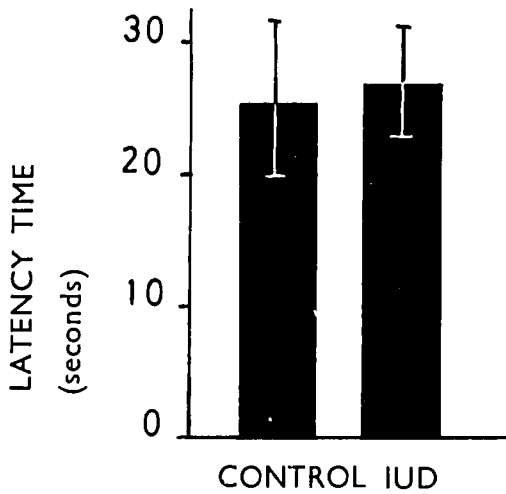


Fig. 6. Ejectolactic reflex. Neuroendocrine component. When the neuroendocrine component of the ejectolactic reflex is studied as a measure of the efficiency of oxytocin liberation, there is no significant difference between controls and women using IUDs.

higher levels of oxytocin in women using IUDs, but has reservations regarding the accuracy of his dosage method.

Benson and Folley^{4,5} have held that oxytocin is important in the regulation of galactopoiesis. In rats, on stopping suckling by the young, the administration of synthetic or natural oxytocin and of vasopressin retards the phenomena of mammary involution. Oxytocin has an effect similar to prolactin, using vaginal mucus also as an index of luteotrophic hormone release. From this it follows that oxytocin has a galactopoietic action, favouring the secretion of prolactin and possibly other pituitary hormones.

This mechanism would be set in motion by sucking and would link inseparably the two

basic phenomena of lactation—secretion and milk ejection. Nevertheless the similarity of the course of lactation in the IUD group to that in the group using injections of long-acting gestogens (without complementary oestrogens being given) makes us feel that prolonged lactation in the IUD group is due to lack of pregnancy as a negative factor for the continuance of lactation. Besides, our studies of the neuro-endocrine component of the ejectolactic reflex do not show any increased secretion of endogenous oxytocin.

The lack of inhibiting effects on lactation we found using MPA are in accordance with the results of Rudel *et al.*⁶ using another pure gestogen, chlormadinone.

As to oral contraceptives which contain oestrogens, the position is not yet clear. Many investigators have administered combinations of oestrogens and progestogens to nursing mothers for periods of three or more weeks after delivery. Pincus⁷ has shown that lactation falls in subjects taking Enovid in high doses. Ferin *et al.* saw no significant effect on the quality of the milk, nor on the growth and development of children whose mothers were taking ethinyloestrenol or 6 methylethinyloestrenol.

Our analysis has shown inhibition of lactation only where the preparation used contained oestrogen. This effect was most dramatic in sequential therapy, where progestogen is only given in the last seven days of the cycle. This is in agreement with the findings regarding the physiological mechanism of lactation inhibition.

As a result of experiments on animals and clinical observation, the theory was maintained for a long time that milk secretion during pregnancy was inhibited by oestrogens^{8,9} and that their disappearance after childbirth allowed lactation to develop. However, contradictory results have been found and at the present time it seems accepted that oestrogens act in conjunction with progesterone.¹⁰⁻¹⁴

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RAPPORTEUR'S SUMMARY

Asked to explain why translocation of IUDs through the uterine wall was so common in Singapore, Mr. T.-H. Lean said that rates for other centres were not strictly comparable. In his hospital all cases of translocation were reviewed; and, though some operators had more of them, lack of skill could not account for their frequency. He believed that the Asian uterus was much smaller than the Western. The Lippes loop, size D, was too big for Asian uteri, and too stiff. The parturient uterus was vulnerable, and little was known about its involutinal dynamics.

The point of exit of the loop was almost always in the lower uterine segment, and in all but one of the 61 cases in which a loop passed through the uterine wall its head went out first. Especially, perhaps, at four to six weeks postpartum, the lower uterine segment might be small for this loop. Often the expulsion was incomplete: in 30% of cases the loop remained extraperitoneal, buried in the uterine muscle. In its "pick-axe" action, to which Mr. Lean attributed most of these translocations, the head of the device found a point of least resistance, and the muscle of the involuting uterus might provide the force needed to propel the rest of the loop through the wall.

To confirm translocation, Mr. Lean used in the first instance a Beo-locator, and then, if this showed nothing, a plain X-ray. In possible pregnancy, no X-ray was taken before the 16th week; but a single exposure at about the 24th week might show what had happened to the loop; this was unlikely to harm the foetus. All the cases of migration or perforation by the loop had been asymptomatic; and the patients had been correspondingly reluctant to enter hospital.

Dr. D. R. Mishell, asked by Dr. R. P. Soonawalla whether he was satisfied with five minutes' sterilization of IUDs with aqueous iodine, said he thought it sufficient. More elaborate sterilization would be out of place because the device was to be introduced through a contaminated cervical canal. Three IUDs recovered from the uterine cavity had not grown bacteria.

Dr. E. Aguilera said that she did not know whether the endometrial changes she had found in IUD patients were due to refractoriness of the endometrium to hormonal stimuli (such as was seen in tuberculous endometritis), or to some neuroendocrine reflex arising from the presence of the device. Ovaries had been found to be histologically normal in women with IUDs. She regarded the effects of the device as multiple, with alterations at the level of the tubes and the cervix as well as the endometrium, and she did not accept a suggestion that change was limited to points at which the device was in physical contact with the uterine wall. Though her studies did not enable her to refute an idea put forward by Dr. Soonawalla that the chronic endometritis she had observed might represent an allergic response to the nylon of the Zipper ring, she thought this unlikely because all the intra-uterine devices were supposed to be inert.

Answering a question by Dr. Peter Eckstein, Dr. J. Zipper said he had been surprised at Dr. Aguilera's finding of endometritis in some 30% of women wearing his ring. In a study by Guiloff and Rosenberg of 277 women in whom a ring was inserted, 47 showed endometritis (subacute or chronic) before the ring was introduced; and this inflammatory reaction disappeared in most of them after the ring was in place.

Dr. I. Spindler asked Dr. Aguilera how often endometritis was found in women not wearing an IUD. In reply she gave the following figures from an institute: endometritis 1-2%; hormonal dysfunction 3-5%.

Dr. E. Knowles, in her first 3,000 IUD cases in Fiji, had noticed considerable differences in the response of Fijians and Indians; and she asked Dr. Tietze whether racial disparities had been noted elsewhere. He replied that the Cooperative Statistical Program, whose findings he had summarized, took no account of race.

Later he enlarged on his remark that the Zipper ring, with its low removal rate, deserved further study. At the end of the fourth year the comparative closure rates were 32·3% for the Zipper ring and 48·4% for Lippes loop D; or (deducting women who had decided on a pregnancy) 31% against 43%. But merely to compare these figures would be an over-simplification, for many other factors had to be weighed.

Dr. Zipper told a questioner that in Chile his ring was usually put in by a gynaecologist. No training was necessary: having seen it done once, the gynaecologist could do it himself. A general practitioner could insert it too.

Dr. C. Gomez-Rogers, asked how he selected cases, said that his patients were all multiparae who had come to the clinic for delivery and had breast fed one or more previous children. By the end of the second month, 3-8% had stopped breast feeding.

Dr. P. A. R. Sukhbir suggested that, as IUDs were introduced through a cervix containing bacteria, sulphonamide cover would be useful at the time of insertion. It had been used, he said, in Jamaica, and it seemed to work. Dr. Mishell replied that he thought the risk from reaction to the sulphonamide might be greater than the small risk of inflammation introduced by the IUD.

Session 12

THE MALE FACTORS IN REPRODUCTION

58. STUDIES OF THE CATIONS IN SEMEN

I. G. White, P. J. Quinn and R. N. Murdoch

*Department of Veterinary Physiology,
University of Sidney, Australia*

Although the influence of inorganic ions on the motility of spermatozoa has been extensively studied,¹ few observations have been made of their concentration in the semen of different species or of their distribution between the spermatozoa and seminal plasma.

We have developed a technique for the accurate and rapid estimation of sodium, potassium, calcium and magnesium in semen, using an atomic absorption spectrophotometer and also a method for the efficient separation of spermatozoa from seminal plasma using special tapering centrifuge tubes.² The distribution of the major cations between the spermatozoa and seminal plasma has been determined^{3,3} and evidence obtained for the active transport of cations in spermatozoa.⁴ The effect of dilution, cold shock and deep-freezing on the cation status of spermatozoa has been studied^{5,6} and some of the effects of potassium on the metabolism of spermatozoa are also discussed in this paper.⁷

Cations in whole semen and distribution between sperm and plasma

Sodium (350–190 mg./100 ml.) and potassium (140–35 mg./100 ml.) were found to be the predominant cations in human, dog, rabbit, ram, bull and fowl semen which contained lower concentrations of calcium (44–1 mg./100 ml.) and magnesium (25–2 mg./100 ml.).

The concentration of sodium was less in the spermatozoa than in the seminal plasma whilst the reverse was true for potassium, i.e. the concentration of potassium was greater in the spermatozoa than in the seminal plasma. The magnesium concentration of the spermatozoa also exceeded that of the plasma while the same was usually true for calcium. The reciprocal relation of potassium to sodium in the spermatozoa and seminal plasma (i.e. high potassium and low sodium in spermatozoa; low potassium and high sodium in the seminal plasma) seem to be of general occurrence and the ratio is not reversed in human semen as suggested by Sheth and Rao.⁸

Active transport of cations in spermatozoa

The distribution of sodium and potassium between the spermatozoa and seminal plasma is similar to that between the erythrocytes and blood plasma⁹ and suggests that a sodium-potassium pump mechanism is operating in spermatozoa, similar to that known to occur in erythrocytes.

The dog appears to be a particularly favourable species for an investigation of cation transport in spermatozoa since of all the species studied the gradients of sodium and potassium between the spermatozoa and seminal plasma are greatest in dog semen. Evidence for active transport of these cations (i.e. metabolism-dependent movements against a concentration gradient) was readily obtained in the following experiments in which the spermatozoa were incubated after a period of cold storage. When dog semen was slowly cooled to 5° C. and stored for 24 hr., potassium was lost from the spermatozoa and sodium accumulated in the cells. If at the end of the cold storage period the semen was incubated at 37° C. in the presence of added glucose there was a rapid uptake of potassium and extrusion of sodium from the spermatozoa against concentration gradients, the intracellular potassium reaching a maximum within 30 min. When the semen was incubated at 20° C. after cold storage there was a slower linear uptake of potassium by the spermatozoa over 3 hr., but no change in intracellular sodium concentration.

Although dog semen does not contain hexose, the spermatozoa are able to metabolise added glucose and under anaerobic conditions glycolysis can supply sufficient energy for cation transport. Under aerobic conditions, the oxidation of endogenous substrate, probably plasmalogen, in the spermatozoa can also supply the required energy.

Further evidence that cation transport in dog spermatozoa depends on metabolism has been obtained by adding metabolic inhibitors to the incubation medium after cold storage. Fluoride inhibited several metal enzyme systems in both the glycolytic and TCA cycles and caused a complete inhibition of potassium uptake. Iodoacetic acid and dinitrophenol decreased sodium extrusion and the detergent CTAB caused loss of considerable potassium to the medium and an influx of sodium, presumably due to destruction of the lipomembranes of the spermatozoa.

Preliminary experiments showed that the addition of the cardiac glycoside, ouabain, to the medium prior to the incubation period suppressed the rise in the potassium concentration of the spermatozoa after storage at 5°C. Thus, the potassium concentration of the spermatozoa in four ejaculates only rose from 12 mEq/kg. to 14 mEq/kg. in the presence of 8×10^{-9} M ouabain compared with 27 mEq/kg. for the control. Increasing the concentration of ouabain from 10^{-10} M to 10^{-6} M increased the inhibition of potassium uptake and the concentration required to cause half maximum inhibition was found to be 5×10^{-8} M ouabain. The presence of 10^{-12} M ouabain, i.e., 1/300 of concentration required to give half maximum inhibition, caused a slight stimulation of potassium uptake, a phenomenon recently observed in erythrocytes and also sodium-potassium activated ATPases from a variety of tissues.

Close correlations have been established between the inhibitory effects of cardiac glycosides on potassium transport in the cell and sodium-potassium-dependent ATPases from the same tissues and the transport of sodium and potassium in dog spermatozoa is probably mediated in a similar way.

Effect of dilution on cations in spermatozoa

When mammalian semen is diluted excessively, even in an isotonic medium containing a glycolysable sugar, motility, metabolism and fertilizing capacity of the spermatozoa is impaired.¹⁰⁻¹³ Washing spermatozoa has a similar effect, and it is thought that the deleterious effect is due to the removal of essential components from inside the cell. A number of authors (e.g. Blackshaw;^{11,14} White;^{12,15} Wallace and Wales¹⁶) have demonstrated the beneficial effect of potassium on the motility and metabolism of washed or diluted spermatozoa and it has been suggested that potassium may be one of the important substances lost from spermatozoa.

The present observations show that the potassium concentration is greater in the spermatozoa than in the seminal plasma and studies of semen diluted at 1 : 2, 1 : 4 and 1 : 8 confirm the finding of Dott and White¹⁷ that a 1 : 2 dilution of ram semen in sodium phosphate buffer causes a marked fall in the potassium concentration in the spermatozoa. A similar effect is seen with bull spermatozoa and there is an efflux of calcium and magnesium as well as potassium. From the data presented on the distribution of potassium, calcium and magnesium between spermatozoa and seminal plasma, it is clear that the concentration of all three cations will be considerably less in the surrounding medium than in the spermatozoa even after mild dilution. The efflux of these ions is, therefore, in the direction of the concentration gradient.

The present studies show that the loss of potassium, calcium and magnesium is more than compensated by the movement of sodium into the spermatozoa. Again, this is along a concentration gradient since the sodium concentration of the diluents greatly exceeds that of the undiluted ram and bull spermatozoa. The ion exchanges become greater with increasing dilution, from 1 : 2 to 1 : 8. At these mild dilutions equilibrium was reached rapidly and there was little subsequent change in the cation content of the spermatozoa during three hours.

After severe dilution (1 : 100) there did, however, appear to be some further exchange of sodium and potassium during 3 hr. Exhaustive washing (i.e. washing four times) has been found to have a similar effect to severe dilution and after a 3 hr. incubation period ram spermatozoa can be almost completely depleted of potassium. These findings are consistent with the report of White^{12,13} that a dilution of 1 : 100 and exhaustive washing both have a detrimental effect on the motility of ram and bull spermatozoa, which can be reduced by including potassium in the sodium phosphate diluent. Potassium levels must, however, fall

to very low levels before motility is impaired. Thus, diluting ram semen 1 : 2 reduces the potassium concentration of the spermatozoa by 20%, yet the motility and impedance frequency change is not greatly affected.

In general, similar exchanges of cations occurred when ram and bull semen was diluted in phosphate, tris or veronal buffers. Nevertheless, the cation concentration of the diluted spermatozoa was, to some extent, dependent on the diluent used and sodium influx into ram spermatozoa was greater in phosphate than in tris buffer, due probably to a lower sodium concentration in the latter diluent (386 mg./100 ml. compared with 240 mg./100 ml.).

Acid conditions were found to decrease the loss of potassium from spermatozoa and this may be of some physiological significance in maintaining intracellular potassium levels and may, in part, explain why there is little loss of potassium when undiluted semen samples are incubated for several hours.

Effect of cold shock and deep freezing on cations of spermatozoa

Cold shock is the irreversible loss of viability which occurs when the spermatozoa of some species, e.g. bull and ram, are quickly cooled to about 0° C. The most obvious sign of cold shock is loss of motility which is not regained on warming the semen. There is also a decrease in the rate of fructose breakdown by the spermatozoa, a decrease in the oxygen uptake and a fall in ATP, which can now be no longer synthesized and used to supply energy for the maintenance of motility.¹⁶ The proportion of cells staining with dyes like eosin or congo red increases^{19,20} and both high and low molecular weight substances are lost from the spermatozoa.^{18,21} Cold shock can be largely prevented or decreased by adding egg yolk to semen, and recent work indicates that the active principle is the phospholipid, lecithin.²¹⁻²³

Deep-freezing spermatozoa to the temperature of a dry ice/alcohol mixture (-79° C.) causes an even more severe drop in motility and metabolism.²⁴ However, by including glycerol in the medium²⁵⁻²⁷ it is possible to revive a greater proportion of the spermatozoa and a vast literature on this subject has now accumulated.^{28,29}

Our experiments clearly establish that when bull and ram semen is cold shocked, sodium and calcium accumulate in the spermatozoa and potassium and magnesium are lost. This conclusion, based on the direct analyses of the spermatozoa reported here, is substantiated by the work of Blackshaw and Salisbury,²¹ who measured the sodium, potassium and calcium content of seminal plasma before and after cold shocking bull semen. The movement of cations is not as great when human, dog, rabbit or fowl spermatozoa are cold shocked; this is of interest since the spermatozoa of these species are not so susceptible to cold shock as judged by motility and vital staining techniques.^{30,31}

Deep-freezing produced a similar, but more severe, disturbance of the cation movements and significant effects were seen with the spermatozoa of all species, except the fowl and human. It may be noted that human spermatozoa have long been known to survive deep-freezing moderately well in tubes or ampoules without adding glycerol to the medium.³²⁻³⁶

Diluting bull and ram semen accentuated the cation movements of both cold shocked and deep-frozen spermatozoa, which is consistent with the motility observations of Choong and Wales³⁷ on bull semen.

The potassium and magnesium concentration in bull and ram spermatozoa is greater than in the seminal plasma and the sodium concentration in the seminal plasma exceeds that of the spermatozoa in these two species.^{2,38} The movement of all three ions on cold shocking and deep-freezing is, therefore, in the direction of the concentration gradient. This is also true for the movement of calcium into bull spermatozoa on cold shocking and deep-freezing, since the calcium concentration of the seminal plasma in this species exceeds that of the spermatozoa.^{2,38} The accumulation of calcium on cold shocking neat or diluted ram spermatozoa or diluted bull spermatozoa must, however, be against a concentration gradient. Merely diluted bull and ram spermatozoa in these diluents causes an efflux of calcium at 25° C.,⁵ and calcium must be actively accumulated specifically on cold shocking. There is, however, no increase after deep freezing when, due possibly to gross damage to the cell membrane, a state of equilibrium or near equilibrium has been reached between spermatozoa and seminal plasma.

Beljkevic, Kljucareva, Rombe and Filaretova³⁹ have postulated that calcium is released

from the external lipoprotein layer of spermatozoa on cold shocking and passes into the cell, causing disorganization of the protoplasm and inhibition of enzymes systems. They also suggest that the protective action of various substances (e.g. lecithin, casein and ethylenediaminetetracetic acid) against cold shock is due to their ability to bind the released calcium and to prevent it passing into the spermatozoa. Whilst our experiments do not provide any evidence for the translocation of calcium within the spermatozoa on cold shocking they do suggest that it actively accumulates. Furthermore, the accumulation of calcium by cold shocked bull and ram spermatozoa is largely prevented by lecithin and glycerol, and clearly the protective effects of these and other substances in relation to calcium warrant further investigation.

The rapid addition of glycerol to semen is, in itself, likely to produce disturbances of the cation concentration in spermatozoa similar to the more drastic changes that follow deep freezing. However, we have found the influx of sodium into bull and ram spermatozoa and the loss of potassium can be greatly reduced if the semen is deep-frozen under optimal conditions in glycerol-containing medium. Further experiments are clearly necessary to determine whether the equilibration or ageing process investigated by Martin¹⁰ is important in this respect or whether one of the constituents of the diluent (e.g. egg-yolk, citrate or fructose) has a major role to play in maintaining the cation status of spermatozoa deep-frozen under these conditions.

Effect of potassium on motility and metabolism of spermatozoa

The beneficial effect of low concentrations of potassium on the motility and metabolism of washed, diluted or dialysed ram and bull spermatozoa has been repeatedly demonstrated.¹¹⁻¹⁷ Very high concentrations of potassium, however, depress the viability of ram and bull spermatozoa,^{13,11} and Sheth and Rao⁸ report that poorly motile human semen has more potassium in the plasma than is the case with highly motile specimens.

In view of the latter observations we have made cation analyses on the seminal plasma of 27 human ejaculates and correlated them with the percentage of motile and unstained spermatozoa. There was no significant correlation between either estimates of viability and the concentrations of sodium, potassium, calcium and magnesium in the seminal plasma. Some interesting correlations between cation levels in ram semen and semen quality have, however, come to light. Thus our data suggest a reciprocal relationship between potassium and calcium concentrations in ram spermatozoa with respect to the percentage of unstained cells—a high percentage of unstained cells being associated with high intracellular potassium and low calcium. This may mean that potassium and calcium are concerned in the permeability of spermatozoa, as is the case with artificial phospholipid membranes and clearly warrants further investigation. A positive correlation is also suggested between the motility and magnesium concentration of ram spermatozoa, whilst high potassium and calcium levels presumably cause some reduction in activity.

By using small Warburg flasks containing radioactive substrates, and the sperm equivalent of about five human ejaculates, we have been able to accurately measure the oxygen uptake of human spermatozoa (which is 4–6 $\mu\text{l}/10^8$ sperm/hr.), and to show that glucose, fructose, lactate, acetate, sorbitol and glycerol are oxidized. These studies leave little doubt that human spermatozoa, like those of other species, have true respiratory activity.

Our study confirms previous reports that low concentrations of potassium stimulate the oxidative metabolism and aerobic glycolysis of glucose or fructose in spermatozoa.^{13,16,12,13} Since, however, we have also shown that potassium stimulates anaerobic glycolysis as well as the oxidation of acetate and lactate, potassium must have a stimulatory effect on both the Embden-Meyerhof pathway and the Krebs cycle reactions in spermatozoa. Boyer, Lardy and Phillips¹⁴ have shown that potassium is necessary for the conversion of phosphopyruvate to pyruvate by muscle extracts and Muntz¹⁵ found that it also participates in the phosphokinase reaction of yeast juice. Both reactions are involved in the glycolytic cycle and might be the point at which potassium affects spermatozoa.

Potassium is known to stimulate the aerobic metabolism of brain,^{16,17} and although its site of action in the Krebs cycle of reactions has not been pinpointed it may indirectly increase the availability of phosphate-acceptor ADP and inorganic phosphate. At all events the critical

effect of potassium on the activity of ram spermatozoa appears to be related to their ability to produce or make use of energy from the oxidation of exogenous substrate over the Krebs cycle.¹⁷

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61. SITES OF SELECTIVE ABSORPTION OF COLLOIDAL PARTICLES ALONG THE SPERM PATHWAY

M. H. Burgos

Institute of Histology and Embryology, School of Medical Science, Mendoza, Argentina

The study of the histophysiology of the male accessory organs presents many gaps in knowledge, especially in those aspects concerning the first portion of the spermatozoal pathway.

Many contributions in the past have pointed out that ductuli efferentes resemble the proximal convoluted tubules of the kidney. They apparently are able to absorb and store vital dyes,¹ and absorb fluid coming from the testis.²⁻⁶ The proximal portions of the epididymis are also able to store trypan blue, indian ink and pigment.⁶

The knowledge of the sites of selective absorption of macromolecules along the spermatozoal pathway have recently awakened the interest of workers in the field of reproductive research. The main reason of such an interest is found in the possibility of autoimmunization by absorption of antigenic molecules.

The present study deals with the places of absorption of colloidal particles which have been injected into the rete testis, and which have been followed through the ductuli efferentes and the first portions of the epididymis. These studies have been made with the combined use of light and electron microscopy.

MATERIAL AND METHODS

Adult male hamsters anaesthetized with nembotal were injected into the rete testis with 0.1 ml. of saline or with 0.1 ml. of 8% colloidal mercuric sulphide (SHg). They were sacrificed five hours later and testis, ductuli efferentes and epididymis were perfused with 3% glutaraldehyde, cacodylate buffer, according to the method of Acki and Vitale.⁷ Tissues were dehydrated through acetone and embedded in Epon (Luft).⁸ Sections 1 μ in thickness stained with toluidine blue-borax were studied with the light microscope and thin sections obtained with a Porter-Blum ultra-microtome stained with uranyl and lead salts (Reynolds⁹) were studied with a Siemens Elmiskop I.

RESULTS AND CONCLUSIONS

The first portion of the spermatozoal pathway

The seminiferous tubules are connected to short tubuli recti which show an enigmatic clump of large foamy epithelial cells which adopt the shape of a flute mouthpiece (Fig. 1). This clump appears to act as a valve controlling the unidirectional passage of testicular material from the seminiferous tubules towards the rete testis.

The wide and irregular compartments of the rete testis were studied in tridimensional reconstruction in our laboratory as shown in Fig. 1. It has two main portions, one intratesticular and the other extratesticular. The first portion is a labyrinthic and irregular system of cavities interconnected which receive the valvular openings of the tubuli recti, and the second one is a cupola-like cavity which exceeds the testicular limits by approximately 0.8 mm. This extratesticular portion is soon divided into two ductules by the appearance of a septum, and subdivided again by septa into 6 to 8 ductuli efferentes.

Ductuli efferentes run straight towards the head of the epididymis and close to it, they change into a coiled disposition and anastomose one with each other, to form a single tubule in the plain first portion of the caput epididymidis (Fig. 1).

The reduction in the total inner volume of the ductuli efferentes is approximately 20 fold. This reduction in diameter is directly related to the absorption of seminal fluid and molecules with concomitant concentration of the cellular content, the spermatozoa.

The first three portions of the epididymis have lumens of approximately the same size. Then, from the body to the tail there is a gradual increase in their inner diameters.

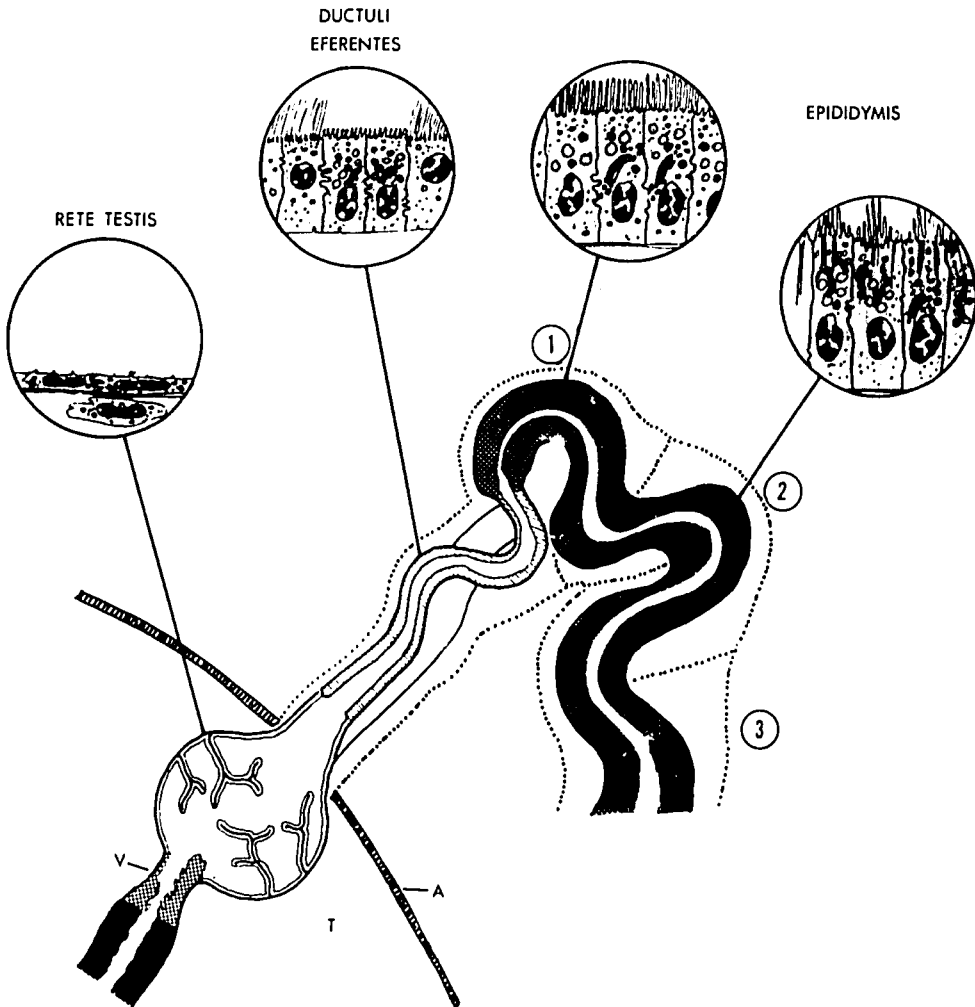


Fig. 1. Schematic illustration of the first portion of the spermatozoal pathway. Circles enclose the main characteristics of the epithelial cells. Rete testis, squamous epithelium. Ductuli efferentes, ciliated and non-ciliated cells, and epididymis, first portion, columnar cells with regular stereocilia (1), second portion, tall columnar cells with irregular stereocilia (2), third portion (3). Albuginea (A); testicular parenchyma (T); valve (V).

A histological survey of the epithelial lining from the seminiferous tubules to the epididymis shows that the low cuboidal epithelium of the rete testis changes abruptly into a tall columnar type of ciliated and non-ciliated epithelial cells. The ciliated cells are more numerous near the rete; the non-ciliated, conversely, near the epididymis. Here the simple columnar epithelium of ductuli efferentes also changes abruptly into a pseudo-stratified epithelium with stereocilia.

Absorption of colloidal particles

Five hours after the injection of colloidal mercuric sulphide the study of the spermatozoal pathway under the electron microscope reveals the uptake of the colloidal particles by some types of cells lining the pathway:

(1) *The low cuboidal cells* of the rete testis (see Figs. 2 and 3) have cytoplasmic vacuoles which contain colloidal particles. Some of these vacuoles appear closely related to lysosomes (Fig. 2) in a way which strongly resembles the mechanism of phago-lysosome formation.

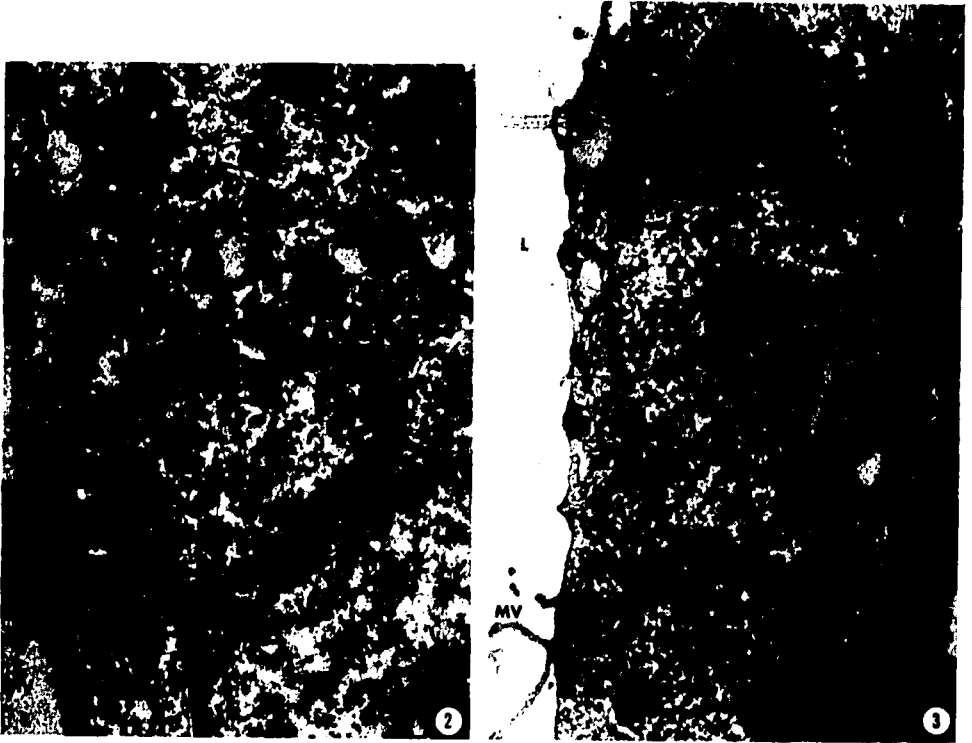


Fig. 2. Rete testis. Portion of two epithelial cells. Nucleus is irregular and shows deep indentation: (N). The cell surface projects short microvilli (MV) into the lumen (L). Colloidal particles (SHg) are shown near the surface (1) in a phagosome (2) and in a large vacuole or phago-lysosome (3). Two dense bodies (lysosomes) are seen at this level, one inside the vacuole and a second one partially included (arrow). The other cell shows a large phago-lysosome with SHg particles (4) and a lysosome (5), mitochondrion (M), intercellular space (IS), endoplasmic reticulum (ER), polyribosomes (RNP) and basement membrane (BM) $\times 50,000$.

Fig. 3. Rete testis. Portion of two epithelial cells. Nucleus (N). Few microvilli at the cell surface (MV). Lumen (L). Cross section of spermatozoon intermediate piece (S). Residual body filled with SHg particles (RB). Dense body (Lysosome) (DB). Basement membrane (BM). $\times 50,000$.

This mechanism involves the incorporation into the vacuole of phagocytosis of the digestive enzymes present in the lysosome. This is the starting point of a digestive process which ends in the formation of a residual body as shown in Fig. 3, and its subsequent elimination into the thin basement membrane and connective tissue.

(2) *The non-ciliated cells* of the ductuli efferentes closely resemble the cells of the proximal convoluted tubules of the kidney. A moderate uptake of colloidal particles accompanied by a substantial absorption of fluid in large vacuoles is shown by these cells. Vacuoles increase in density as they progress into the apical cytoplasm towards the nucleus (Fig. 4). Ciliated cells do not show uptake of particles. More details have recently been given in a recent publication by Montorzi and Burgos.¹⁰

(3) *The columnar cells* of the second portion of the caput epididymidis incorporate such an amount of colloidal particles that this portion becomes darkened to the naked eye by black colloids. Particles are seen in the lumen in contact with the long stereocilia which incorporate them by pinocytosis and tubular invaginations of the cell membrane. The stereocilia have a filamentous coating which appears to behave as an adhesive material. Particles bound to this coating are introduced by a flow of membranes into canaliculi, vesicles and large vacuoles (Fig. 5). Clumps of particles appear to be glued into the large

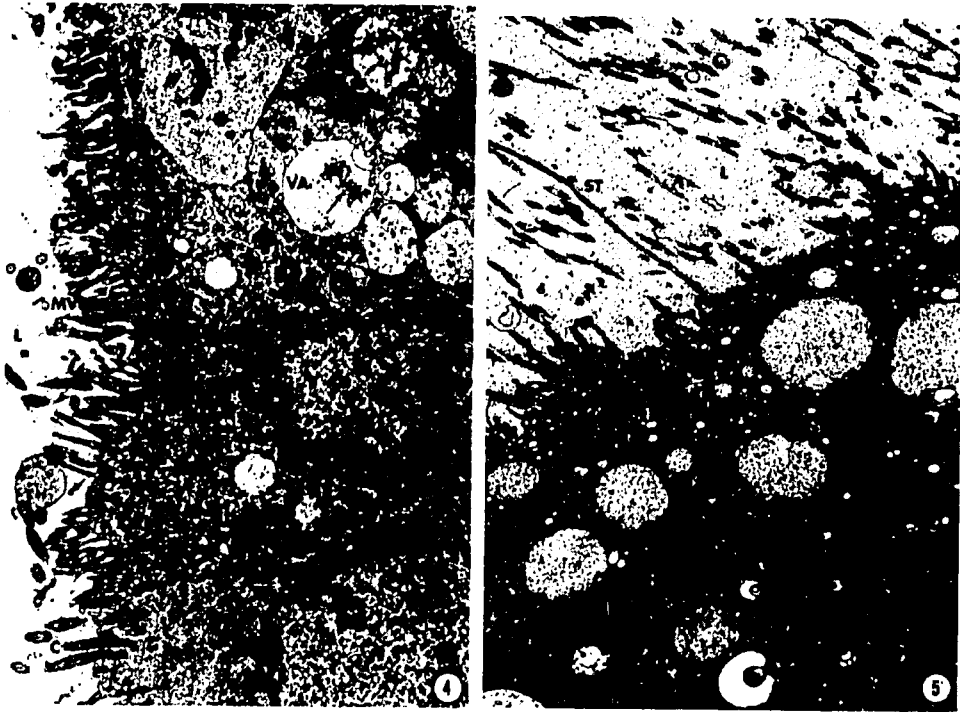


Fig. 4. Ductuli efferentes. Portions of six cells. Ciliated cells (CC) show irregular nuclei located at the apical cytoplasm (N) and basal bodies and cilia (C). The non-ciliated (N-C) cells show microvilli (MV) and numerous apical canaliculi (AC), vesicles (Ve) and large vacuoles (VA). This type of cell is able to absorb SHg (arrows). Mitochondria (M). Lumen (L). $\times 15,000$.

Fig. 5. Epididymis second portion. Irregular and long stereocilia (ST) enter the lumen (L). Oblique section of the apical cytoplasm of some cells. It shows large vacuoles which contain SHg (arrows) and numerous small vesicles loaded with particles. $\times 10,000$.

vacuoles by a material of low electron density similar to the extracellular coating.¹¹ The apical cytoplasm contains numerous lysosomes which sometimes are close or fuse with the large vacuoles and a well developed Golgi complex. This apical zone shows a very intense histochemical reaction for acid phosphatase.

The present observations clearly show that most of the cells lining the spermatozoal pathway are able to absorb colloidal particles. It shows also the mechanism by which these particles are absorbed. For the rete testis it resembles the way littoral cells or macrophages phagocytize. As an example of this quality, Fig. 3 shows the cross section of a spermatozoon included in plain cytoplasm of an epithelial cell of rete testis. Non-ciliated cells of ductuli efferentes absorb particles in a way which resembles the tubular cells of the kidney; in that sense recent experiments from our laboratory have shown that sodium, glucose and water are markedly absorbed by ductuli efferentes. Cells from the second portion of the epididymis show the highest concentration of absorbed particles in the entire spermatozoal pathway. This highly

developed function is related to the great richness in membranes which characterize these cells (steriocilia, cell membrane invaginations, Golgi complex and vacuoles).

All the absorbing cells mentioned above present the cytological machinery for intracellular digestion well developed. It has also been shown in the present study that the colloidal particles enter into close relationship with that digestive machinery. Based on these observations we postulate that a disturbance in the intracellular digestive process could allow the passage of non-digested or incompletely digested molecules endowed with antigenic properties through this digestive barrier into the blood stream.

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62. AUTO-ANTIBODIES TO SPERM AS A CAUSE OF INFERTILITY IN THE HUMAN MALE

P. Rümke

Department of Immunology, Netherlands Cancer Institute, Amsterdam

It is now well established that some infertile human males possess auto-antibodies against spermatozoa in their bloodserum as well as in their seminal plasma. As originally described by Wilson in 1954,¹ these auto-antibodies agglutinate and sometimes immobilize the otherwise normal spermatozoa in the ejaculate. As a result the sperm is no longer capable to penetrate the cervical mucus. The infertility is thus directly due to the action of sperm auto-antibodies. Judged by post-coital tests and cervical mucus invasion tests *in vitro*, a parallel has been found in 11 cases between the inability of the patients' spermatozoa to invade the cervical mucus and the titre of spermagglutinins and immobilizins in the serum.² Differences exist in the type of agglutination.^{1,3,4} The majority of the sera contain agglutinins against the tails, others against the heads. With some sera agglutination starts with the tail-end, while with most sera the whole tail seems to be involved; mixed forms also exist. The presence of spermagglutinins in serum of males is a relatively uncommon phenomenon. Investigating the serum of 2,015 infertile males Rümke and Hellinga,³ using a macroscopical agglutination technique,⁵ found 67 or 3.3% positive cases with titres of 1 : 32 or higher; none of 416 fertile males or 124 unselected infertile females possessed spermagglutinins at that titre. Of these 67 males with spermagglutinins in the serum, only about one-third appeared to have complete or partial auto-agglutination of the spermatozoa in the ejaculate. It is this group of patients of which one can say that the auto-antibodies are the cause of the childlessness. The semen samples of another third of the patients showed extreme oligo- or asthenospermia, in which agglutination is often difficult to observe. Only occasionally patients were encountered with seemingly normal ejaculates in spite of the presence of agglutinins in the serum. Generally, seminal plasma titres were much lower than serum titres, which presumably is related to the low gamma-globulin content of seminal plasma (about 1% of the serum concentration). Variation in gamma-globulin level of normal and pathological semen samples as has been found by others (e.g. Klopstock⁶), may account for differences in the ratio of serum/seminal agglutination titres. The remaining third of our 67 patients suffered from azoospermia which was nearly always due to obstruction of the efferent ducts. In this group of patients a disturbance of spermatogenesis was probably only once the cause of the azoospermia, whereas in a random group of 172 azoospermic men without sperm-agglutinins in the serum impaired spermatogenesis was found in at least 94 patients. The absence of abnormal spermatogenesis in the group of azoospermic patients with spermagglutinins was stressed by the fact that testicular biopsies appeared to be normal in 15 of 17 patients, and suggests that spermagglutinins do not interfere with testicular function. This statement is in complete accordance with results of experimental work.⁷ Guinea-pigs injected with testicular homogenates emulsified in complete Freund's adjuvant develop auto-allergic orchitis and aspermatogenesis, but animals immunized with these extracts as such or emulsified in incomplete Freund's adjuvant fail to show any sign of testicular damage, in spite of the formation of humoral auto-antibodies to sperm.

The significant finding of spermagglutinins in serum of patients with obstructions was confused by others. Phadke and Padukone⁸ detected spermagglutinins in the serum of 8 of 25 previously fertile men in whom vasoligation had been done to limit family size 2 to 20 years prior to serum testing. They also found five positive cases in 25 patients with obstructive azoospermia and 6 of 25 infertile patients in whom a former condition of obstructive azoospermia had been successfully relieved by vaso-epididymostomy.

Recently we had the opportunity to test serum of 11 patients with congenital absence of both vasa deferentia and seminal vesicles. Because the testes of these men are normal they must have resorbed their sperm since adolescence. With the macroscopical agglutination technique 6 patients did not possess serum-spermagglutinins, but the serum of 5 contained these antibodies in titres ranging from 1 : 8 to 1 : 256.

It seems logical to assume that in males with obstruction or absence of the efferent ducts excessive resorption of sperm in the epididymis might be the possible cause of the sperm-autoantibody formation. In such cases extravasation of sperm in the interstitium of the epididymis and even spermatozoa in the lymph vessels have been observed (for ref. see Rümke.¹⁰) Extravasation of sperm often is accompanied by infiltration of mononuclear leucocytes. Also, spermatic "granulomata" are ascribed to sperm extravasation.

From experimental studies started at the turn of the century it is already known that spermatozoa are potentially auto-antigenic. This is not surprising: many tissues as well as spermatozoa¹⁰ have their own specific organ antigens. Since the spermantigens do not seem to reach the immune competent cells normally, and for obvious reasons certainly not before the reticulo-endothelial system is mature, we may assume that the seminal antigens can not be recognized as "self" when they do make this contact. The question remains why three-quarters of the males with obstruction do *not* develop spermagglutinins in spite of presumed excessive resorption. Phadke¹¹ has found that obstruction does not necessarily lead to sperm-extravasation in the epididymis. In the majority of his cases sperm phagocytosis was witnessed only in the lumina of the epididymal tubules. This might suggest that individual variation in the mechanism of sperm phagocytosis could account for the noted variation in auto-antibody response. Possible other or additional explanations for this variation are: (1) spermantigens are, depending on the initially resorbed quantity, either tolerogenic or immunogenic; (2) certain individuals are genetically more prone to produce antibodies on weakly antigenic stimuli than others; (3) development of other kinds of antibodies might block the formation of agglutinating antibodies; (4) additional factors, such as minor inflammations might be necessary to initiate antibody formation. At this moment it is not yet possible to judge which of these suggestions are of value.

The conclusion that obstruction might lead to excessive resorption and therefore to antibody formation was based on evaluation of the date of our azoospermic patients. Case histories and physical examination of the other males showed that in several instances obstruction on one side was presumably present. These were patients with healed gonorrhoeal or tuberculous epididymitis or males who underwent herniorrhaphy in childhood. (This operation too often leads to cutting of the tiny vasa deferentia when not performed by an experienced surgeon.) One of our patients developed an acute necrosis of one testis after a surgical accident during herniorrhaphy in adult life.

In about half of our patients, however, the case history or physical examination did not reveal any clue as to the cause of the auto-antibody formation. Moreover, in three of them surgical exploration proved definitely the absence of obstruction in the epididymis and vas deferens. The cause of the antibody formation in such cases has to be solved in the future.

A current investigation may in fact do so. In one of the old people's homes of Amsterdam, autopsies are done on all patients who die in the home. Recently we have found that out of 100 male residents born before 1900, 12 had spermagglutinins in their serum. Thorough histological examination of the whole genital tract of these people at the time of autopsy might answer the question what the various causes of the spermagglutinin formation are, and why variation occurs in the type of agglutinin formation. In this connection it is of interest that in 1921 Wegelin¹² already postulated: "... that antibodies prepare the sperm for phagocytosis, at least when resorbance of sperm substances takes place". According to Wegelin this is not so rare in old people, and in cases of epididymitis in which sperm is found in the interstitium and lymph-vessels of the epididymis and rete testis.

Another possible cause of spermagglutinin formation is suggested by the results of the experimental work of Weil and co-workers (for review, see Weil¹³). They found that seminal plasma contains highly effective antigens and that antisera against seminal plasma cross-react with spermatozoa. Conversely, antisera against carefully washed seminal spermatozoa cross-react with seminal plasma. It was concluded that spermatozoa receive a coating of an antigen

derived from the seminal vesicles when they become mixed with the combined secretions of the adnexal glands. Theoretically, auto-antibodies against this organ-specific antigen would agglutinate ejaculated spermatozoa. So far, however, no auto-immune diseases of the adnexal glands have been described. Moreover, according to immuno-fluorescent antibody studies, most of the stronger spermagglutinating sera react with ejaculated as well as with testicular spermatozoa, which proves that at least in these instances the antibodies are not directed to a coating antigen.¹⁴

Those patients who show complete auto-agglutination in their ejaculate have been infertile for as long as we have followed their cases—in some cases for more than 10 years. So far, therapeutical trials have been unsuccessful. Patients treated with ACTH or corticosteroids in moderate doses for a period of two months did not improve: their serum titres and the auto-agglutination remained the same.

Recently we started to treat 10 males with testosterone, in the hope that antibody formation would diminish after termination of sperm resorption by testosterone-induced suppression of spermatogenesis. Results cannot be expected before the end of 1967, but if they appear to be discouraging, we intend, in cases of proved one-sided obstruction, to remove the source of excessive resorption by hemicastration.

In an attempt, some years ago, to elute the auto-antibodies from the agglutinated sperm for the purpose of making it suitable for artificial insemination, we found that the semen seemed to be normal after incubation with 1% trypsin for half an hour. The clumps disintegrated while the sperm did not lose motility. Unfortunately experiments with pigs inseminated with boar sperm incubated with trypsin taught us that this procedure might be harmful to offspring.⁹ With other drugs we have never been successful in disagglutinating clumps of living sperm.

When we switch the theme from the infertile patient who wants to be treated for his childlessness to the fertile male who wants to control the birth rate of his progeny, we may ask ourselves whether the data collected from our first category can be used in order to help the second. In other words, would it be possible to induce infertility in males by auto-immunization to sperm? Artificial auto-immunization to sperm could be accepted as a contraceptive method if it would be possible to induce such auto-antibodies by a few injections of a suitable "vaccine", if the state of infertility would be induced with certainty and maintained for a sufficiently long period, if the procedure would do no harm and, ideally, if it would be possible to convert infertility into fertility again. To meet these requirements many problems have to be solved. In principle, they can be solved. And the infertile patient with auto-antibodies to his sperm is not the least important who can help us in achieving this task.

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63. ANTI-SPERMATIC ANTIBODIES IN THE HUMAN AND ANIMAL MALE

R. E. Mancini

Department of Histology, Buenos Aires Medical School, Argentina

The pioneer studies of Landsteiner, Metchnikoff and Metalnikoff at the end of the last century demonstrated the antigenic potency of heterologous and homologous spermatozoa. The first evidence of the immobilizing property of an antispermatic antibody was obtained by intraperitoneal injection of bull spermatozoa into guinea pigs previously sensitized with bull sperm. This was followed by much research generally based in *in vitro* techniques which tended to demonstrate some other antispermatic effects of antisperm antiserum. Specific antigens have been demonstrated in the spermatozoa of many mammals, including man; although a high degree of species specificity was assumed, some cross reactions occur.¹⁻³ Also, blood group isoantigens are present in sperm cells of some species,⁴⁻⁷ while proof of the existence of common antigens between brain and testicular tissue is conclusive.^{8,9} Interest was renewed by the advent of new immunologic procedures, the clinical concept of autoimmune disease, its experimental counterpart expressed by autologous or homologous allergic orchitis and inflammation of the accessory glands and by the possible implication of immune phenomena of the male genital tract in the pathogenesis of human sterility and fertility control.¹⁰

In the present account it is intended to define and compare the biological effects of an antispermatic antibody upon spermatozoa *in vitro* (agglutinating, immobilizing, cytolytic and fluorescent reactions) with the serological results and the incidence of germinal cell damage established *in vivo*. For this purpose animal and human studies will be listed which include the role played by different types of antigens from testicular, accessory gland and other tissue proteins in the induction of specific antispermatozoal effects and their correlation with pathological findings in infertile patients.

I. ANIMAL EXPERIMENTS

A similar effect to that already described for antispermatozoal antibodies on homologous and heterologous sperm cells, i.e. immobilization, lysis of the acrosome and immunofluorescent staining of the acrosome of spermatozoa, was also attributed to some factor contained in normal sera.¹¹⁻¹⁴ More recently, it was demonstrated that testicular antigens or

PLATE I

Fig. 1. Spermatozoa from normal guinea pig incubated with heated homologous normal serum plus complement. Compact and homogenous acrosome; nucleus of normal aspect. Contrast phase microscopy. $\times 900$.

Fig. 2. Spermatozoa from normal guinea pig incubated with heated homologous antitestis serum plus complement. Marked swelling of the acrosome area. No visible alteration in the remaining structure. Contrast phase microscopy. $\times 900$.

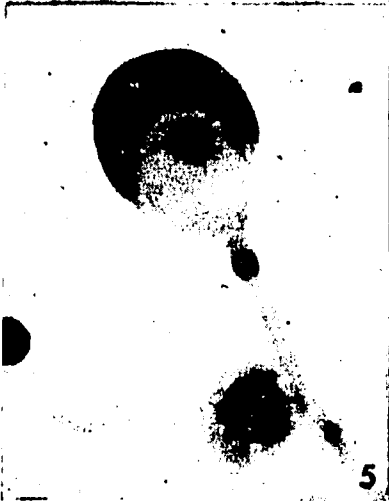
Fig. 3. Spermatid from normal guinea pig incubated with heated homologous normal serum plus complement. Normal aspect of the nucleus, cytoplasm and of acrosomic granule. Contrast phase microscopy. $\times 900$.

Fig. 4. Spermatids from normal guinea pig incubated with heated homologous antitestis serum plus complement. Swelling of nuclei, cytoplasm and of perinuclear acrosome. Contrast phase microscopy. $\times 900$.

Fig. 5. Smear of spermatozoa from normal guinea pig previously incubated as in Fig. 1 and stained with the PAS-haematoxylin technique. Homogenous staining of the acrosome and normal structure of nucleus and intermediate segment. $\times 2,000$.

Fig. 6. Smear of spermatozoa from normal guinea pig previously incubated as in Fig. 2. Weaker or absent reaction of the vacuolated acrosome to PAS staining. $\times 2,000$.

PLATE I





spermatozoa plus Freund adjuvant induced in adult guinea pigs, mouse and man, destruction of germinal cells, complement-fixing antibodies, specific immunofluorescent reactivity of the acrosome, positive skin tests and immobilizing effects on homologous spermatozoa.^{9,15-19}

To contribute more detailed information of the cytotoxic action exerted *in vitro* by normal and antispermatic sera, the following investigations were carried out: (a) a study of the immunological specificity of the immobilizing and cytolytic effect of normal as well as homologous and heterologous antispermatic antisera upon spermatozoa, as judged by the relation to detectable circulating antibodies, the corresponding absorption procedures and the use of other antiorgan antisera; (b) an optical and electronmicroscopical study of the lytic action of the immune sera on different types of germinal cells; (c) correlation of both effects with the results provided by immunofluorescent and immunoelectronmicroscopic techniques, in order to detect the possible site of action of the antibodies.^{20,21}

Results obtained in our experiments suggest that the factors present in homologous or heterologous normal sera or in homologous or heterologous antitestis antisera seem to be different as regards their action on germinal cells. In this sense our observations confirmed and amplified results of previous authors but differed with respect to others. That homologous and heterologous normal sera immobilize spermatozoa at low titre, are heat labile, partially complement-dependent and capable of a lytic effect on acrosome of spermatozoa, agrees with previous data.^{11,14,22} By contrast, negative serological reaction against any testicular antigen and some immunofluorescent results corroborating previous observations of ours^{21,23} and of others^{18,22,24,25} are not in accordance with earlier reports of positive reactions.^{26,27}

The fact that deactivation of homologous and heterologous normal sera was achieved in our experiments with testis, liver or kidney homogenates, spermatozoa or isolated acrosomes, and other tissue and serum protein antigens, suggests the absence of specific immunological characteristics in these reactions. Therefore the factor responsible for the interaction with germinal cells, does not appear to be a typical antibody. Although it was defined as a macromolecular substance with some resemblance to complement,¹¹ more studies are needed to characterize the nature of this substance. In this respect it is worthwhile to remember that a non-specific cytotoxic effect upon other normal or tumour cells, was repeatedly advocated for the normal sera.²⁸

On the contrary, the immobilizing and cytolytic effect of homologous and heterologous antitesticular antibodies, are not only complement-dependent and clearly visible at much higher dilutions but are also consistent with positive results of complement fixing, precipitin and immunofluorescent tests. Our results concerning immobilization of spermatozoa induced by both types of antibodies confirmed the classical and more recent studies^{11,16,29} which reported a correlation of this effect with the increased antibody titre in the sera of sensitized animals. The cytolytic action of the antisera detected at lower dilution as compared with the immobilizing effect, and essentially revealed by swelling of the acrosome of spermatozoa and spermatids and of the cytoplasm of spermatids (Plate I), strongly suggests an increase in permeability of the cell membrane leading to a greater incorporation of water and electrolytes and loss of high molecular cytoplasmic components. This assumption, which was chemically substantiated in other conditions of immunological and also complement-dependent cell damage,³⁰ is backed in our material by the appearance of empty areas and weak PAS staining in the acrosome of spermatozoa and spermatids, discontinuity of plasma membrane,

Fig. 7. Electronmicrograph of a spermatid from normal guinea pig testis previously incubated with guinea pig normal serum plus complement. Normal picture of nuclei and acrosome. Some dilated smoothly outlined vesicles, profiles of granular endoplasmic reticulum and mitochondria are observable as well as normal aspect of both plasmatic and nuclear membrane. $\times 12,000$.

Fig. 8. Spermatid incubated in similar conditions as in Fig. 4. Higher magnification of the acrosome area showing infolding and detachment of acrosomal membrane, peripheral clear areas and numerous tangential or cross sectioned vesicles. $\times 26,000$.

KEY: PM: plasmatic membrane. Nucl: nucleus. Acr: acrosome. Acr Sac: acrosomic saccule. Ves: vesicle. Agr: agranular endoplasmic reticulum. Mit: mitochondria. Gr: granular endoplasmic reticulum. \times Nu: clear areas in chromatin of nucleus. \times A: peripheral clear areas in acrosome. Acr M: acrosome membrane. Sp Cyr: spermatid cytoplasm.

increased number of vesicles and loosening of subcellular particles in the cytoplasm of spermatids. (Plates I and II). Also, the disappearance of chromatin areas in the nuclei of these cells points to a possible alteration of permeability even in the nuclear membrane. The fact that the electronmicroscopic density of the acrosome does not appear grossly modified, in contrast to the optically feeble PAS staining, may be explainable by the lack of change in osmium-reacting lipids of the lipoglycoprotein complex³¹ present in the acrosome. The immunofluorescent test which confirms that spermatozoa and both early and mature types of spermatids appear as the major sites of testicular antigens is in accordance with the well-known assumption that only mature testes containing advanced stages of spermatogenesis are able to induce immunization.^{9,10,32} Our results showing the immunofluorescent acrosome reaction in the same cells have confirmed and amplified previous data by ourselves²³⁻²⁵ and others, but disagree with claims that the acrosome reaction is induced by normal sera and that only sperm tails react with the immune sera.²⁷ Our findings are supported by the high titre antisera used, positive results of both direct and indirect fluorescent method and control reactions. Preliminary immunoelectronmicroscopical studies in our laboratory, by incubating germinal cells in Warburg flasks with homologous anti-guinea pig antitestis antibodies or immune globulin labelled with ferritin, have confirmed these fluorescent results; in addition, a lesser concentration of granules of labelled compound was observed in the cytoplasm and nuclei of spermatids and spermatozoa.

The specificity of our results is also strengthened by the negligible immobilizing action, absent cytolytic effect and negative immuno-fluorescent reaction obtained with homologous guinea pig anti-lymph node antisera and the rabbit anti-guinea pig serum proteins. Nevertheless it is interesting to emphasize the weak immobilizing but non-cytolytic effect and absent fluorescent staining exerted by both homologous and heterologous anti-guinea pig kidney antisera, which suggest some cross-reactivity between this organ and the testis. Also, the absorption procedures, showing little difference between homologous and heterologous antitestis antisera, were able to prevent partially all these reactions and fixing complement test, especially with testicular homogenate, a protein testicular fraction and spermatozoa. Results were less evident with other tissue extracts or serum proteins, but unrewarding results were obtained with the poorly soluble spermatozoal components like isolated acrosome and the remaining spermatozoal material. These findings may be partly explained by the fact that antitesticular antisera contain a rather heterogeneous antibody which shows in the double agar diffusion test, six or seven lines against testicular homogenate and two or three against a testicular protein fraction, liver and kidney homogenate, albumin and globulins. Some of these lines are identical with those of testicular homogenate. Conversely, the same antisera, tested with spermatozoa or acrosome, only reveal one or two lines, continuous with those of testicular homogenate and a protein fraction, but no apparent correlation with those of liver and kidney homogenate, albumin and globulin, while a weak or negative result was seen using the remainder spermatozoal material devoid of acrosome.³³

These data, which suggest that spermatozoa and the acrosome may not be entirely responsible for the antigenicity of testicular homogenate, point to the problem of the reliability of the absorption procedures when complex antisera are used and to the existence of some common antigenic properties between testis extract and other tissue and serum proteins. This is not applicable to spermatozoa and isolated acrosome where no other antigens are present except those common to testicular tissue; this finding supports the view that these structures are specifically related to the antigenicity of testis tissue. It may then be admitted that the immobilizing effect appears to be a less specific property of antitesticular antisera, and should be more closely correlated with surface moieties and exposed reactive groups, as was previously suggested.³⁴ Consequently, the motility of spermatozoa might be more easily modified by other tissue-related antibodies, whereas cytolytic and immunofluorescent reactions which may be dependent on more deeply situated and selective antigens such as those contained in the acrosome, should be less influenced by non-specific antibodies. Further study is needed, to elucidate whether the serological, cytological or immunofluorescent reactions may be present simultaneously and whether they detect the same antibody fraction in the anti-serum and similar or different sites of interaction in the germinal cells. For this purpose selective antibodies against each one of the various antigens so far recognized for testicular

tissue and spermatozoa^{17,25} should be prepared in order to verify not only their *in vitro* effects, but also to correlate them with the cell bound and/or circulating antibodies supposedly involved in the germinal cell damage present in sensitized animals.

In this sense, current experiments in our laboratory demonstrate that there is a better correlation between circulating antibodies and the cytotoxic and immunofluorescent results with *in vivo* damage of germinal epithelium than with the immobilizing effect, as could be deduced from guinea pigs sensitized with several homologous testicular antigens. It has been also observed that the immunological significance of the acrosome and of a glycoprotein substance contained in this structure are backed by the serological and cytolytic reactions (*in vivo* and *in vitro* damage of germinal cells) and by the immunofluorescent ones of the acrosome of spermatozoa and spermatids of guinea pigs sensitized with the same antigens; these findings are in contrast with the less ostensible immobilizing effect on spermatozoa obtained in the same animals. On the other hand, inoculation with spermatozoa devoid of acrosome, produces a serum with higher immobilizing action but a poor cytolytic effect on cells and a doubtful fluorescent staining of the acrosome.

Until findings from more refined studies are available, it is hard to say if this apparently different localization of the action of specific antisera corresponds to a real topography of the corresponding antigens in the spermatozoa. Taking into account that, as stated,^{24,26,27} the surface properties and natural antigenicity of spermatozoa may change with storage, washing and centrifugation, three antigens were detected in bull sperm using rabbit antibodies; one was head specific, another tail specific and the third common to head and tail of the sperm.^{2,10} It was also described applying agar diffusion tests, that part of the antigens present in human and rabbit spermatozoa seems to be surface antigens, common to those contained in seminal plasma and originating in the seminal vesicles,²⁸ but no information was reported as to the immobilizing, cytolytic effect or fluorescent reaction of these antibodies with homologous spermatozoa. As regards the damaging action on germinal cells *in vivo*, where a mechanism of delayed hypersensitivity mediated by cell-bound antibodies have been widely accepted, the cytological picture of spermatozoa and spermatids resembles those of the *in vitro* cytolytic effect as shown in our current electronmicroscopical studies. Obviously, the identification of the subcellular site of these spermatozoal antigens by means of immunoelectromicroscopy, their precise chemical nature and mechanism of damaging action on the structures of spermatozoa and germinal cells in *in vivo* and *in vitro* systems, would be of much help in clarifying the significance and correlation of antispermatozoal properties of the corresponding antibodies and their possible implication in the gonadal or accessory gland lesion in cases of induced male sterility.

II. CLINICAL OBSERVATIONS

Antispermatic antibodies detected by serological methods, sperm agglutination, immobilization and fluorescent reaction have also been described in man and claimed to affect human fertility. However, in spite of numerous findings, little is known about their pathogenesis and much less of their interference with the functions of the genital tract. Admitting that antibody production may be elicited and testified by autologous or homologous spermatozoa or other testicular or adnexal gland antigens in man, the question arises whether auto-immunization occurs and further to what extent it is of pathological significance and correlated not only with impairment of seminal sperm but also with alteration of the germinal epithelium.

Topographical immunological differences in spermatozoa have been reported. Experimental evidence indicates that human spermatozoa extracted from spermatoceles lack the antigens which characterize the seminal spermatozoa and the correlated antigens from seminal plasma. This finding which contradicts previous results obtained in animals sensitized with mature testis, probably implies that the higher antigenic material present in seminal spermatozoa is taken up during the passage through the accessory organs, most probably the seminal vesicles.²⁹ Some cases showing the spermagglutinins described below in their sera, do not give complement fixing test with spermatozoa or seminal plasma, but produce a zone of precipitation with seminal plasma as antigen in the gel diffusion test.⁴⁰ Closely correlated with the cross reactions between adnexal glands and semen, is the fact that antisera against

human prostate and acid phosphatase give a strong agglutination test using seminal spermatozoa as antigen.^{41,42}

In order to test the auto- or homo-antigenicity of testicular extracts, germinal cells and spermatozoa, in relation to the production of antispermatic antibodies, as already obtained in animals, we have tried to sensitize adult men. For this purpose different groups of patients having prostatic carcinoma and with no oestrogen treatment were studied (Table I). The first group was sensitized with autologous or homologous testicular homogenate or with a precipitated protein fraction plus complete Freund adjuvant. Patients of the second group were incompletely sensitized. The third group, not sensitized at all, served as control.

It was observed that low titre circulating antibodies against seminal spermatozoal or testicular homogenate (complement fixing, gel diffusion, FCA and antiglobulin consumption tests) and cell bound antibody (skin test), appear in some patients of Group I eight weeks after sensitization. Also, sperm immobilizing and cytolytic antibodies against germinal cells and spermatozoa could be demonstrated in the serum of these patients. The patients' testes developed patchy lesions consisting of congestion, oedema and moderate sloughing of germinal cells. The immunofluorescent technique using the patient's own sera and testis sections, showed a positive reaction in the germinal cells, presumably in spermatids and spermatozoa.¹⁹

Concerning clinical investigations, the presence of sperm agglutinins in human blood and seminal plasma, two main types of microscopic agglutination of spermatozoa may be present: head-to-head and tail-to-tail and sometimes a tail-to-head type is seen. Microscopic and macroscopic agglutination technique was then recommended and patient's own spermatozoa or those of normal donors were currently used.^{43,44} Investigating the serum of several groups of infertile males with a macroscopical agglutination technique, using normal sperm as antigen, some were found positive.⁴⁵⁻⁴⁷ Immunofluorescent studies using serum having spermagglutinins and seminal or testicular spermatozoa as antigen also yielded positive results. Specific fluorescence appeared located in the head and sometimes in the mid-piece or also in the tail.⁴⁸

Although a satisfactory explanation of the immunological pathogenesis of all these conditions does not yet appear feasible, the possibility that an antigenic antispermatic stimulus may develop following sperm absorption by the epithelium of seminiferous tubules or by the mucosa of the accessory glands during inflammatory processes seems tenable.^{49,50} This is supported by the fact that penetration of sperm cells into the epididymal mucosa and of involuted germinal cells into the Sertoli cell cytoplasm, occurs in normal conditions. Consequently, a process of local autosensitization with subsequent formation of circulating and/or cell-bound types of antibody and even passage into the seminal plasma should be accepted.⁵⁰⁻⁵² In this connection, it was recently reported that circulating antisperm antibodies are present in men who had episodes of orchitis or in some cases suffered from different kinds of inflammatory disease of the genital tract.^{53,54} Using as antigen sonicated motile seminal spermatozoa from normal donors, and applying the complement fixing, agar diffusion, antiglobulin consumption and skin tests, we have recently found circulating and cell-bound antibodies in some patients suffering mumps orchitis, whereas negative results appeared in fertile men, children and a variety of primitive and secondary endocrine diseases of the testis, without undeveloped or atrophied germinal epithelium.

It is evident that our knowledge of the immunological phenomena of the genital tract in the human being is at present less advanced than in animals. Apart from clinical observations and the demonstrated antigenicity of human testis in homologous or autologous sensitization, nothing is known about isolation and characterization of purified antigens and the pathological significance and specificity of such diverse antispermatic antibodies, like those inducing agglutinating, immobilizing, cytolytic and fluorescent reactions *in vitro* and their bearing on alterations present in the germinal epithelium and accessory glands.

SUMMARY

From animal experiments and clinical findings in the field of immunological factors and male reproductive processes it may be deduced that:

(1) Homologous and heterologous normal sera may have a cytotoxic action upon spermatozoa *in vitro*, but the factor responsible does not appear to be a typical antibody.

Table I. Comparison between immuno-serological tests in sensitized and in unsensitized groups of patients

Patient group	Patient	Age (yr.)	Antigenic stimuli†	Type of sensitization	Immunological tests††				Skin test	Immobilizing effect	Immuno-fluorescent test	Testicular lesions
					PCA	CFT	GDT	AGCT				
I. Completely sensitized	** 1	59	TH + CA	Autolog.	+++	$\frac{1}{64}$	+	+++	+	$\frac{1}{64}$	Pos.	Pos.
	** 2	62	TH + CA	Homol.	+++	$\frac{1}{32}$	+	+++	+	$\frac{1}{16}$	Pos.	Pos.
	* 3	61	TH + CA	Autolog.	++	$\frac{1}{32}$	+	++	±	$\frac{1}{16}$	Pos.	Pos.
	* 4	60	TH + CA	Homol.	+	$\frac{1}{16}$	+	+	Neg.	$\frac{1}{16}$	Neg.	Pos.
	5	62	ASP + CA	Homol.	+	$\frac{1}{16}$	Neg.	Neg.	Neg.	$\frac{1}{8}$	Neg.	Neg.
	6	63	ASP + CA	Homol.	±	Neg.	Neg.	+	+	Neg.	Neg.	Neg.
	* 7	59	ASP + CA	Homol.	++	$\frac{1}{64}$	+	++	+	Neg.	Neg.	Neg.
	8	62	MUC + CA	Homol.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	9	64	MUC + CA	Homol.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	*10	65	MUC + CA	Homol.	±	$\frac{1}{16}$	Neg.	+	±	Neg.	Neg.	Neg.
II. Incompletely sensitized	11	58	CA		Neg.	Neg.	Neg.	Neg.	Neg.	$\frac{1}{8}$	Neg.	Neg.
	12	60	IA		+	Neg.	Neg.	Neg.	±	Neg.	Neg.	Neg.
	13	62	TH alone	Homol.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	14	62	TH + IA	Autolog.	±	Neg.	Neg.	Neg.	±	Neg.	Neg.	Neg.
	15	64	ASP + IA	Homol.	±	Neg.	Neg.	Neg.	±	Neg.	Neg.	Neg.
	16	62	MUC + IA	Homol.	Neg.	Neg.	Neg.	Neg.	Neg.	$\frac{1}{8}$	Neg.	Neg.
	17	64			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	18	63			+	Neg.	Neg.	Neg.	Neg.	$\frac{1}{8}$	Neg.	Neg.
III. Unsensitized	19	59			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	20	58			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	21	60	None		±	Neg.	Neg.	Neg.	±	Neg.	Neg.	Neg.
	22	61			+	Neg.	Neg.	Neg.	Neg.	$\frac{1}{8}$	Neg.	Neg.
	23	62			+	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	24	60			Neg.	Neg.	Neg.	Neg.	±	Neg.	Neg.	Neg.
	25	61			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
	26	63			Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

† Human testicular antigens: (1) TH: testicular homogenate; (2) ASP: ammonium sulphate-precipitated fraction from TH; (3) MUC: mucoprotein from testis provided by Dr. Katsh; (4) CA: complete Freund adjuvant; (5) IA: incomplete Freund adjuvant.

†† Immunological tests used: (a) PCA: passive anaphylactic, cutaneous; (b) CFT: complement fixing; (c) GDT: double agar diffusion method; (d) AGCT: antiglobulin consumption.

The number of asterisks against patient numbers indicate the intensity of the immunological and testicular response.

(2) Auto- or homologous and heterologous antispermatic antibodies reveal a much more potent and specific cytotoxic action on spermatozoa and spermatids which is correlated with positive complement fixing, precipitin and immunofluorescent reactions.

(3) Specificity of this action checked by the use of several testicular antigens, other organ and tissue antisera and absorption procedures, suggest that the immobilizing effect appears to be less characteristic of antitesticular antibodies as compared with the lysis of the acrosome and the immunofluorescent reaction of this structure.

(4) Antigens of the acrosome seem to induce more easy, circulating, lytic and immunofluorescent antibodies than other spermatozoal structures which predominantly stimulate the immobilizing antibody.

(5) A better correlation was also noted between circulating antispermatic antibodies, the lytic and fluorescent reactions, with the damage of germinal epithelium of testis of homologous sensitized animals than with the immobilizing effect.

(6) Electronmicroscopic studies showed that the lytic effect suggesting increased permeability of the sperm cells, mainly consists of swelling of the cytoplasm and acrosome, weak PAS staining of this structure, discontinuity of plasma membrane, numerous smooth bounded vesicles and loosening of cytoplasmic organelles and nuclear chromatin. This picture was very much like that observed in the germinal cells of testis of sensitized animals, widely admitted to be concerned with cell bound antibodies and delayed hypersensitivity.

(7) There are differences in the antigenic properties of maturing spermatozoa and seminal plasma-coated antigens, for antibodies against testicular antigens or seminal spermatozoa do not affect adnexal glands but may immobilize testicular or epididymal sperm cells, whereas antiseminal plasma and adnexal gland antibodies react only with this tissue and seminal spermatozoa but not with those from testis.

(8) Experimentally induced allergic orchitis in men as well acute or subacute inflammatory disease of the genital tract, appear more related to the presence of antispermatic antibodies of the immobilizing or agglutinating types. However, the possibility that these antibodies develop as a result of sperm absorption by the damaged testicular or adnexal gland epithelium, remains to be proved.

(9) Much more work is needed to justify the pathological significance of these antispermatic antibodies, as causally related with the impairment of spermatogenesis and/or fertilizing capacity of sperm cells in the male genital tract.

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64. IMMUNO-ASPERMATOGENESIS INDUCED IN RABBITS BY ANTIGENS OTHER THAN SPERMATOOA AND TESTIS

By B. A. Lobo, G. L. Santa-Rosa, H. C. de Oliveira, and A. T. R. Magalhães

*Department of Histology and Embryology, University of Brazil,
Rio de Janeiro*

We consider the immunological method as one of the most promising for inhibiting spermatogenesis. The inoculation of antigens from spermatozoa or from the testis causes testicular lesions provoking aspermatogenesis, without effect upon the endocrine functions of the testis.

Several authors, Katsh and Katsh,¹ Voisin and others² have produced lesions in the guinea pig's testis by inoculation of homologous spermatozoa or testis homogenates associated with Freund's complete adjuvant.³ Repetition of this experiment in rabbits has given contradictory results. Katsh⁴ was unable to produce such lesions in these animals using homologous spermatozoa or testis homogenates. Nevertheless, in our laboratory, Lacombe and Teixeira⁵ observed testicular lesions by inoculating rabbits with antigens from homogenates of guinea pig's testis or spermatozoa, in either case associated with incomplete Freund's adjuvant. These observations seem to us important since Katsh and Bishop,⁶ and Brown and others,⁷ asserted that only the complete Freund adjuvant associated with efficient antigens induces aspermatogenesis in guinea pigs.

The Ouchterlony and immunofluorescence techniques were unable to reveal identity among the existent antigens of the guinea pig testis and those found in the rabbit testis. Therefore we had difficulties in interpreting the pathogenesis of the lesions and had to resort to the method of trying to induce similar lesions using other antigens.

Knowing that Delaunay and Voisin⁸ had induced testis lesions in guinea pigs and rabbits in a few hours by inoculating high doses of diphtheria toxin, we decided to study the testis from rabbits submitted to treatment with various antigens.

MATERIAL AND METHODS

Preparation of antigens

Washed spermatozoa. Fragments of guinea pig epididymis and vas deferens were first washed in saline solution to suspend the spermatozoa; then the saline solution was passed through wide-meshed gauze folded four times, to retain the tissue fragments. The filtrate containing the spermatozoa was centrifuged and resuspended in saline solution several times and finally homogenized, resulting in the guinea pig spermatozoal homogenate.

Testes. After removal of the T. albuginea and larger blood vessels, guinea pig testes were homogenized, forming the guinea pig testis homogenate.

Seminal vesicle. After incising the seminal vesicle from guinea pigs the gelatinous contents were removed and homogenized in a small amount of saline solution.

Kidney and liver. Guinea pig kidney and mouse liver were obtained from the animals following the same procedure used for the prostate glands.

Rat brain. This was removed carefully; the larger blood vessels and membranes were eliminated and then it was homogenized, and diluted in saline solution.

Human globulin. Human serum globulins were precipitated by addition of an equal volume of saturated ammonium sulphate solution, centrifuged and resuspended in a solution half

saturated with ammonium sulphate; the result was again centrifuged, dissolved in a small amount of water and dialyzed by constant stirring at a low temperature against a saline phosphate solution, pH 7·2.

Human seminal plasma. Human seminal plasma was removed by centrifugation of ejaculated semen.

Schedule of immunization

Mature male rabbits were used in this experiment. The antigen was administered, mixed with either Freund's complete adjuvant (Difco No. 0638) or incomplete adjuvant (Difco No. 0639), in doses varying from 1·0 ml. to 2·0 ml. The antigen was injected subcutaneously in the interscapular region of rabbits. Three doses were given weekly, in series except to rabbits No. 12 and No. 16 (see Table I).

The animals were killed at different times after immunization. The testis, epididymis and other organs were removed and fixed in 10% formalin for histological examination, specially testis and epididymis.

Table I. Schedule of inoculation

<i>Rabbits</i>	<i>Antigens</i>	<i>No. doses</i>	<i>Vol. of inj. (ml.)</i>	<i>Freund's adjuvant</i>
3	G.p. spermatozoa	5	6·3	Incomplete
14	G.p. spermatozoa	9	18·0	Incomplete
4	G.p. testis	6	10·0	Incomplete
11	G.p. testis	6	11·6	Incomplete
6	Human sem. plasma	15	6·3	Incomplete
7	G.p. sem. vesicle	9	12·8	Incomplete
12	G.p. ventr. prostate gland	1	1·0	Incomplete
28	G.p. dors. prostate gland	3	3·0	Incomplete
37	Rat brain	15	15·0	Complete
16	Human globulin	2	2·0	Complete
18	Mouse liver	12	12·0	Complete
23	G.p. kidney	11	8·5	Complete

Note: G.p. = Guinea pig.

RESULTS

The histological examination of slides stained by H. and E. obtained from testis of inoculated animals shows the following results, summarized in Table II: and Figs 1-13:

Table II. Testicular lesions

<i>Rabbits</i>	<i>Killed after 1st. inj. (days)</i>	<i>Histological study</i>
3	16	Diffuse lesion. Congestion. Vacuolized Sertoli cells.
14	63	Diffuse lesion. Fibrosis of tubular wall. Congestion.
4	19	Diffuse lesion. Fibrosis of tubular wall. Vacuolized Sertoli cells.
11	31	Diffuse lesion. Fibrosis of tubular wall. Vacuolized Sertoli cells.
6	912	Focal lesion. Inflammatory cell infiltration. Congestion.
7	730	Diffuse lesion. Fibrosis of tubular wall. Intense congestion.
12	3	Diffuse lesion. Fibrosis.
28	5	Focal lesion. Vacuolized Sertoli cells. Inflammatory cell infiltration. Congestion.
37	365	Focal lesion. Inflammatory cell infiltration. Congestion.
16	912	Diffuse lesion. Congestion.
18	730	Focal lesion. Vacuolized Sertoli cells. Congestion.
23	912	Focal lesion. Fibrosis of tubular wall.

Rabbit 3 (inoculated with guinea pig spermatozoa). Presents a diffuse lesion of aspermatogenesis. Sertoli cell cytoplasm shows vacuoles. Binucleated cells in the lumen of the seminiferous tubules show a compact and acidophilic cytoplasm. Marked vascular congestion is observed.

Rabbit 14 (inoculated with guinea pig spermatozoa). A diffuse lesion with vacuoles in the Sertoli cells, tubular wall fibrosis and congestion, absence of multinucleated cells.

Rabbit 4 (inoculated with homogenate of guinea pig's testis). Diffuse lesion with Sertoli cell cytoplasm presenting vacuoles. Fibrosis of the tubular wall and binucleated cells in the tubular lumen are usually found.

Rabbit 11 (inoculated with guinea pig's testis homogenate). Differs from the previous ones, due to the scarcity of multinucleated cells.

Rabbit 6 (inoculated with human seminal plasma). Presents focal lesions (5%) of aspermatogenesis with a triangular basis towards the T. albuginea. In these areas the tubules are atrophic, covered only by Sertoli cells, with intense fibrosis of the tubular wall. The interstitial tissue in the above-mentioned areas shows intense lympho-plasmocytic infiltration and vascular congestion.

Rabbit 7 (inoculated with guinea pig's seminal vesicle). Presents diffuse lesions of aspermatogenesis with moderate tubular wall fibrosis and intense congestion. The Sertoli cell cytoplasm shows vacuoles but multinucleated cells are scarce.

Rabbit 12 (inoculated with homogenate of guinea pig's ventral prostate). Similar to the previous one.

Rabbit 28 (inoculated with homogenates of guinea pig's dorsal prostate). Presents focal lesion (30%) of triangular shape, showing a high amount of vacuoles in the Sertoli cells and in the stroma, congestion and intense lympho-plasmocytic infiltration, multinucleated cells.

Rabbit 37 (inoculated with rat brain homogenate). Shows focal lesions with congestion and lympho-plasmocytic infiltrations. Sertoli cell cytoplasm with vacuoles, intense congestion and plasmocytic infiltration of the peri-tubular connective tissue.

Rabbit 16 (inoculated with human globulin serum). Shows diffuse lesions with aspermatogenesis with slight vascular congestion. Many multinucleated cells are present.

Rabbit 18 (inoculated with mouse liver homogenate). Shows limited areas of aspermatogenesis with Sertoli cell cytoplasm with vacuoles and vascular congestion as well as a large number of multinucleated cells.

Rabbit 23 (inoculated with guinea pig kidney homogenate). Focal lesions (5%) with pronounced fibrosis of the tubular wall, Sertoli cell cytoplasm with vacuoles, and absence of multinucleated cells.

In cases of focal lesions spermatozoa were always found in the lumen of the epididymis or in the ductus deferens, whereas in cases of diffuse lesions, they do not appear.

Histological examination of the testis of rabbit 14 which had been submitted to unilateral orchidectomy before the first inoculation revealed normal spermatogenesis.

We used as a control testis from normal animals of the same ages as the experimental ones, either untreated or injected only with incomplete Freund's adjuvant, born and reared in the same cage.

DISCUSSION

Since we have only experimented with a small number of animals we do not possess valuable statistical data at present, but we were able to achieve a better understanding of the pathogenesis of aspermatogenesis.

To induce aspermatogenesis in rabbits there is no need to use the complete Freund adjuvant. The appropriate antigens associated with the incomplete Freund adjuvant are able to cause lesions as severe as those formed in the guinea pig treated by testis antigens associated with Freund's complete adjuvant. Under such conditions, we should take into consideration the necessity of interaction between the antigens and micro-bacteria.⁹ If such is the case it applies only to the guinea pig and it cannot be assumed to occur also in the rabbit.

The inoculation of an adjuvant not associated with efficient antigens is unable to cause lesions in rabbits as well as in guinea pigs.

In the list of antigens used in this experiment, the criteria established allowed us to observe

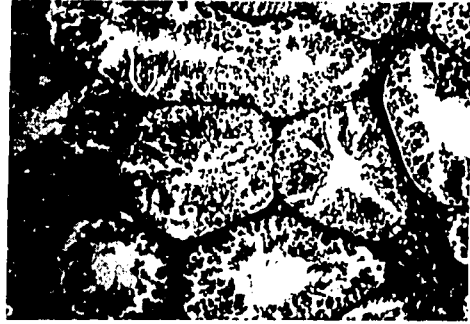


Fig. 1. Rabbit 14: Section from testis obtained after immunization. Notice the diffuse aspermatogenic lesion and compare with normal testis from the same animal. $\times 100$.

Fig. 2. Rabbit 14: Section from normal testis obtained prior to immunization. $\times 100$.



Fig. 3. Rabbit 4: Diffuse tubular lesion with fibrosis of tubular wall. $\times 100$.

Fig. 4. Rabbit 11: Diffuse tubular lesion and interstitial fibrosis. $\times 100$.

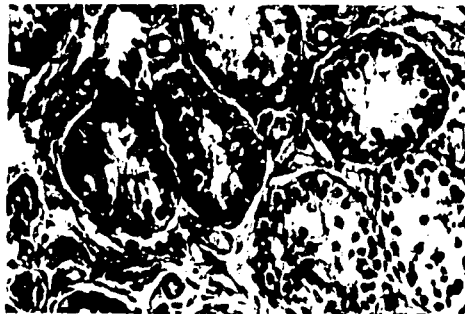


Fig. 5. Rabbit 11: Atrophic tubules with Sertoli cell vacuolization and absence of spermatozoa. $\times 100$.

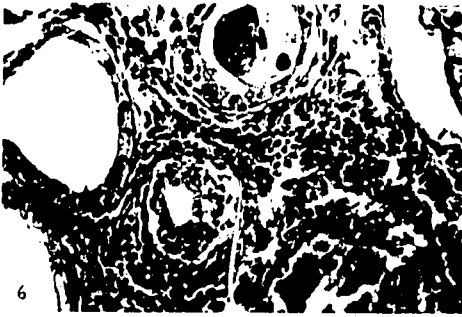


Fig. 6. Rabbit 6: Atrophic tubule occluded by giant cells and heads of spermatozoa. Notice the heavy cellular infiltration of the intertubular connective tissue. $\times 250$.

Fig. 7. Rabbit 6: As for Fig. 6, $\times 450$.



Fig. 8. Rabbit 7: Marked interstitial cell hyperplasia and diffuse tubular atrophic lesions with Sertoli cell vacuolization. $\times 35$.

Fig. 9. Rabbit 28: Section showing a triangular band of fibrosis between normal and aspermatogenic tissue. Notice in the latter the interstitial inflammatory cell infiltration. $\times 100$.



Fig. 10. Rabbit 28: Focal lesion showing inflammatory infiltration, fibrosis and atrophic seminiferous tubules. $\times 100$.

Fig. 11. Rabbit 28: Focal lesion with interstitial infiltration and several multinucleated and hyperchromatic cells. $\times 100$.

that there is no easily demonstrable evidence of a relationship between the nature of the antigens and their efficacy. Antigens constituted by protein secretions with a scarce content of cells, such as that of the seminal vesicle of the guinea pig, were able to produce aspermatogenic lesions. Therefore the hypothesis of the importance of the cellular matter mainly from the nucleus in inducing lesions, was abandoned.

Severe and diffuse lesions were provoked by inoculating human globulins, thus proving that nucleic acids are not responsible for these lesions and that antigens from other organs and not only from the genital apparatus can cause such lesions.

Several authors, among them Lewis,¹⁰ have demonstrated that certain antigens, such as those of rat brain and guinea pig kidney, were similar to those found in the testis, and, while from an immunological point of view, unspecific or having relative organ-specificity, were nevertheless able to produce focal lesions.

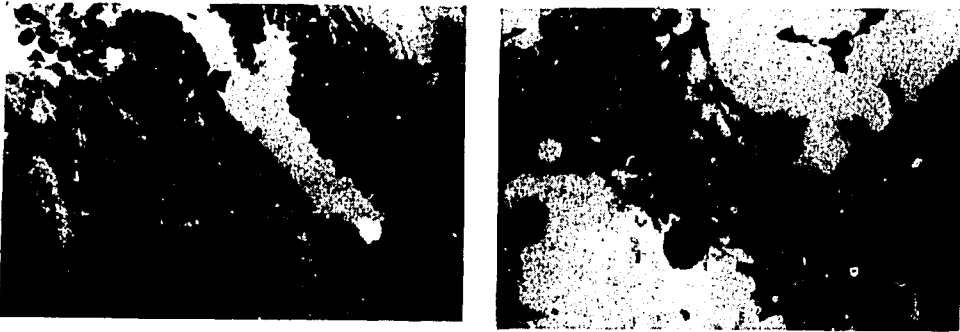


Fig. 12. Rabbit 37: Heavy plasmocytic perivascular infiltration of peritesticular connective tissue. $\times 450$.

Fig. 13. Rabbit 16: Rarification of germinal epithelium and giant cells in tubular wall. $\times 450$.

The diffuse lesions of aspermatogenesis were observed in the testis of rabbits inoculated with homogenates of washed guinea pig spermatozoa, guinea pig testis and seminal vesicle and human globulins. Histologically, the rabbit's testis is similar to that of the guinea pig (cf. Katsh and Katsh¹ and Brown *et al.*⁷). In atrophic tubular lesions we were able to detect multinucleated cells which Brown *et al.*⁷ consider of doubtful origin, and no inflammatory infiltration in the interstitial tissue was seen.

The extraordinary similarity of the procedure in all cases suggests strongly the same pathology for the process. A future task would be to prove whether the antibodies produced against those various antigens are able to cause direct lesions on the testis of rabbits or whether in any phase of the immunological reaction any toxin against the testis was released.

In rabbits inoculated with homogenates of human seminal plasma, rat brain, mouse liver, guinea pig kidney and dorsal prostate gland we could observe that, besides the many well preserved tubules, there were others located in circumscribed areas showing severe aspermatogenic lesions, corroborating the description given by Brown *et al.*⁷ in their study of the early lesions produced in the guinea pig. These areas show a triangular form in histological sections with the base turned towards the T. albuginea, suggesting a lesion in one of the testis lobes, possibly as a result of a vascular disturbance. Nevertheless, we were unable to determine the morphological substratum of these lesions because the only vascular trouble frequently observed in the above-mentioned areas was intense congestion.

The dense lympho-plasmocytic infiltration suggests that congestion may be due partially to an immunological element.

Brown *et al.*⁷ believe that these lesions are the beginning of an auto-immunity disease, but occurrence of these lesions between 5 and 12 days after the first inoculation, would be due to the low efficiency of antigens if such an assumption is accepted.

The general comparison of our results, working on rabbits, with those obtained in experiments with guinea pigs does not suggest that the complete Freund adjuvant is more efficient in producing testis lesions in the rabbit. Comparing with the research of Katsh⁴ we even draw

the conclusion that the incomplete Freund adjuvant is more efficient than the complete one in the rabbit.

Therefore, it seems necessary to carry out a systematic study of antigens and their possible connection with the production of aspermatogenesis in order to understand, at least as an hypothesis, the existent relations between aspermatogenesis and auto-immunity.

SUMMARY

The immunological method is considered one of the most promising in the experimental production of aspermatogenesis.

The need to resort to the complete Freund adjuvant, the lack of complete knowledge regarding the pathology of the lesions and the need for homologous testicular antigens are the main obstacles to a widespread use of the above-mentioned method.

The authors studied the lesions produced in 12 rabbits by repeated injections of various antigens associated with an incomplete Freund adjuvant, which, according to the work of Katsh¹¹ were not able to induce aspermatogenesis when associated with spermatozoa and testicular homogenate.

The antigens used were: spermatozoa, testis, seminal vesicle, ventral and dorsal prostate gland, and kidney of guinea pig, human seminal plasma, rat brain, human globulin and mouse liver.

In some cases unilateral orchidectomy was carried out prior to immunization in order to permit examination of the testicle before and after inoculation. We could observe the following:

(1) The incomplete adjuvant is efficient when associated with the appropriate antigens to aspermatogenesis in rabbits.

(2) The incomplete adjuvant, by itself, is not responsible for aspermatogenesis.

(3) The antigens effective in the induction of aspermatogenesis are dissimilar as regards their composition in nucleic acid, polysaccharide and lipids.

(4) The diffuse lesions of aspermatogenesis were observed in the testes of rabbits inoculated with homogenates of spermatozoa, testis, guinea pig ventral prostate gland and seminal vesicle of guinea pig and human globulin.

The seminiferous tubules, examined by light microscopy, are lined with a single layer of Sertoli cells. These have cytoplasm abundantly vacuolated and reveal no characteristic detail of the apical cytoplasm. Spermatids and spermatozoa are absent.

Even the young cells of the spermatogenetic cycle were rare and, in some cases, the presence of multinucleated cells in the tubules was noted.

The interstitial tissue showed hyperplasia, at least relative, but no sign of inflammatory infiltration or vascular lesions.

Sections of the epididymis and vas deferens showed no spermatozoa.

(5) Focal testicular lesions, consisting of triangular areas with the base towards the T. albuginea, and characterized by tubular atrophy and interstitial inflammatory infiltration, were observed with homogenates of: human seminal plasma, rat brain, mouse liver, kidney and dorsal prostate gland of guinea pig. However, it was not possible to determine whether they represent the initial phase of the process, as assumed by Brown *et al.*,⁷ since we have observed them in animals over periods which varied from 5 to 912 days.

(6) The experimental observations do not suggest that the complete Freund adjuvant is more efficient for this purpose than the incomplete adjuvant in producing testicular lesions in rabbits.

This being so, the systematic study of such antigens and of the part they play in the production of aspermatogenesis is necessary in order to understand the connections, believed to exist, between aspermatogenesis and auto-immunity reactions.

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Session 13

OVUM TRANSPORT AND FERTILIZATION

65. TUBAL OVULAR RELATIONSHIPS

L. Mastroianni, Jr.

*Department of Obstetrics and Gynecology,
School of Medicine,
University of Pennsylvania, USA*

Several of the important events which culminate in a normally implanted pregnancy occur at the level of the Fallopian tube. These include successful transfer of the ovum from the ovarian follicle into the tubal lumen, fertilization, precedent capacitation of spermatozoa, cleavage of the fertilized tubal ovum through many cell divisions and finally delivery of the fertilized cleaved ovum into the uterus at a timed interval following fertilization. Thus, the function of the tube may be broadly divided into two categories: tubal transport of gametes, and provision of a suitable environment for the gametes and for the fertilized ovum during early development. We propose to review some work which was designed to explore the relationship between the recently ovulated ovum and its tubal environment.

Any influence of the tubal environment on the recently ovulated ovum is mediated via the fluid within the tubal lumen. In 1956 it was clearly demonstrated by Bishop that the rabbit Fallopian tube is a secretory organ.¹ The tube produces an active secretion, the quantity of which varied with the endocrinologic status of the animal. In the rabbit, when a ligature is placed at the fimbriated end of the Fallopian tube and ovulation is induced, within a matter of hours, a collection of clear fluid accumulated within the tubal lumen. With time, the fluid actually causes distension of the tube. The fluid is contained as a result of a physiologic closure at the isthmus which occurs after ovulation. In order to explore the quality of the environment provided by the rabbit Fallopian tube, means for continuous collection of tubal fluid have been developed. In the initial set of experiments the tube was ligated at the utero-tubal junction.² A cannula was fixed in place with a single suture just beyond the tubal ostium and passed through the lateral abdominal wall into an externally placed collecting chamber. The chamber was calibrated to allow measurement of the quantity of tubal fluid and was equipped with a rubber adapter which permitted removal of accumulated tubal fluid at will. The chamber was fastened to the external abdominal wall. This system allowed collection of tubal fluid continuously over many days. Initially attention was directed at the rate of fluid accumulation. The rate varied with the endocrinologic status of the animal.³ It decreased following ovariectomy and it could be brought to precastration levels by administration of exogenous oestrogen. In the oestrogen primed animal, administration of progesterone resulted in a decreased rate. In early pregnancy a decrease in the rate of accumulation of tubal fluid was noted.⁴ During the first three days of pregnancy the rate diminished to approximately 50% of the oestrous rate. In these experiments efforts were made to survey the contents of tubal fluid. After a period of time the fluid became contaminated as it accumulated in the collecting chamber. The system was therefore modified and the externally placed chamber was equipped with a small refrigeration unit to permit collection of tubal fluid at about 1-2 C.⁵ Earlier observations on the electrolyte content of tubal fluid were confirmed. In the three-day postovulatory period sodium concentration is significantly depressed and the potassium and chloride levels remain unchanged. Calcium concentration is increased. Glucose, lactate and pyruvate levels are significantly increased during the three-day interval following ovulation.

Now let us consider the influence of tubal environment on the ovum. Recently ovulated ova recovered from the rabbit Fallopian tubes are surrounded by a mass of cells, the cumulus oöphorus. When such ova are exposed to hyaluronidase, spermatozoa, or to the supernatant from washed diluted semen, the peripheral layers of cells are dispersed, leaving the corona

radiata, a densely packed layer immediately adjacent to the zona pellucida.⁶ Swyer, who did these experiments in England, found that continued exposure *in vitro* does not result in dispersion of the corona radiata cells. Yet when pretreated ova are replaced into the oviduct, denudation occurs within two hours.

In our laboratories the influence of tubal fluid on the relationship between the corona radiata cells and the zona pellucida has been evaluated.⁷ Ova, pretreated with hyaluronidase, were placed in groups of two or three in the centre well of a Warburg flask containing 0.05 ml. of freshly harvested tubal fluid and shaken aerobically for two hours. In the presence of tubal fluid the corona cells were loosened or removed. When a measured amount of fine sand was added as an abrasive, denudation almost always occurred. Similarly treated ova in Krebs-Ringer solution or in Gey's solution remained unchanged. Rabbit serum or Ringer's solution containing hyaluronidase failed to bring about denudation. Tubal fluid consistently caused dispersion of the corona. The effect was observed after the tubal fluid had been heated or, in fact, boiled. It was also observed when the fluid was freeze-dried and reconstituted with distilled water. The denudation occurred in fluid which had been dialyzed against saline. It was clear then that tubal fluid contained a factor which was heat stable, lyophilizable, and dialyzable which could alter the relationship between corona cells and the zona pellucida of recently ovulated rabbit ova. The morphological basis for this effect was investigated with the electron microscope.⁸ After 30 minutes exposure to tubal fluid there is retraction of the pseudopodia which normally extend into the zona from the corona cells. At two hours the pseudopodia disappear. In control ova, incubated in Ringer's solution, the relationship between the zona and the corona cells remains unchanged. The importance of these changes in the fertilization process remains to be explored. Recent attempts at *in vitro* fertilization using tubal fluid have yielded a 63.7% success rate.⁹ It is evident therefore that tubal fluid provides an excellent environment for the fertilization process.

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66. BIOLOGICAL ASPECTS OF TUBAL OVUM TRANSPORT

R. Delgado-García

*Anatomy Department,
Faculty of Medicine, University of Vall^o, Cali, Colombia*

This paper deals with certain biological aspects of the problem of egg migration which are useful as a frame of reference to the study of the Fallopian tube.

The mammalian oviducts are highly specialized organs which, besides playing an important role in egg migration, aid in the development of the gametes. However, detailed knowledge of the nature of this function is still rather rudimentary. On the other hand, the different functions of the oviduct are to a certain extent intimately related, as will be emphasized in the following summary of the existing basic research.

EGG MIGRATION TOWARDS THE INFUNDIBULUM

Precise details of how the secondary oocyte moves from the site of rupture of the ovarian follicle to the infundibulum, are poorly understood. It is known that considerable variation exists among species regarding the proximity of the fimbriated end of the oviduct to the ovary. In the rat and mouse, for example, the ovaries are covered by a thin, membranous periovarial sac. The infundibulum is a part of the sac, but occupies only a small area of the periovarial space. In animals in which fluids accumulate in the periovarial sac at the time of ovulation, the oocyte is directed to the ostium by the action of these fluids passing through the oviduct.¹

Unfortunately there are very few studies on the movement of fluids in this zone. Vital dyes and particles placed in the periovarial sac, in the vicinity of the ostium, are soon detected into the first loop of the oviduct, implying a migration movement.² The ciliary activity of the fimbriated end of the ostium is the primary reason for the transport.³

We must not forget that the ovary moves within the periovarial sac and that such movement, being accentuated at the time of ovulation, is effected by the rich smooth muscle in the mesovarium. This movement keeps the fluids of the periovarial sac in motion.

In the human, as in the monkey, there is full communication between the ostium of the oviduct and the peritoneal cavity, communication which naturally varies according to the stage of the menstrual cycle.⁴

It is now possible to observe the activity of the human fimbriae by means of abdominal peritoneoscopy or exploratory culdotomy. Nevertheless, it has not been possible to decide if during the rupture of the follicle the elongated fimbria grasps the lower pole of the ovary,⁵ or if the oocyte is siphoned into the ampulla by peristaltic contractions of the fimbriae,⁶ or if the ovulated eggs are drawn into the tube by the fluids.⁷

The idea prevails today that the muscular activity of the fimbriae is more important than the cilia in the transport of eggs from the ovary to the oviduct. *Fig. 1* shows the complicated foldings of the mucous membrane in a cross section of Fallopian tube near the fimbriated extremity. The muscle coat is here rather thin.

MIGRATION THROUGH THE AMPULLA

In the rat, mouse and hamster, the ampullary dilatation during the heat period is very evident.⁸ In the rat, a contraction in the distal end of the dilated loop of the ampulla is frequently visible and this acts as a valve-like constriction, holding back the eggs and fluids for 18 to 20 hours. The hormonal or nervous mechanisms of this contraction are still unknown, as are the details of how the spermatozoa cope with this stenosis and reach the ampulla.

The fertilized eggs of the mouse and rat remain for 20 to 30 hours in the dilated ampulla before passing to the isthmus. The movement of the eggs across the ampulla seems to take place as much by peristaltic as by ciliary activity. In the second loop of the oviduct the ciliary action is powerful enough to rotate a whole cluster of eggs, and the peristaltic waves are vigorous and localized, moving the egg towards the entrance of the isthmus.⁹

MIGRATION THROUGH THE ISTHMUS AND INTRAMURAL REGION

The passage of the egg across the isthmus and the intramural region seems to proceed at a constant rate in various animals, although the exact role played by the cilia or the muscle in the transport has not been fully established. In the rabbit oviduct it is suggested that when the ova reach the isthmus, they are retained until sufficient fluid surges down the tube to sweep them through the tubo-uterine region.¹⁰

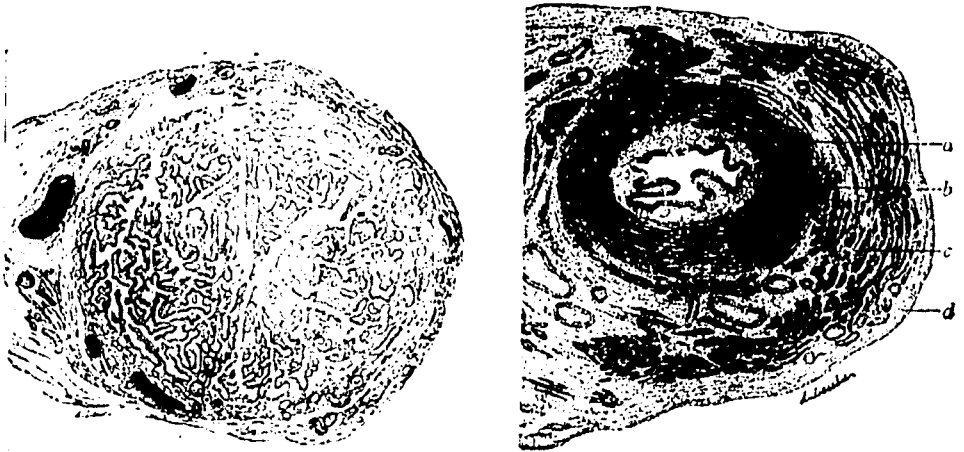


Fig. 1. Cross section of human Fallopian tube near the fimbriated extr. my (Orthman)^{10a}.

Fig. 2. Cross section of human Fallopian tube at the level of the isthmus. (a) Mucous membrane; (b) circular muscle coat; (c) longitudinal muscle coat; (d) connective tissue of serous coat (Orthman)^{10a}.

In the human, the circular and longitudinal muscle coats are rather thick at the isthmus, suggesting a leading role in the passage of the egg. This is clearly illustrated in Fig. 2.

EFFECTS OF HORMONES ON TUBAL MUSCULATURE

The normal functional state of the oviduct will be dependent on a delicate balance between oestrogen and progesterone. In the mated mouse and rabbit, injections of oestrogen result in tube locking of the ova for as long as 7 days after coitus, at which time the eggs degenerate.¹¹ The injection of progesterone,² and the induction of superovulation,¹² accelerate egg transport. The last fact must be emphasized since many investigators use with great frequency superovulated animals for studies of "normal aspects of physiology of reproduction". For instance, Mastroianni¹³ used superovulated monkeys in his well-planned experiments dealing with the possible mechanism of action of IUD's.

We can state that in general oestrogen acts preventing exit into the uterus and progesterone hastens the passage of ova into the uterus.¹¹ Indeed, the major regulatory influence on the tubal transport of eggs appear to be ovarian hormone. In the follicular phase of the cycle, or on oestrogen administration, tubular contractions tend to be of large amplitude and relatively infrequent; ciliary movements tend to speed up and the tubal fluid is produced in increased amount. In contrast, during the luteal phase of the cycle or on progesterone administration, the contractions are of much less amplitude and more frequent, peristalsis is less violent, ciliary movement is lessened and fluid secretion reduced.

Moderate doses of oestrogen during the post fertilization days, produce¹³: (a) A retention of

the ova in the Fallopian tubes (tube locking), long past the time they would normally enter the uterus, and (b) an eventual degeneration of the cleaving ova. In contrast, massive doses of oestrogen administered to rats and mice accelerated the passage of ova through the Fallopian tubes and uterus, with consequent sterility.¹⁶ These sterilizing effects of oestrogen administration have been observed with the use of both synthetic and natural oestrogens.¹⁷ In the mouse, testosterone administration also causes tube locking and sterility,¹⁸ probably by an effect on the musculature of the tubo-uterine junction. In the rat, progesterone administration accelerates the passage of tubal ova.¹⁹

Oestradiol cyclopentylpropionate given to rabbits at low doses accelerates the tubal passage of ova, and at high doses causes retention.²⁰ Norethynodrel will induce the expulsion of tubal ova in the rabbit, but it may also produce tubal retention of some ova.²¹ Clomiphene,

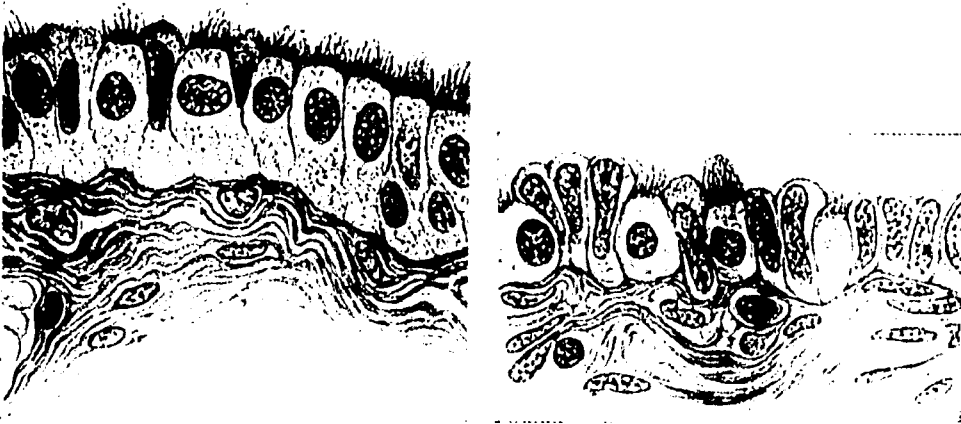


Fig. 3. Section of human Fallopian tube removed at the middle of the menstrual cycle, showing the characteristic type of epithelium present at that stage $\times 1,500$.

Fig. 4. Section of the Fallopian tube of a woman 2.5 months pregnant, showing the type of epithelium characteristic of pregnancy and of the progravid stage of the menstrual cycle $\times 1,500$.

an anti-oestrogen, accelerates ovum passage in rabbits and rats.²² In the rabbit, the administration of medroxyprogesterone acetate, three days before ovulation, produces effects similar to those of oestrogens given after ovulation: a rapid passage of the ova through the tube and the degeneration of the developing ova. This subject has been well reviewed by Austin.²³

HORMONAL EFFECTS ON THE SECRETORY ACTIVITY OF THE TUBES

Mastroianni and his colleagues have developed a technique for the quantitation of tubal secretion in rabbit and rat.²⁴ Castration produces a marked decrease in tubal fluid secretion which could be restored by oestrogen administration. MER-25 significantly decreases tubal secretion in both intact rabbits and oestrogen primed castrates²⁵; this low secretion could be responsible for the degeneration of tubal ova that occurs following its oral administration.²⁶

In woman, the epithelium lining the Fallopian tube is a simple columnar type, some cells of which are ciliated, whereas others are narrow, peg-shaped and non-ciliated. The height of the epithelium and the proportion of ciliated to non-ciliated cells, although varying considerably, show changes that are correlated with the stages of the menstrual cycle (*Fig. 3*). The epithelium is taller during the first phase of the cycle (follicular phase) than it is in the second half, which is under the influence of the corpus luteum. The number of non-ciliated peg-shaped cells, also increases in the secretory phase. During pregnancy, the epithelium is quite low and there is an increased number of peg-cells (*Fig. 4*).

The epithelium secretes mucus and probably other substances which are necessary for the maintenance of the ovum during its journey down the tube.

On electron microscopical study, the secretory type of cell shows a centrally located nucleus

and a cytoplasm filled with great numbers of secretory granules (Fig. 5). Fine microvilli project into the lumen. Fair numbers of mitochondria and lysosomes occur in the cytoplasm, which is occupied by a rough surfaced endoplasmic reticulum. A thin basement membrane separates the epithelium from the lamina propria; the latter is very rich in capillaries. Looking at this micrograph, we understand better the dynamic activity of this cell. The true nature of its secretion is not entirely clear, but judging from the fine structure of the secretory granules, it is most likely a mucous secretion. At mid-oestrus (Fig. 6), the Golgi complex is fairly large and the apex of the cells are occupied by numerous secretory granules. The microvilli are abundant and quite slender.

Tubal secretions are probably utilized for egg and embryo maintenance, for sperm maintenance and successful fertilization, and for maintenance of the epithelium itself.²⁷

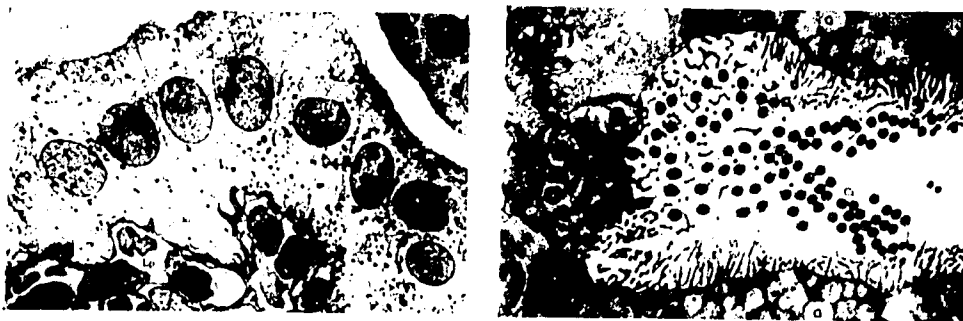


Fig. 5. Electron micrograph of Rat Fallopian tube (Rhodin *). Nu, nuclei; G, secretory granules; Lu, lumen; Bm, basement membrane; Lp, lamina propria; Ca, capillaries. Magnification $\times 2,200$.

Fig. 6. Electron micrograph of Rat Fallopian tube in mid-oestrus (Rhodin *). Ci, Cross sectioned cilia; Bc, basal corpuscles; Ro, rootlets; Go, Golgi Complex; G, secretory granules; Vi, microvilli. Magnification $\times 10,000$.

SUMMARY

The paper describes the different functions of the Fallopian tube by presenting some of the results of the existing basic research. It stresses the importance of considering simultaneously the migration aspects with the secretory activity of the oviduct. Egg migration towards the infundibulum and through the tube, as well as the effects of certain hormones on tubal musculature and on the secretory activity of the oviducts, are discussed.

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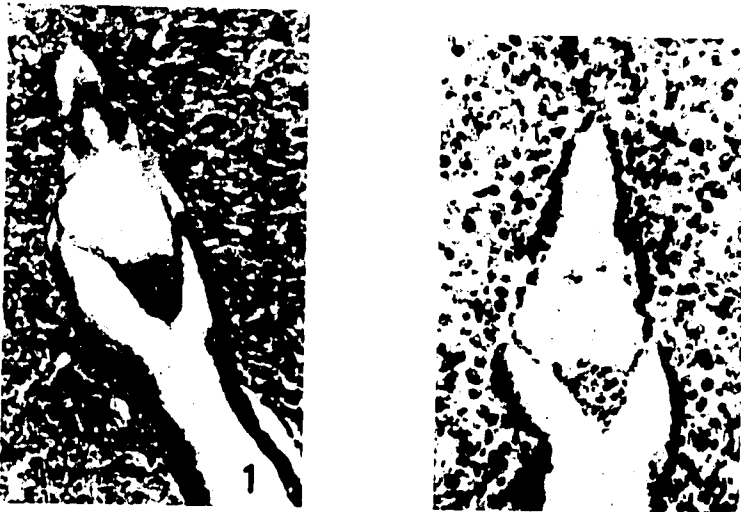
67. CYTOCHEMICAL OBSERVATIONS ON TUBAL OVA

L. Izquierdo

Faculty of Veterinary Medicine, University of Chile

Insufficient attention has been given to the development of mammals prior to implantation. This is partly due to technical difficulties in their culture and manipulation, although at present these are largely overcome¹⁻⁵ and partly to the assumption that developing mammalian ova are similar enough to corresponding stages in other vertebrates and marine invertebrates to permit a valid extrapolation of data. Mammalian ova are, however, not only interesting because they might play a central role in the control of fertility, but also as suitable material for the study of cell differentiation.⁶ Mouse ova, in particular, offer a good chance of analysing the genetics of development, since several genes are known to act on them (see ⁷).

This paper summarizes our recent cytochemical observations on normal mouse ova, made while investigating the effect of lethal genes. The observations are briefly compared with what is known from ova of Amphibia and marine invertebrates, and attention is drawn to several discrepancies that should not be disregarded.



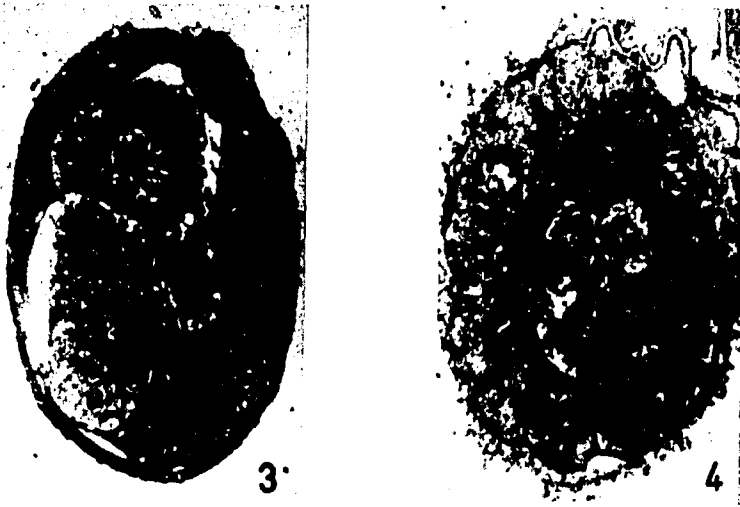
Figs. 1, 2. Mouse embryo 4½ days (d.). Fixation: Carnoy, 24 hr. Staining: Toluidine Blue 0·1%, pH 4·8, for 20 min. 1, control. 2, digested with ribonuclease, pH 6, for 4 hr. at 37°.

Using basic stains and enzymatic digestion with ribonuclease,⁸ we have studied the distribution of RNA in tubal ova and early implantation stages. In all ova, from the 1-cell stage to late blastocysts, whole mounts show an heterogeneous distribution of RNA; but they do not reveal an evident pattern of bilateral symmetry or polarity. In young implanted embryos, RNA is differentially distributed (Figs. 1, 2), but not in a spatial gradient (Izquierdo and Cerisola, unpublished observations).

The existence of a morphogenetic gradient in corresponding stages of Amphibia and echinoderms,⁹ has stimulated the search of an analogous situation in mammals (see ¹⁰). Our

negative results with one technique cannot be decisive, nor exclude the existence of a gradient which does not coincide with RNA distribution. Nonetheless, it seems to us that they question the reality and necessity of a cytoplasmic morphogenetic field in the oocytes and early developmental stages of mice. Such a field would be, in any case, labile, as is shown by the regulation potentialities of half embryos.^{11,12}

During the development of tubal ova, specially from the morula stage onwards, there is a remarkable increase in basophilia and in the rate of incorporation of RNA precursors.^{13,14} Mice ova incorporate in culture, tritiated nucleosides in RNA. A radioautographic study on thin sections, of pulse-chase experiments and enzymatic extractions, shows the following sequence of incorporation: nuclear non-nucleolar label, nuclear and nucleolar label, nuclear



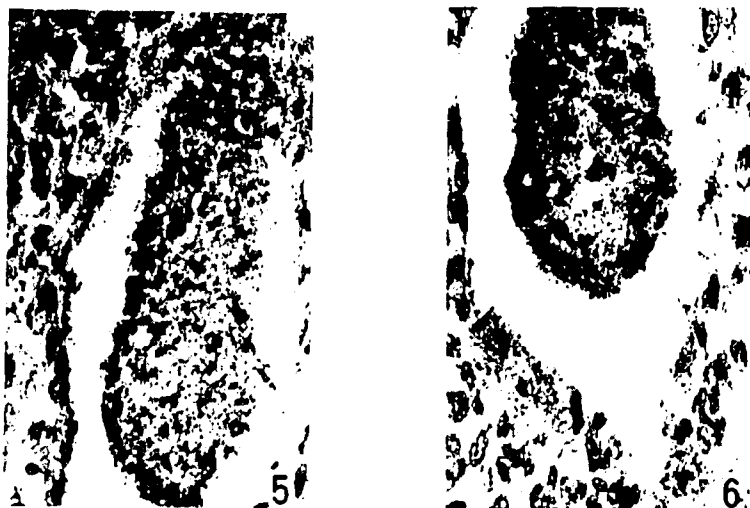
Figs. 3, 4. Mouse embryos 8- to 10-cell. Incubated with ^3H -uridine, $10\ \mu\text{c}/\text{ml}$. saline solution plus serum and dextrose, pH 7.2 at 37° , under mineral oil. 3, 1 hr. incubation. 4, 4 hr. incubation. Embedding in Methacrylate, $0.5\ \mu$ sections. Radioautography with Kodak NTB2 emulsion. Exposure: 10 d. Stain: Toluidine Blue in Borax.

and cytoplasmic label (Figs. 3, 4). The time of incubation required is shorter the more advanced the development; 6 hr. of incubation with ^3H -uridine produces nuclear non-nucleolar label in a 2-cell embryo, while 15 min. of incubation produces nuclear and cytoplasmic label in a blastocyst (Izquierdo and Roblero, unpublished observations).

We have tentatively interpreted this sequence in morulae, as synthesis of ribosomic RNA, and discussed the contrast with what is known from the eggs of Amphibia and marine invertebrates.¹⁴ The effect of actinomycin emphasizes this contrast: while it stops at low doses the development of mice ova,¹⁵ it does not affect echinoderms and Amphibia prior to blastulation.^{16,17} This does not mean that RNA is not synthesized in their cleaving ova, but rather, that the effect is only apparent later.¹⁸ Furthermore, the existence of lethal gene t^{12} , which in the homozygous condition stops the development of mouse morulae,¹⁹ proves how precociously mammalian development depends on gene action.

Mouse ova can be transferred to a foster mother, where they implant.²⁰ With this technique we obtained implantation of blastocysts previously incubated with ^3H -cytidine. The radioautographs neatly reveal the limit between embryonic and endometrial tissues (Figs. 5, 6), which has permitted us to confirm the embryonic origin of the giant cells (Izquierdo and Cerisola, unpublished observations).

Protein synthesis is active in tubal ova (Izquierdo and Roblero, unpublished observations). Labelled amino-acids are readily incorporated into mouse ova and at least one protein, alkaline phosphatase, appears or becomes active in this period (Mulnard²¹). Using Gomori's technique, we obtained in the mouse similar results to Mulnard's on the rat: the reaction appears suddenly in the central blastomeres of 12- to 16-cell embryos (Fig. 7); at the later



Figs. 5, 6. Mouse embryos, 5½ d. Blastocysts incubated 50 min. at 37°, with ^3H -cytidine (10 $\mu\text{C}/\text{ml}$.) and transplanted to foster mother. Paraffin embedding, NTB2 emulsion. Exposure: 4½ d.



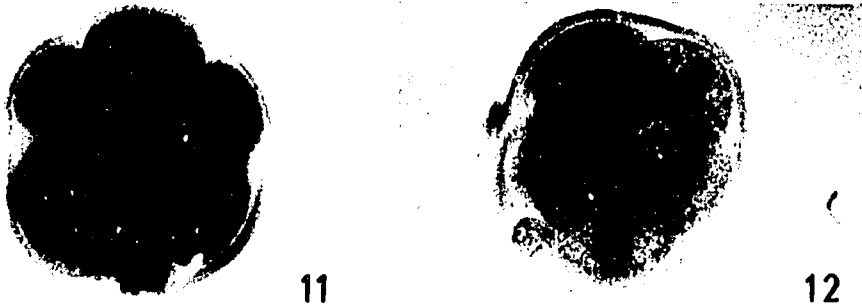
Figs. 7, 8. Gomori's method adapted by Mulnard for alkaline phosphatase, on morulae (Fig. 7) and blastocysts (Fig. 8). Whole mounts of mice ova. Fixation: alcohol 80%, cold, 1 hr. Incubation with Na β -glycerophosphate for 2 hr. at 37°, pH 9.3. Co reaction.



Figs. 9, 10. Mouse testis. Fixation: 24 hr. neutral formalin. Paraffin sections. Extraction with TCA at 90° C. for 15 min. and (in Fig. 10) acetylation for 2½ hr. Fast green FCF staining at pH 8.2 for 30 min.

blastocyst stage, the reaction is positive for the inner cell mass and negative for the trophoblast (Fig. 8). (Izquierdo and Ortiz, unpublished observations).

In view of the role of genic repressors attributed to them, we studied the basic proteins after extraction of nucleic acids, with or without acetylation before staining,²² on sections of testis, ovaries and on whole mounts of ova in different stages (Izquierdo and Marticorena, unpublished observations).



Figs. 11, 12. Whole mounts of mice morulae. Fixation: 2 hr. in neutral formalin. TCA extraction at 90° C. for ½ hr. and (in Fig. 12) acetylation for 3 hr. Fast green FCF staining, 1 hr. at pH 8-2.



Figs. 13, 14. Whole mounts of mouse blastocysts. Technique as above.
Fig. 14, acetylated preparation.

In the case of the testis (Figs. 9, 10), the acetylation reveals the arginine-rich histone of the sperm.²³ In the ovary, where an appreciable amount of basic protein bound to nucleic acids is present in the nucleus and cytoplasm, acetylation produces a generally paler staining, not showing a localized arginine-rich histone. Studies by Davenport and Davenport²⁴⁻²⁶ on the ovaries of several marine invertebrates, gave similar results, but only on small, growing oocytes.

Using 1- to 2-cell embryos, the distribution of basic proteins is similar to that of the oocytes, but from the 4-cell stage onwards, particularly in morulae and blastocysts, the nuclei fix much more stain than the cytoplasm. Since after acetylation there is no significant contrast between nuclei and cytoplasm, it might be assumed that their histone is lysine-rich (Figs. 11, 12, 13, 14). Thus the typical aspect of somatic tissues is attained, reversing the process that takes place during spermatogenesis; presumably, the cytoplasmic ribosomes are no longer blocked by basic proteins.

The observations on mouse ova, here summarized, altogether point to a metabolism related to genetic activity, which is different from that of marine invertebrates and Amphibia. Hence, much caution should be exercised in extrapolating the extensive information acquired from the latter to mammals.

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68. THE BEGINNINGS OF HUMAN DEVELOPMENT

R. G. Edwards

Physiological Laboratory, University of Cambridge, England

This paper gives a brief account of recent studies on early human development, starting with the maturation of the oocyte *in vitro*. We have applied knowledge and experience gained from studies in oocytes of animals to the study of human oocytes, and during this lecture I will outline our studies in animals and describe in more detail our work on human oocytes. It is important to note that ovarian oocytes in mammals are arrested from birth in the dictyate stage of development, i.e. a nucleated stage between diplotene and diakinesis of the first meiotic division. Their further maturation is dependent on the secretion of LH, whereupon they proceed through diakinesis, then through metaphase, anaphase and telophase of the first meiotic division, and finally to metaphase of the second meiotic division. Here, further development is arrested, the oocyte is ovulated. At the second meiotic division is completed after fertilization.

The initial work in this field was carried out by Pincus and his collaborators many years ago.¹ They showed that many rabbit oocytes would resume their maturation when removed from their Graafian follicles and placed in a culture medium. In 1955, Chang² found that the rate of maturation of these oocytes was the same as in rabbit does injected with LH. We have applied this knowledge to many animal species, working with rodents, cows, sheep, pigs, and monkeys.^{3,4} We found that in all these species the same rule applied; a majority of oocytes taken from their follicles and placed in a culture medium resumed their maturation at the same rate as in females injected with LH. In some species, e.g. rodents, the nucleus (germinal vesicle) dispersed and the chromosomes appeared in metaphase-I within 3-4 hr. of the beginning of culture. In other species, however, there was a long delay—up to 24 hr.—before the germinal vesicle dispersed. An example of the “delayed” type is the pig oocyte. In Table I, the timings that Dr. Polge and I found in culture are given, and for comparison, the data obtained by Hunter and Polge⁵ after injecting LH into the sows. The timings in the two series are identical.

Table I. Maturation of pig ovarian oocytes *in vitro* after release from their follicles, compared with their maturation *in vivo* following an injection of LH into the mother

	<i>Hours after release of oocytes from follicles, or injection of LH into mother</i>	
	<i>Release</i>	<i>LH</i>
Germinal vesicle	0-20	0-18
Metaphase-I	20-35	18-34
Anaphase/Telophase	ca. 35	34-37
Metaphase-II/Polar Body	35-43	38

There are certain points to note about this system. First, all oocytes mature synchronously, so that if the oocytes are examined at a particular time, they are all in the same stage of development. In the pig, for example, at 30 hr, the maturing oocytes are all in metaphase of the first meiotic division, while at 43 hr., they are in metaphase of the second meiotic division and have extruded their first polar body. Second, a wide variety of culture media can be employed for maturing oocytes, although certain media cause a block in the development of

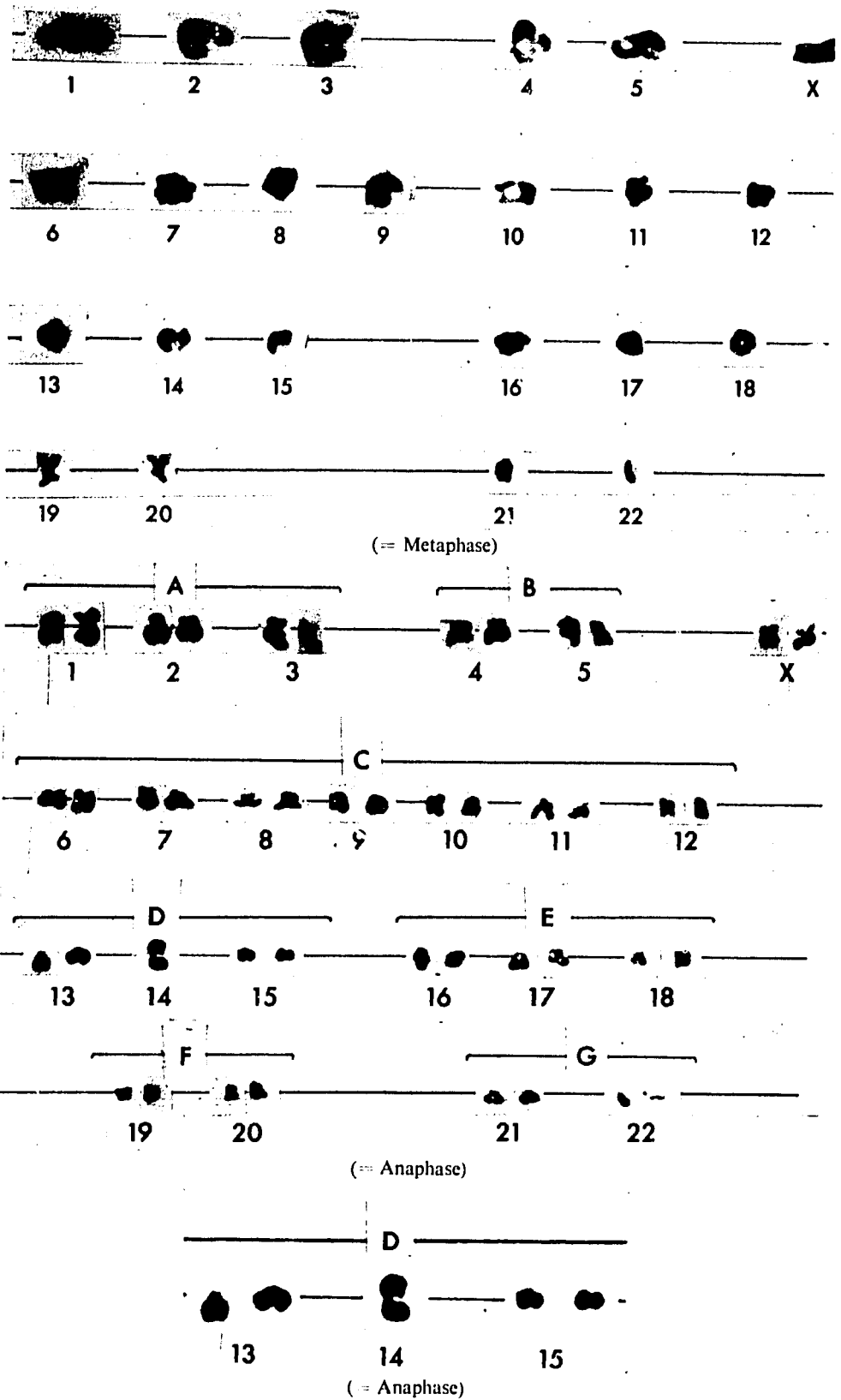


Fig. 1. Karyotypes showing metaphase (above) and anaphase (below) of the first meiotic division in human ovarian oocytes maturing *in vitro*. Part of the anaphase karyotype is enlarged to show chromosome No. 14 in detail.

oocytes from some species, e.g. mouse and pig, although not others, e.g. rabbit and cow. Thirdly, there are also species differences in the proportion of oocytes that mature *in vitro*, from approximately 60% in the pig to 90% in mice, rabbit and cow. Differences between species in the proportion of oocytes maturing *in vitro*, and in the period of culture before breakdown of the germinal vesicle may be due to differences in the biochemistry of oocyte maturation, e.g. in RNA synthesis. Fourthly, the endocrinological state of the donor female had little or no detectable effect on the maturation of oocytes, ovaries being taken from animals in various stages of the oestrous cycle or during pregnancy and pseudopregnancy.

These findings led us to work on the human egg and we used the same type of approach with human oocytes. The human oocytes came from ovaries that had been removed at laparotomy from women in various stages of the menstrual cycle and from pregnant women. The results were similar to those found in animals. Approximately 80-90% of oocytes from all donors matured *in vitro*, and the endocrine state of the donor had no detectable effect on maturation. The rate of maturation *in vitro* was identical in all oocytes examined, and the observed timings are shown in Table II. There was a delay of approximately 24 hr. in the germinal vesicle stage, just as in the pig. By 40-42 hr. the oocytes were extruding their first polar body.⁶

Table II. Maturation of human ovarian oocytes *in vitro* after release from the follicles

	Hours after release of oocytes from follicles
Germinal vesicle	0-24
Diakinesis	25-28
Metaphase-I	26-35
Metaphase-II/Polar Body	36-43

We could therefore obtain human oocytes in their maturation stages, or ready for fertilization, in large numbers. This system allows us to do studies on certain aspects of early human development, and I want to describe very briefly three of these.

First of all, using data on oocyte maturation, we can predict the interval between the injection of LH and ovulation in woman; as shown, it is about 36-43 hr. (Table II). On the other hand many workers consider that ovulation occurs 24 hr. after the injection of LH into women, being their conclusion on the pattern of urinary steroid excretion. Some recent work by Dr. Jagiello in Guy's Hospital, London, to whom I am indebted for permission to quote her data, has shown that a woman given gonadotrophins ovulated between 24 and 48 hr. after the injection of LH, as judged by direct examination of the ovaries. This observation fits in beautifully with our data.

The second aspect of early human development we can now study is the examination of the meiotic chromosomes for evidence of anomalies leading to mongolism and other chromosomal anomalies. We can do this simply by waiting for the correct interval after the beginning of oocyte culture to obtain the requisite stage of meiosis. Dr. Henderson and I have just begun this work, but you can see in Fig. 1 the karyotypes of two oocytes; one is in metaphase, and the other in anaphase of the first meiotic division. There are many chiasmata in the metaphase karyotype. In the anaphase karyotype, one chromosome—no. 14—is unusual. It has failed to separate into two when the others have already separated. Had this chromosome remained like this, it would have entered the first polar body or the egg as a whole, leaving an unbalanced chromosome number in the egg before fertilization. Human chromosomal errors may arise in this way, but we have to examine many more oocytes to confirm this.

The third aspect of this work is the attempted fertilization of eggs after their maturation. The problem here is to get "capacitated" spermatozoa. Capacitation is a process first detected by Austin and by Chang (see Austin⁷) which takes place in the female reproductive tract. Spermatozoa have to be taken from the uterus or oviduct to obtain fertilization *in vitro* in all mammalian species so far studied, except in the hamster. In animals, it is possible to circumvent the necessity of obtaining capacitated spermatozoa by placing oocytes in the oviduct of mated recipients for fertilization, but this method obviously presents difficulties in

man. We had either to develop a system in which capacitated spermatozoa could be easily obtained in man, or we had to use other methods. Several approaches have been attempted (Edwards, Donahue, Baramki and Jones⁶). We have tried taking human cervical sperm from post-coital tests, putting little pieces of ampulla in our culture medium together with eggs and spermatozoa, and various other techniques. The incidence of sperm penetration into the eggs was very low. We have also transferred eggs and spermatozoa into the oviducts of other species in the hope that fertilization would occur. The females of these species had been primed with gonadotrophins and were in full oestrus when we transferred the human eggs. The results were disappointing (Table III).

Table III. Attempted fertilization of mature human oocytes by transferring them with human spermatozoa into the oviducts of other species

Species	Number of eggs transferred	Number of eggs recovered		
		Germinal vesicle	Unfertilized eggs	Fertilized eggs
Rabbit	20	3	9	0
Monkey	70	0	2*	0
Pig	40	5	20 + 13*	2?

*Degenerate

This problem is still unsolved. How can we get capacitated human sperm? We are now attempting to do this by means of a small chamber which we can easily insert into and remove from the human uterus. The chamber with its inserter tube is shown in Fig. 2, with an IUD for comparison in size. After making preliminary designs with Drs. McGaughey and Talbert in Chapel Hill, North Carolina, this present model was developed with Dr. Israelstam at the Hammersmith Hospital, London. The little chamber is made of nylon tubing, with "windows" drilled in the side, and plugged at each end. A Millipore filter of known pore size is stuck

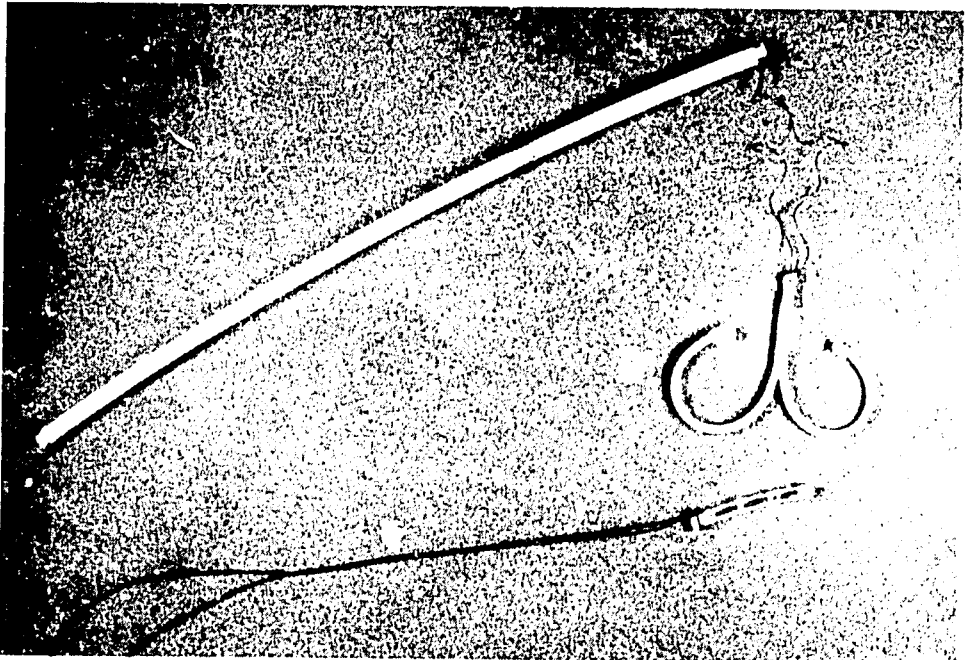


Fig. 2. Intra-uterine chamber for sampling human uterine secretions and exposing spermatozoa to a uterine environment (below, right). The chamber is shown as it is before the Millipore filter membrane is stuck around it. An IUD and inserter tube are shown for a comparison of size.

around the chamber, and the chamber is loaded through a narrow channel in one of the plugs. This channel is sealed, the chamber inserted through an IUD inserter tube, and removed by means of the thread. To avoid contamination with cervical secretions we put a small gelatin cap over the end of the IUD inserter, and so slip the whole chamber cleanly into the uterus. The chambers have been filled with saline, and are removed 12 hr. later for analysis of their contents, or filled with spermatozoa and removed at various times later to discover if the spermatozoa were capable of fertilizing eggs. We have found that many proteins enter these chambers *in utero*. Many of the serum proteins were found, including the immunoglobulins, which is of considerable interest from an immunological viewpoint. It is possible that some inflammatory fluids contaminate the uterine secretions, despite the small size of the chambers.

Spermatozoa placed in these chambers have been viable in the uterus for 12 hr. As yet we have not been able to test the spermatozoa exposed for 12 hr. for fertilization, although a sample left for 4 hr. was not capacitated, as judged by the failure of fertilization *in vitro*. In similar experiments in the cow with Dr. L. E. A. Rowson, in Cambridge, we obtained some evidence that capacitation occurs in these chambers. If we could capacitate human spermatozoa in these chambers, we should be a step closer both to obtaining large numbers of human eggs for study, and to curing infertility in women with blocked Fallopian tubes.

I would like to conclude on a note describing the future possibilities we have in mind, in an experiment carried out in rabbits (Edwards and Gardner⁹). In rabbit blastocysts, the trophoblast is a monolayer of cells. By examining this monolayer of cells by fluorescence microscopy while the embryo was living, we could detect sex chromatin in many nuclei of approximately one-half of the embryos. Embryos with sex chromatin are females—in male embryos there is seldom any sex chromatin. After classifying the embryos as male or female by this criterion, we fixed and stained them, and classified them again. We then found that we had sexed nearly all of the living embryos correctly by fluorescence microscopy (Table IV). These embryos are still at an age when they can be transplanted back into a recipient female, and this technique thus offers the prospect of some control over the sex of offspring. Whether we will be able to detect sex chromatin in human embryos will have to await the availability of blastocysts. The application of these techniques to man could be invaluable in exerting some control over sex-linked anomalies.

Table IV. Sexing of living rabbit blastocysts by fluorescence microscopy

Classification	Embryos classified	Number of errors
Definite	♂ 20	2
	♀ 19	0
Doubtful	♂ 3	2
	♀ 3	0

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69. PHYSIOLOGICAL MECHANISMS RESPONSIBLE FOR THE EFFECTIVENESS OF ORAL CONTRACEPTIVES

M. C. Chang

*The Worcester Foundation for Experimental Biology,
Shrewsbury, Mass.*

Development of oral contraceptives

On the basis of observations showing that ovulation could be inhibited by injection of progestins¹⁻⁴ and that sperm transport or fertilization could be disturbed both during pseudo-pregnancy^{5,6} and by injections of progesterone in the rabbit,⁷ we began in 1951 to develop an oral contraceptive method by testing newly synthesized progestational compounds on laboratory animals. In the first report⁸ the ability of progesterone and similar synthetic compounds to inhibit ovulation in the rabbit was confirmed and their effectiveness on subcutaneous, intravaginal, or oral administration determined. When this study was extended to rats,⁹ it was found that the occurrence of pregnancy could be inhibited indefinitely by injection of 5 mg. progesterone twice weekly. Since a single feeding of 2 to 50 mg. progesterone or ethinyl testosterone also had some effect, it was thought that more orally effective synthetic steroids might be found.

Further study of four 19-norsteroids, 17 α -ethinyl-19-nortestosterone (norethindrone), 17 α -ethinyl-5 (10) estraenolone (norethynodrel), 17 α -ethyl-19-nortestosterone, and 17 α -methyl-19-nortestosterone on rats, mice, and rabbits^{10,11} showed that norethindrone and norethynodrel, administered orally, were more effective than the other two norsteroids or progesterone in inhibiting ovulation. In this study we determined their progestational and/or oestrogenic activity, but we did not find any clear-cut evidence of disturbance of other reproductive processes. When administered to females for 70 days, complete inhibition of fertility was observed. Following withdrawal, the sterile period persisted for some time before fertility returned.

Based upon these animal studies, the first clinical trial was begun and showed¹² that using a standard oral dosage of 300 mg. progesterone/day from days 5 to 20 of the menstrual cycle, the usual signs of ovulation were suppressed. This was also supported by direct inspection at laparotomy of the ovaries of 10 patients. Thus the foundation for clinical exploitation of other synthetic steroid compounds was laid.

Since four 19-norsteroids had been shown to be very effective in animals,^{10,11} a parallel study was carried out in women and the results were subsequently reported by Rock, Pincus and Garcia.¹³ Using basal body temperature, endometrial biopsy, vaginal smear and pregnanediol determination, it was found that, in dosages of 10 mg./day on days 5 to 25 of the cycle, norethindrone and norethynodrel were effective ovulation inhibitors in women. Despite regular coitus, none of the 50 women became pregnant during the months of medication, but within 5 months after the last treated cycle, seven subjects conceived. In order to avoid occasional break-through bleeding during medication, it was found^{14,15} that with a combined therapy (10 mg. norethynodrel with 0.15 to 0.18 mg. 3-methyl ester of ethinyl oestradiol) the incidence of break-through bleeding was reduced and effective contraception was better maintained.

Further clinical trials with one tablet a day (10 mg. norethynodrel plus 0.15 mg. ethinyl oestradiol) given to 830 women for a total of 8,133 menstrual cycles, or 635 women-years,^{16,17} showed a rate of 2.7 pregnancies per 100 women-years, which was better than with any of the other then available contraceptives. Pregnancy, however, occurred only in women who failed to take medication. Thus by 1959¹⁸⁻²¹ the successful use of oral contraceptives in

humans was well established, and has been confirmed since then by many authors.^{22,23} In a comprehensive review of the development of the control of conception by hormonal steroids in 1966, Pincus²⁴ concluded that their efficiency as antifertility agents by preventing ovulation is extraordinary and that their beneficial effects would seem to outweigh their adverse ones. At present, various pills are on the market and the principal ingredients are either derivatives of progesterone such as medroxyprogesterone acetate (Provera), chlormadinone (Lutoral), or 19-norsteroid derivatives, such as norethynodrel (Enovid), norethindrone acetate (Noreluteate), and lynestrenol (Orgametril) with or without supplement of ethinyl oestradiol or mestranol.²⁵

After the publication of our third series of animal studies in 1956^{10,11} when various clinical trials were in progress, it was thought by the present author that a systematic study of these compounds on the other reproductive processes ought to be carried out and that any compounds which inhibit ovulation are closely involved with the higher nervous centres and might be disadvantageous. Fortunately, these compounds turned out to be extremely efficient contraceptives, but the physiological mechanism of their efficiency is still obscure. Even the inhibition of ovulation by these compounds in rabbits is not perfect and probably depends on dosage (Table I). This paper reviews and summarizes mainly some published and unpublished work of the present author concerned with the other effects of these compounds on reproductive physiology.

Table I. Ovulation induced by 2 matings in rabbits fed with various oral contraceptives for 3 days (examined 2 days after mating)

Compounds and dosage (mg./rabbit)	Rabbits which ovulated/total	C.L./rabbit	Rabbits with live sperm in uteri/total	Fertilized eggs
Progesterone (injection) 2.0	1*/6	9/1	4/6	0
Medroxyprogesterone acetate 2.0	2/5	5/2	—	4
Chlormadinone 1	0/6	0	3/6	0
0.2	1*/6	12/1	3/6	0
Norethynodrel 2.0	2/6	17/2	2/6	17
Norethindrone acetate 2.0	3/6	26/3	1/6	23
Ethinyl Oestradiol 0.5	5/6	36/5	4/6	32
Control	4/6	41/4	3/6	29

*Ovulation might have occurred before expected time.

Antifertility effects of oestrogens

In view of the cumbersome aspects of the daily medication with these pills and stimulated by a report²⁶ that pregnancy can be prevented in the rat by feeding with a non-steroid compound (MER-25) after mating, the present author investigated this compound.²⁷ It was found to be rather toxic. When other non-steroid antifertility compounds²⁸⁻³¹ and norethynodrel were fed to rabbits for 3 days after insemination and an ovulating injection of HCG, it was found that all induced degeneration of fertilized eggs. Even norethynodrel was effective in a high dose (Table II), but the most effective one was an A-norsteroid.³² In fact, other antifertility effects of norethynodrel, besides that on ovulation, have been suspected by many workers.³³⁻³⁵ Since norethynodrel in high dose and the A-norsteroid have oestrogenic properties, it is possible that all these compounds, despite their differing chemical structures, provided they have oestrogenic activity, will induce degeneration of eggs. Later work^{36,37} has shown that the most effective one administered orally after mating is ethinyl oestradiol

Table II. Normal blastocysts, as per cent of corpora lutea and of recoveries (in brackets), observed on day 6 following three feedings of various compounds on days 1, 2, and 3

Dosage (mg./rabbit)	Compounds				
	Clomiphene*	U-11555A†	U-11100A‡	ICI 46,474§	Norethynodrel
20	22 (29)	29 (56)	20 (30)		4.5 (45)
10	34 (56)	12 (75)	18 (20)		11 (19)
5			3 (40)	4 (28)	48 (57)
2.5			14 (35)	14 (42)	
1			34 (51)	14 (42)	
0			75-89 (87-96)		

*1-[p-(B-diethylaminoethoxy) phenyl]-1,2-diphenyl-2-2-chloroethylene.

†2-[p-(6-methoxy-2-phenylinden-3yl)-phenoxy]-triethylamine, hydrochloride.

‡1-[2-[p-(3,4-dihydro-6-methoxy-2-phenyl-1-naphthyl) phenoxy] ethyl] pyrrolidine, hydrochloride.

§Trans isomer of 1-(p-B-dimethyl aminoethoxyphenyl)-1,2-diphenylbut-1-ene.

(Table III), the antifertility activity of which was first described in 1938.³⁶ Indeed, the disturbance of egg transport by oestrogen³⁹⁻⁴³ is well known, and the interruption of pregnancy by administration of oestrogen^{44, 45} was reported in 1926.

In our studies,^{32, 36, 37} however, the mechanism of action, whereby eggs degenerated after their passage to the uterus, has been clearly revealed. Administration of these compounds

Table III. Normal rabbit blastocysts, as per cent of corpora lutea and of recoveries (in brackets), observed on day 6 following three feedings of oestrogens on days 1, 2, and 3

Dosage (mg./rabbit)	Compounds					
	H241*	Stilboestrol	E.C.P.†	Oestrone	Oestradiol	Ethynyl Oestradiol
1.0	0 (22)	0 (25)	17 (49)	0 (38)	3.5 (37)	
0.5	10 (27)	9.4 (11)	3 (30)	1.4 (51)		
0.2	22 (30)		59 (71)	8.6 (29)	7.5 (36)	
0.1	51 (55)	62 (69)	64 (79)	23 (42)	5.2 (43)	0 (15)
0.05						0 (18)
0.02						19 (26)
0.01						60 (73)

*A-norsteroid, 2 α -17 α -diethyl-A-norandrostane-2,17-diol.

†Oestradiol cyclopentylpropionate.

after insemination induced the eggs to reach the uterus much sooner than normal, and also caused their expulsion from the uterus to the vagina. Since it is known that transplantation of newly fertilized eggs from the tube to the uterus causes degeneration of eggs,⁴⁶⁻⁴⁸ the mechanism of action is, therefore, mainly due to disturbance of egg transport. This was confirmed by the fact that normal foetuses were obtained following the transfer of eggs from rabbits treated with ethinyl oestradiol to untreated ones and *vice versa*.³⁷ Recently, some steroid and non-steroid compounds⁴⁹⁻⁵⁴ were reported to have "anti-oestrogen" or "anti-progestin" properties, and claimed to inhibit implantation by virtue of these activities. Oestrone, one of the natural oestrogens can cause the degeneration of rabbit and hamster eggs when administered after mating,³⁶ and has been claimed to inhibit implantation when administered on day 1 of pregnancy in the rat.⁵⁴ However, those steroid compounds⁵⁴⁻⁵⁶ which cause rapid egg transport and degeneration of eggs are not necessarily inhibiting implantation, because implantation cannot occur without normal healthy blastocysts. Only one compound, "ICI 46,474",⁵⁷ may have a specific anti-oestrogenic effect on implantation because administration of this compound to rats at the time of implantation, not before or after, prevented implantation.

From this account it is evident that exogenous oestrogen has other effects on the normal reproductive processes besides the claimed inhibition of ovulation in humans.^{58,59} When administered before ovulation, it has no obvious effects on fertilization and development of eggs.⁶⁰ When administered after ovulation and fertilization, it can interrupt pregnancy by differing mechanisms, depending on the dosage of the particular compound used, the species used for testing, and above all, on the time of administration. With continuous medication with oestrogen tube locking and degeneration of newly fertilized eggs is highly probable, even if ovulation and fertilization take place.

Antifertility effects of progestins

It has been reported that fertilization is inhibited by the disturbance of sperm ascent during pseudopregnancy in the rabbit^{5,6,61} and in oestrous rabbits treated with progesterone.⁷ In our first experiment⁴ sperm were found in the tubes of 7 out of 15 rabbits treated with 10-30 mg. progesterone. Since the estimation of sperm in the tube is unreliable and since sometimes no sperm were found in the tube and yet the eggs were fertilized,⁶² we did not pursue further the disturbance of sperm transport by progesterone. However, we found that although capacitation of sperm^{63,64} could be achieved in the tube of pseudopregnant rabbits, it was inhibited in the uterus of pseudopregnant or progesterone treated rabbits.⁶⁵

Recent work in our laboratory has shown that the transport of rabbit eggs is hastened by treatment with an orally effective progestin, medroxyprogesterone acetate, for 3 days before insemination, and this leads to degeneration of eggs.⁶⁶ Similar treatment also inhibited the fertilization of ferret eggs.⁶⁷ When this compound, another potent progesterone derivative, chlormadinone (6-chloro-6-dehydro-17 α -acetoxy-progesterone), or 19-norsteroids were administered for 3 days before insemination and induction of ovulation, the results were as follows:⁶⁸

Subcutaneous injection of 1-4 mg. progesterone/rabbit significantly reduced the fertilization rate from 66 to 22%; feeding with 1-4 mg. medroxyprogesterone acetate from 88 to 51%, with 0.2 to 4 mg. chlormadinone from 66 to 11%, while feeding 2-4 mg. norethynodrel or norethindrone acetate had no effect.

The rate of egg recovery (as a percentage of corpora lutea) was low (51-82%) and the presence of eggs in the uterus on day 2 was high (27-72%) in the animals treated with progesterone and its derivatives. The disturbance of fertilization appears closely related to the rapid egg transport. Many fertilized or unfertilized eggs recovered from the uterus were degenerating, and a few eggs were recovered from the vagina. Uterine or tubal insemination significantly increased the fertilization rate (38-55%) as compared with vaginal insemination (23%) in treated animals but was still significantly lower than in untreated animals (78-91%). Thus sperm transport also appears to be disturbed to a certain extent.

When sperm were incubated in the uterus or tube of the treated animals for 12 hr., recovered and deposited into the tube of newly ovulated rabbits, capacitation of sperm was probably inhibited to some degree; but fertilization of eggs was still possible.

Although the fertilization rate was quite high following administration of 1 mg. progesterone or 0.2 mg. chlormadinone (66%), practically all the eggs had degenerated by day 6. Surprisingly, treatment with 4 mg. norethynodrel before ovulation, though without disturbing fertilization, also induced an almost complete degeneration of eggs by day 6.

It was concluded that treatment with progestational compounds disturbs sperm transport and sperm capacitation, and thus inhibits fertilization to a certain degree; but their major effect is on the transport of eggs, which interferes to some extent with fertilization, but mainly causes the degeneration of eggs in the uterus and their expulsion from the uterus.

It is of interest to mention here that treatment either with oestrogen after ovulation or with progesterone before ovulation induces rapid egg transport from the Fallopian tube to the uterus in the rabbit, and this leads to the subsequent degeneration and expulsion of the eggs. Although an interpretation of these apparently contradictory phenomena was suggested** their basic nature is still obscure, and the full application of these findings to the human species remains to be established.

In the light of the facts mentioned above, continuous medication with progestational compounds as practised in recent years, besides the possibility of inhibiting ovulation, would disturb many physiological processes of normal reproduction (Table IV). Thus the effectiveness of these contraceptive pills is not surprising. Moreover, reproductive activity in the female functions in cyclic fashion. When medication of progestins, oestrogen, or both, is prolonged or continuous, one can hardly distinguish whether their effects take place before or after ovulation, especially considering the delicate balance between oestrogen and progesterone in affecting any or all phases of reproductive physiology.

When oestrogen and progesterone, the two major female reproductive hormones were successfully synthesized, it was hoped that they would do wonders for sterility cases. The clinical attempts to improve female infertility by administration of both hormones, however, have been rather limited and disappointing. Paradoxically, medication with oestrogen or progesterone does produce a contraceptive effect.

Table IV. Effects of steroid compounds by feeding on ovulation, fertilization, and egg development in the rabbit

Days of daily treatment	Compounds and dosage (mg./rabbit)	Inhibition of ovulation	Suppression of fertility by disturbance of			Disturbance of egg development	
			Sperm transport	Sperm capacitation	Egg transport	Degen. of early eggs in uterus	Expulsion of eggs from uterus
3 days before insemination and ovulation	Progesterone (injection) 2.0	++	++	+	++	++	++
	Medroxyprogesterone acetate 2.0	+	+	+	++	++	+
	Chlormadinone 0.2	++	++	+	++	++	+
	Norethynodrel 2.0-4.0	+	—	—	—	++	+?
	Norethindrone acetate 4.0	+	—	—	—	++	+?
	Ethinyl Oestradiol 0.5	—	—	—	—	—	—
3 days after insemination and ovulation	Ethinyl Oestradiol 0.05-0.1					+++	++
	Norethynodrel 20.0					+++	++
	Progesterone (injection or oral) 2.0					—	—

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70. MECHANISM OF ACTION OF INTRA-UTERINE CONTRACEPTIVE DEVICES

A. B. Kar

*Division of Endocrinology,
Central Drug Research Institute, Lucknow, India*

INTRODUCTION

The scientific interest in the *modus operandi* of intra-uterine contraceptive devices (IUDs) seems to be as old as their use as mechanical devices to prevent pregnancy. Thus Haire¹ quotes Retschmenschky as having observed an increase in pH of the uterus, the resulting high alkalinity preventing implantation; the oligodynamic action of silver of IUDs made of this metal has also been invoked. Gräfenberg² regards the "hyperdecidual" condition induced by the device as responsible for preventing implantation. On the other hand, Carleton and Phelps³ consider the anti-implantation effect of IUDs to be largely due to physical coverage of the endometrial surface.

The revival of interest in IUDs as a positive means for birth control has inevitably focused attention on their precise mode of action. This knowledge is urgently needed for future developments and refinements in this effective contraceptive technique, and to reduce its undesirable side-effects.

Studies carried out to date in animals have revealed a marked species difference with respect to the points of impact of the IUDs in the reproductive mechanisms. Further, the devices may be of different composition and form. IUDs in human and other primates are generally composed of polyethylene or stainless steel and are in shapes such as loops, coils, bows and rings. Devices in other animals of necessity have different shapes since they have bicornuate uteri. In large domestic animals, such as sheep and cattle, IUDs consist of strips or spirals of polyethylene. In rodents they may be silk or nylon threads as well as spirals; glass beads have also been used. The importance of those differences in composition and form, as well as the presence or absence of uterine distension which the devices may cause are, however, still imperfectly understood.

Consequently, the state of the existing knowledge is being reviewed critically below according to the points of impact at which different IUDs have been shown to exert their influence. Although no attempts will be made to extrapolate knowledge derived from animal studies to the human, it may be interesting to examine *pari passu* any relevant and analogous clinical information on the mode of action of IUDs.

1. POINTS OF IMPACT OF THE IUD

A. OVULATION

The only evidence that IUDs may exert their contraceptive effect through inhibition of ovulation has been obtained in the Indian water buffalo,⁴ and to a lesser extent in cows.⁵

An inhibitory effect of IUDs on corpus luteum function has been reported in guinea pigs, pig, sheep and cows.⁶⁻⁸ This effect appears to be unilateral, that is, on the corpora lutea of the particular side bearing the IUD. A decrease in pituitary LH level has been noted in rabbits and sheep fitted with an IUD. This may be related to the diminished luteal activity in these species. However, the effect of an IUD on steroidogenic capacity of the corpus luteum is largely unknown. In rabbits,^{9,10} rhesus monkeys,^{11,12} and women¹³⁻¹⁵ the ovulation process is unaffected by the IUDs; the cyclic pituitary-ovarian interplay is apparently undisturbed.

B. SPERM TRANSPORT

Interference with sperm transport has been recorded in case of sheep fitted with an IUD;¹⁴ sperms were found to be absent or greatly reduced in numbers in washings from both tubes, even though the IUD was fitted in only one uterine horn. Also, sperms were found to be decapitated if injected into the IUD-fitted horn of these animals. In fowl an IUD disturbs sperm passage and survival in chronic stages.¹⁷ It is interesting that the device also interferes with the deposition of shell, and as a result shell-less eggs are produced.

In rodents (rats, mice, hamsters), rabbits, ferrets, rhesus monkeys and women sperm transport remains normal.^{13,14,18-20}

C. TUBAL EVENTS

(1) *Acceleration of ovum passage*

It has been shown that in superovulated rhesus monkeys fitted with an IUD the tubal transport of ova is markedly speeded up; so much so that ova could no longer be found in the tubes of such animals 5 hours after the expected time of ovulation, compared with approximately 3 days in normal controls.¹⁸ Ova could, however, be recovered following unilateral tubal ligation and even in the uteri of non-ligated females provided they were examined early enough. Fertilized ova could not be recovered from the tubal and uterine washings of these animals, but were found in controls.

The validity of these findings was examined recently in unstimulated normally cyclic and spontaneously ovulating rhesus monkeys.²¹ It was observed that there was no marked difference in the rate of ova recovery from tubes of normal and IUD fitted animals. It was concluded that if there was any speed-up in the tubal passage of ova due to the presence of an IUD in naturally ovulating monkeys, it was far less pronounced than that reported by Mastroianni and Hongsonand.¹⁸ Further, Eckstein,²² commenting on the studies of the latter authors, pointed out that the gonadotrophin-stimulated ovaries of their monkeys must be expected to produce excessive amounts of oestrogen and progesterone. It was therefore not surprising that such superovulated ova should pass rapidly through the tubes and uterus; the possibility also remained that endometrial sensitivity was disturbed.

One of the earliest of modern theories advanced to explain the *modus operandi* of the IUDs in women is that the devices stimulate tubal motility, as a result of which the ovum is rushed through the tubes and arrives prematurely in the uterus in a condition unfit for implantation.^{23,24} The endometrium, in its turn, has not had sufficient time to undergo full progestational transformation necessary for reception of the blastocyst. The evidence frequently offered in favour of this theory is the small number of tubal pregnancies that have been accounted in women fitted with IUDs, the incidence being about one-twelfth of the rate recorded in normal populations.²⁵ In this connection the following pertinent reports merit critical consideration:

(a) No evidence of increased tubal peristalsis or mechanical obstruction of the tubes could be found in women fitted with an IUD.²⁶

(b) A low rate of tubal pregnancy in women may be consistent with the rapid ova passage theory but does not actually prove it. Most of the women who are using the IUDs are highly fertile and have had many consecutive uterine pregnancies; thus a low incidence of tubal pregnancy can be expected. Whether the reported rate of tubal pregnancy is unusual in such women can be determined only by comparing their incidence with that for women of similar age and parity who are not using IUDs, rather than with the rate in the general population.²⁵ Moreover, it is worth noting that Chen and Ta-Ko²⁶ reported six tubal pregnancies in women fitted with IUDs during a seven-month period. Willson, Bollinger and Ledger²⁷ described three ectopic pregnancies out of 623 women fitted with IUDs, and Denny²⁸ also recorded a case of tubal pregnancy.

However, Tietze²⁹ has provided statistical evidence in support of the rapid ova transport theory. He estimated that in 22,400 women wearing IUDs with an aggregate of more than 300,000 women months of use, 588 pregnancies occurred with the device *in situ*. Of these 26, or 1 in 23, pregnancies were ectopics. In a normal population the incidence of tubal pregnancy is between 0.8 and 1.2 pregnancies per 100 women per year. Hence 200-300 ectopic pregnan-

cies could have been expected, but only 26 in fact occurred. While the incidence of ectopic pregnancies is very high in relation to the total number of pregnancies with the IUD *in situ*, it is very low in relation to the number expected on the assumption that the mode of action of IUDs is at the uterine level. Thus these findings lend statistical support to the view that IUDs act by speeding up the tubal transport of ova.

(c) Bonney, Glasser, Clewe, Noyes and Cooper¹³ found no evidence of rapid transport of ova through the tubes in women wearing an IUD. On the contrary, the recovery rate of ova from the tubes in IUD-fitted women was somewhat higher than in control women.

(d) An IUD does not cause any noteworthy biochemical changes in the tubal tissue of rhesus monkeys except for some (28%) increase in oxygen consumption during the proliferative phase 90 days post-insertion;³⁰ 545 days after insertion the oxygen consumption rate of the tubes is, however, normal.¹² Similarly, the tubal fluid of rabbits does not show any noteworthy biochemical alteration in the presence of an IUD.³¹

(e) The insertion of a surgical silk suture directly into one tube of rabbits stopped pregnancy in 45% of animals.³² The number of foetuses were significantly less on the side of the treated tube; that of corpora lutea was virtually the same in the two ovaries. This showed that about 67% of ova failed to implant or there was a foetal loss of this magnitude.

In rabbits fitted with an IUD a high foetal loss has been recorded between days 10 and 27 of pregnancy, in addition to a failure in ovum implantation.³²⁻³⁵ Further, post-coital ligation of the tubes has been reported to impede development of the blastocysts.³⁶ Whether the absence of pregnancy in the treated uterine horn as observed in this study, was due to foetal loss occurring between days 10 and 15 *post coitum*, interference with tubal transport of ova, or an inhibition of blastocyst development due to the presence of an intra-tubal device could not be determined.

It thus appears that there is as yet no firm experimental or clinical basis for the view that the tubal passage of ova is considerably accelerated in the presence of an IUD. Even if this is the case, little is known as to how such speedy transport is achieved. It has been suggested that an IUD provokes a state of hyperoestrogenism; or an increased sensitivity of the genital tract to oestrogen.³⁷⁻³⁹ There is also some indirect evidence (like a high urinary FSH excretion rate) of such hyperoestrogenism in women wearing IUDs.¹⁵ Accordingly, it has been suggested that an increased secretion of oestrogen by the ovary in the presence of an IUD may be responsible for such rapid transport of tubal ova; this property of oestrogens is well authenticated, although precisely how the effect is exerted is still unknown.³⁸

Recently, Kar, Kamboj, Chandra and Karkun¹⁰ investigated the tubal sensitivity of IUD-fitted ovariectomized rhesus monkeys to exogenous oestrogen, but could not find any ponderal or histologic evidence of an increased responsiveness. Biochemically, oestrogen caused a significant increase in concentration of DNA, acid soluble phosphates and total lipids in the tubes of controls, but not those of IUD animals. However, the relation of these changes to the rapid transport of ova through the tube is difficult to assess. The precise tubal transit time of human ova has not been determined with certainty.⁴¹

In the same study¹⁰ the uterus did not show any alteration in sensitivity to oestrogen. Tamada and Sturgis¹² also reported no effect of an IUD on uterine responsiveness of ovariectomized rhesus monkeys to oestrogen and progesterone; however, at the points of contact with the device the endometrium showed squamous metaplasia of the epithelium. Similar changes have been recorded in women fitted with an IUD for one to two years.

(2) Retardation of ova passage

Doyle and Margolis¹³ observed that in mice an IUD retarded the tubal passage of ova on the control side and inhibited implantation in the treated uterine horn. This shows that an IUD may act through two different points of impact in the same species.

(3) Fertilization

An interference with fertilization has been demonstrated clearly only in sheep fitted with an IUD, apparently through a retardation of sperm transport.¹⁶ A similar disturbance in fertilization probably occurs in artificially inseminated cows but not in normally mated ones.⁵ However, in sheep ova recovered from IUD-fitted females can be transferred into the

uteri of normal host ewes and following mating of the host, they will be fertilized and implant.¹⁶ This shows that in this species an IUD does not affect fertilizability of the ovum.

It is not known whether the fertilization process or fertilizability of ova are disturbed in women wearing IUDs, even though a couple of pronuclear ova have been recovered from tubal washings of such individuals.^{11,14}

D. IMPLANTATION

The most widely held view about the *modus operandi* of IUDs is that they somehow prevent implantation of the blastocyst. In this connection an interference with the blastocyst or the uterine components of the implantation process including the luminal fluid, provocation of unphysiologic motility of the uterus, neurogenic disturbances, inflammation, physical coverage of the endometrial surface, and the role of the cervix have been considered. However, a species difference in the extent of influence of an IUD on the implantation process should be kept in view. For instance, in guinea pigs a silk suture does not interfere consistently with implantation.¹⁵

(a) Blastocyst component and the uterine fluid milieu

There is no published information on the effect of an IUD on the biochemistry, metabolism, morphology and ultrastructure of the blastocyst. Several authors recovered degenerated blastocysts from the uterine horns of rats fitted with a silk suture device.¹⁶ On the other hand, some knowledge is available regarding the uterine fluid. Thus Kar, Goswami, Karnboj, and Chowdhury³⁷ carried out detailed biochemical studies on the uterine luminal fluid of rats in the presence of a silk suture. They could not find any change in pH of the fluid (cf. also Marcus, Marcus and Wilson¹⁷), but the volume was reduced by about 50% with a marked change in consistency, apparently as the result of dehydration. The most noteworthy alteration, however, occurred in the proteins of the fluid. There was passage of a protein into the fluid with the same electrophoretic motility as albumin, which was consistently absent in the fluid of the control horn. This protein comprised about 50% of the total protein of the fluid, and this high concentration would produce a rise in overall osmotic pressure of the fluid. This, together with the increased osmotic pressure due to elevated non-protein constituents, might expose the blastocyst to an uterine luminal milieu with considerable dehydrating activity, and hardly conducive to blastocyst implantation.

Dukelow, Perry, Cherwoff and Williams¹⁸ studied the biochemical changes in the uterine and tubal fluid of rabbits at the time of IUD-induced embryonic mortality (cf. Adams and Eckstein³⁸), and observed increased proteolytic activity and alterations in the carbohydrate—sialic acid moieties of the uterine and tubal fluids at this stage.

In women there is evidence that IUDs induce some changes in the uterine secretions. Thus Americh¹⁹ noted that an IUD caused profuse secretion of the endometrial glands which filled the lumen. He believed that this was an impediment to implantation of the blastocyst. Vorys *et al.*¹³ observed that women wearing the Margulies spiral who had no pain, discharge or bleeding often had scanty endometrial secretion. Hall, Sedlis, Chabon and Stone⁵⁰ reported no change in total protein concentration but an increase in that of carbohydrate in the uterine secretion of women fitted with an IUD. Stone⁵¹ noted the presence of neutrophils in the fibrin within the endometrial glands of women fitted with an IUD, while Bonney *et al.*¹³ found that the endometrial secretions became thick and mucoid around the Margulies coil during the proliferative phase.

(b) Endometrial component

(1) *Inhibition of decidualization.* An observation frequently cited to explain the mechanism of anti-implantation effect of an IUD, particularly in rats, is that it inhibits decidualization;^{15,16,52} Segal³³ holds a contrary opinion. However, divergent views have been expressed as to how the anti-decidualization effect is achieved. Psychoyos⁵⁴ showed that trauma caused an increase in uptake of progesterone-C¹⁴ by the rat uterus. He suggested that the presence of an IUD has the same effect as trauma *vis-à-vis* progesterone uptake by this organ—the uterus becomes more sensitive to progesterone. If this period of progesterone uptake precedes oestrus the progesterone-oestrogen sequence, which is critical for decidualization, will occur

prematurely, so uterine receptivity ensues at a time when the ova are still in the Fallopian tubes. When they reach the uterus it has already passed into the non-receptive stage and thus implantation cannot occur. Psychoyos has further shown that if both uterine horns of the rat are traumatized during the sensitive period the control horn will respond normally, whereas the IUD-fitted one will show decreased vascular response. He considers this to be due to the non-receptive stage of the horn provoked by an increased sensitivity to progesterone circulating before oestrus. For this reason the uterus has to be fitted with the device before oestrus to achieve the inhibitory effect. One day may make all the difference; if the device is inserted during oestrus no anti-implantation effect is seen.

Potts⁵⁵ reported two cases of pregnancy in women during the particular cycle in which the IUD was inserted. He believed that this was evidence in support of Psychoyos' view since the device was not there early enough to upset the timing of the cycle. In point of fact, Psychoyos⁵⁴ commented that in women the presence of the IUD was necessary for a short period before ovulation to bring about precocious endometrial sensitization to progesterone (as in rats) leading to ova endometrial "asynchrony". In the rat, even low grade injuries make the endometrium hypersensitive to progesterone.⁵⁶

However, Laumas and Farooq⁵⁷ did not observe any effect of an IUD on uterine uptake and retention of 1,2-H³-progesterone in rats. As already mentioned, Kar *et al.*⁵⁷ observed an increased sensitivity of the uterus to oestrogen in this species in the presence of an IUD. This may contribute to an imbalance in the optimal responsiveness of the uterus to the two critical hormones involved in decidualization. It is interesting that Psychoyos⁵⁴ considers changes in uterine fluid to be involved also in the inhibition of decidualization.

On the other hand, Shelesnyak⁵⁸ believes that an IUD causes premature depletion of uterine histamine store so that little or none is available at the proper time to induce decidualization; he has shown a low histamine content of the IUD-fitted horn compared with the control horn.⁵⁶ Roy Chowdhury's⁵⁹ finding of a numerical increase in uterine mast cells in animals fitted with a silk suture tends to support this concept. It is interesting to note that high doses of oestrogen can evoke similar changes in the mast cells of the guinea pig endometrium.⁶⁰

Accordingly, it is not unlikely that in rats an IUD prevents implantation both by provoking adverse physico-chemical changes in the uterine luminal fluid and by inhibiting the process of decidualization.

Potts⁵⁵ has suggested that (a) a device might merely hold the epithelium apart mechanically so that in animals with small blastocysts such as man, the blastocysts simply fall out and do not come into sufficient contact with the endometrium to implant, and (b) the trophoblast preferentially implants on the plastic device rather than on the endometrium. Blastocysts cultured *in vitro* stick remarkably well on plastic dishes; the trophoblast comes into intimate contact with the plastic material and spreads out rapidly on it. However, Meyer⁶¹ has been unable to find any such implantation on the devices themselves. Moreover, this explanation is not valid for silver or stainless steel rings.^{56,61}

(2) *Provocation of decidualization.* Since decidual formation is known to prevent implantation in rats, this mechanism has been invoked to explain the anti-implantation effect of an IUD in this species.^{62,63} However, Doyle and Margolis⁴³ and Kar, Kamboj and Datta⁶⁴ did not find any evidence of decidual formation in this species in the presence of a silk thread.

Bonney *et al.*¹³ recorded a premature and abnormally fibrous predecidual reaction in the endometrium of women fitted with an IUD. They consider this as a failure of the endometrium to undergo adequate biochemical maturation for implantation. Since it must be accompanied by comparable biochemical maturation of the ovum and perhaps other sites concerned with implantation, it is conceivable that adverse physico-chemical changes in the uterine fluid may also retard the biochemical maturation of the pre-implantation blastocyst and make it unfit for implantation.

It may be recalled that Gräfenberg² believed that a "hyperdecidual" condition of the endometrium provoked by the device was responsible for failure of implantation. More recently, Jessen, Lane and Greene⁶⁵ and Rozin, Sacks and Shenker⁶⁶ recorded the occurrence of decidual tissue in women fitted with an IUD. Several investigators have also reported

asynchrony in histologic dating of the endometrium and the stage of the cycle in women fitted with IUDs; the endometrium lagged behind the normal cycle.^{14,67,68} Such asynchronous endometria may be unfit for implantation.

(c) *Stimulation of uterine motility*

In rats an IUD does not provoke excessive electrical activity of the myometrium nor alters its sensitivity to oxytocin,^{69,70} or the latter's release. However, Marcus *et al.*⁴⁷ reported an increase in uterine motility in this species in the presence of a silk suture. In rabbits no significant effect of an IUD on uterine motility *in vivo* was observed.⁷¹ In rhesus monkey the immediate result of a device appears to be to convert a given motility pattern into one characteristic of menstruation and labour.^{20,72} This effect is, however, transitory and eventually results in a slight accentuation of the normal motility pattern of the uterus.

Bengtsson and Moawad⁷³ investigated the motility of the human uterus *in vivo* twice weekly by means of an intra-uterine catheter connected with a pressure recorder. They observed that pre-labour type of contractions normally appeared about the 25th day of the cycle, but these developed about the 19th day of the cycle after the insertion of an IUD. They suggested that the occurrence of such contractions at about the time of implantation might explain the contraceptive action of the IUDs. Marcus *et al.*⁴⁷ also noted a stimulation of uterine motility in women fitted with an IUD. However, Johnson, Brewer and Brewer⁷⁴ did not find any effect of the device on frequency and amplitude of uterine contractions in women. Further, whether such an acute stimulatory effect of an IUD on uterine motility persists throughout its period of residence remains to be determined. In this connection, any simultaneous haemodynamic changes in the uterus also merit consideration.

(d) *Neurogenic factors*

The possibility of involvement of neurogenic factors in the *modus operandi* of an IUD has been considered in rats and sheep. Segal⁵³ achieved normal implantation in the IUD-fitted horn of rats by severing its sympathetic nervous connections. Moore's studies on sheep, reported by Wishik,⁷⁵ showed that when an inflated balloon-like object of the size of an embryo was fitted into one uterine horn, the contralateral horn did not become pregnant. When this balloon-fitted horn was resected by cutting at both ends and removing all nerve connections, and then re-sutured back without apparently restoring the nerve supply the contralateral horn did accept a pregnancy. These studies are evidently extensions of earlier findings by Moore and his associates (see ⁷⁶), and suggest a possible neurogenic involvement in the mode of action of an IUD in this species.

In this connection reference may be made to the interesting studies by Toth, McEwen and Shabanah⁷⁷ who observed that pelvic parasympathectomy caused vasoconstriction and an imbalance of the homeostatic vascular mechanisms in dogs through the resultant sympathetic dominance. The vicious circle thus created led to a diminished blood flow to the uterus, hypoxia and impeded nutrient supply. The net effect on early implantation stages and the foetus was disastrous. It is tempting to speculate that an IUD somehow causes similar sympathetic dominance and thereby disturbs the optimal hemodynamics of the endometrium which is so critical for the implantation process. It is pertinent to note that there is some evidence of a reduced capillary permeability of the rat uterus in the presence of an IUD.²⁰ Segal's⁵³ findings in rats are also suggestive. Nevertheless, Bland and Donovan⁷⁸ are critical of the neurogenic theory since, according to them, the "denervation of a segment of the uterus as done in sheep by Moore must inevitably interfere with the normal activities of the endometrium by disruption of its blood supply". Apparently, any neurogenic involvement in the *modus operandi* of an IUD may be but one facet of a far more complicated mechanism.

(e) *Inflammation*

Greenwald⁷⁹ believes that endometrial inflammation caused by an IUD is primarily responsible for the anti-implantation effect. According to him, this condition increases uterine motility which expels the pre-implantation blastocyst *per vaginam* in rats. However, Parr and Segal⁷⁹ considers endometrial inflammation as an unlikely cause for implantation failure in this species.

A mild inflammatory condition of the endometrium is often encountered in women wearing IUDs.^{25, 65, 80, 81} Jessen *et al.*⁶⁵ think that this may have some bearing on the mode of action of the devices. However, the current consensus is that such inflammatory changes represent a "sterile irritation" of the endometrium due to the presence of a foreign body and have little to do with its *modus operandi*^{20, 25, 80, 81}

(f) *Coverage of endometrial surface*

The view that physical coverage of endometrial surface by an IUD is responsible for preventing implantation in rabbits,³ has subsequently proved untenable.^{33, 82} This is also probably true of other species including women.²⁰ In the latter there is enough exposed endometrium in spite of the presence of an IUD (such as the Lippes loop, Hall-Stone stainless steel ring and Zipper nylon ring), but even then pregnancy does not usually occur.

Nevertheless, this view seems to be resurrected and upheld from time to time. Thus Meyer⁶¹ observed that when a silk suture was placed either in the upper, middle or lower one-third of the rat uterine horn, implantation did occur in 25-40% of cases. If the suture was inserted from the mesometrial to anti-mesometrial surface just at one point only, implantation was not prevented. This suggests that maximum contact of the foreign body with the endometrium is necessary to prevent implantation. Similarly, in rabbits Ledger *et al.*⁹ noted that complete prevention of implantation is achieved in the area of the endometrium with which a device is in intimate contact.

(g) *Role of the cervix*

Speilburger and Olewine⁸³ reported that a silk suture inserted in the cervical region of rats reduced the number of implantations and caused foetal degeneration. However, in women an IUD has no effect on the cervical mucus.^{77, 84}

II. MODE OF ACTION OF IUDs AND POST-INSERTION BLEEDING

Early studies by Meyer⁶⁵ and recent ones by Willson *et al.*⁸⁸ and Israel and Davis⁸⁰ in women, and Kar and Chandra^{86, 87} in rhesus monkeys recorded certain vascular and other changes in the endometrium during the IUD post-insertion bleeding episodes. These changes are virtually alike in both species and consist of oedema and congestion of the superficial layers of the endometrium, patchy to marked denudation of the surface epithelium; development of large thin-walled vascular channels in the superficial layers which do not bulge above the surface nor show signs of rupture; the passage of blood (and probably also lymph) from these channels into the lumen; passage of blood from capillaries and probably also lymph focally in the stroma; compression of the endometrium at places without necrosis or ulceration and occasional presence of debris of denuded epithelial cells, blood and lymph in the lumen. Similar changes have been observed in the endometria of sexually immature rhesus monkeys which also show such uterine bleeding after the insertion of an IUD.⁸⁷ This suggests that the stimulus provoking bleeding acts directly (from the IUD) on the endometrial vasculature and not *via* any hormonal mechanisms. On biochemical grounds,^{11, 12, 88, 89} it appears that this stimulus is temporary, mild trauma of the endometrium. This is suggested particularly by a transitory rise in oxygen consumption of the endometrium without any disturbance in its basic metabolic pattern. The nature of such vascular changes, in fact, appears to be similar to those occurring in blood vessels of a tissue under trauma. Indeed, the post-insertion bleeding episodes in women and in rhesus monkeys may be traumatic, and thus may involve a transitory histamine surge.⁹⁰ The significance of the increased oxygen level may be to dispose of such traumatically liberated histamine by oxidation. As pointed out before, histamine has been implicated in the mode of action of IUDs.⁶⁸

COMMENTARY

From a critical consideration of the currently available knowledge, it thus appears that an IUD prevents pregnancy by acting simultaneously and synchronously on several vulnerable points in the reproductive mechanisms. A similar *modus operandi* has been envisaged for the steroidal contraceptives (Pincus).³⁸ Further, it has been possible to achieve effective contra-

ception with some of the progestational steroids through a dissociable action on a particular point of impact; this is done by simple dosage manipulation." By such wilful dissociation the "load" on different points of impact may be evenly distributed during the prolonged periods of use of a contraceptive with minimization of chances of disruption of the homeostatic reproductive mechanisms. It may be possible to develop IUDs of suitable design and material in future which would act in such dissociable manner with better efficacy and minimum of side-effects. Further knowledge about their mode of action may help to realize such a possibility.

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71. MECHANISMS OF EXPERIMENTAL IMMUNO-INFERTILITY

S. J. Plank

*Department of Demography and Human Ecology,
Harvard School of Public Health, USA*

The urgent need for acceptable, effective, long-lasting methods of controlling fertility has focused increasing attention on the development of an immunological contraceptive. Although this possibility was once described by Prof. Parkes¹ as "The subject of much indifferent work over a long period", the prospects brightened more recently with the advent of Freund's type adjuvants which greatly enhance most immunological responses.²

Experimental work by Isojima *et al.*³ and Katsh⁴ with female guinea pigs demonstrated the potential for producing prolonged infertility by injections of homologous sperm emulsified with the complete adjuvant (mineral oil, emulsifier, and mycobacteria). Although these authors proposed several hypotheses, the mechanism of the observed reproductive impairment was not established. In order to progress to the stage where sperm immunization might even be considered for possible use in women, much more would have to be known about the specific processes responsible. The studies reported here were therefore designed to help assess a number of the potentially effective mechanisms.

In an initial study, I immunized 24 female pigs with sperm and complete adjuvant a single time intracutaneously, using the same dosage and procedures as those of Katsh. For controls, I injected another 24 with homologous liver and adjuvant while 24 more were left untreated. A month later a male was placed in each cage with one representative of each treatment group. Within the next 90 days, which allowed time for one oestrous cycle and gestation to term, there was no difference among the groups in the proportion delivering. Fertility was low in all of them. As time passed, however, 19 of the 20 control animals which had not delivered in the first 3 months eventually became pregnant, whereas there were only 7 pregnancies among the 13 animals injected a single time with sperm. By Fisher's exact test this is significant at the 0.01 level, and suggests that there may have been some long-term changes induced which did not correspond with the usual temporal curves of immunological response.

For the next series of experiments, I injected 32 animals with the complete adjuvant and sperm (SpC); an equal number of controls with complete adjuvant and 0.85% saline (Adj); and left a third group untreated (Un). Blood samples were taken 3 weeks after the injections and males were placed with the females one week after that. (For further details of materials and methods, see Plank *et al.*⁵).

Subsequent fertility, measured by the proportion of females delivering within 90 days, was the same for all groups after this first treatment (Table I, a). (The overall low fertility was later shown to have been due to the use of sawdust for bedding material during this time⁶.) But following a second injection, about 6 months after the first one, the number of SpC deliveries within the ninety-day period was considerably less than in the two control groups (Table I, b).

The 11 SpC animals which had delivered within 85 days, i.e. those apparently most resistant to treatment, were matched with equally fertile representatives of the other two groups and, along with the controls, were reinjected, bled, and placed with males on the same time schedule as before. Corresponding fertility is summarized in Table I, c, which shows another sharp decrease among the sperm immunized.

The animals were kept with males, and at the close of five months seven out of the eight surviving Adj. animals had delivered a second time, whereas only one SpC sow had had

Table 1. Fertility by treatment, number of injections, and time*

Group†	Proportion of females delivering within 90 days after:		
	(a) 1st injection	(b) 2nd injection	(c) 3rd injection
Un	15/32	23/31	10/11
Adj	16/32	21/31	9/10
SpC	18/32	12/31	5/11

*Injections given at days 0, 158 and 287; males placed with females 30 days after each injection.

†Un., untreated; Adj., injected with complete adjuvant and 0.85% saline; SpC., injected with complete adjuvant and sperm suspension.

another delivery, and that was a single birth. Thus, even in the absence of further immunologic stimulus, SpC fertility continued to decline.

These data confirm, of course, what others have shown: that repeated injections of homologous sperm with complete adjuvant can render a female guinea pig infertile. They also reveal that the process is protracted and the effect incomplete.

Among other tests to find out how the infertility was mediated, the blood samples taken 3 weeks after each injection were titrated by complement fixation for antibodies to sperm. The level of antibody did not correlate well with the degree of infertility. Although it rose sharply from a modal value of 160 after a single injection to 2,560 after a second, it then declined to 640 following the third and must have fallen even further in the succeeding months during which the fertility effect was almost total. (Arithmetic and geometric mean titres followed the same course as the mode. A reduced titre after a 3rd injection is characteristic of responses to antigens in complete adjuvant?).

Even though this lack of correspondence between titre and degree of infertility makes it seem probable that circulating antibody was responsible for the effect, titre against a specific antigen may have increased following repeated injections even as total antibody declined. Alternatively, there could have been a very slow transition from a 19-S macromolecular antibody to the smaller 7-S type as found by Rubenstein and Harter.⁸ Since 19-S does not pass the placental barrier while 7-S may, an analogous situation might account for late antibody being more effective even at a lower titre. Such a shift could possibly explain McLaren's results,⁹ but ultracentrifugation and selective inactivation tests showed that even the early antibody in this present study was of the 7-S type. Other qualitative changes (e.g. Blumer *et al.*¹⁰), however, have not been excluded, and not all antigen-antibody complexes fix complement.¹¹

If the infertility were dependent on circulating antibody of any type, however, it remained to be shown just how and where it acted. To ascertain this, all of the animals not being used for the third breeding test were kept under observation. Twenty of them were mated when found in heat, and then sacrificed at given periods after copulation. Surprisingly, it was found that in immunized females whose blood serum immobilized sperm almost instantaneously, the motility of sperm in the uterus was not diminished for as long as 9 hr. Within the Fallopian tubes of three of the four SpC animals examined, however, there were very few sperm encountered and all of these were non-motile even at 2.5 hr, in contrast to the great numbers of active sperm in the control groups. But there was one SpC animal in which the tube contained as many and as active sperm at 6 hr. as did any of the controls. This tube was occluded at the ovarian end by a large cyst. From this fortuitous experiment it seems that if the findings in the other SpC animals were due to an immunological immobilization, the antibody and/or complement required for this did not have their origin in the tubal secretions. At least one of these presumably came from the peritoneal fluid since complement fixation and fluorescent antibody tests against sperm revealed no specific antibody in liquid from the cyst or from mature follicles. Parenthetically, but of physiological importance, the finding of very few sperm in the tubes of sperm-immunized animals suggests that we should reconsider the concept that sperm motility "probably plays little part in their passage from the site of ejaculation to that of fertilization".¹²

Within the uterine cavities of the first few females I examined following copulation, it seemed that phagocytosis of sperm was initiated more promptly and vigorously in the immunized than in control animals. This was also found by Edwards¹³ and by Maruta and Moyer.¹⁴ However, there was a considerable overlap between my two groups, and some uncertainty in interpreting the finding since the uterus is normally flooded by white cells at the close of oestrus. Thus, differences in the timing of mating in relation to the end of heat could have accounted for the variation. Further complicating the evaluation of these observations is the tendency of oestrogen to enhance the leucocytic response to spermatozoa as shown by Marcus.¹⁵ Therefore, any side-effect of the immunization procedures which affected liver function (e.g. amyloidosis) might possibly accelerate phagocytosis within the uterus. Finally, however, even if sperm were cleared more rapidly from uteri of immunized animals, whether in response to specific antigen or not, it would not necessarily affect fertility. The process would probably be too slow to prevent enough sperm for fertilization from ascending the tube, and I saw no phagocytosis at that level.

I also sought for evidence of what Katsh¹⁶ has termed an "anaphylactoid" response, a contraction of the uterus on exposure to the antigen, which is quite readily demonstrable *in vitro*. I found no evidence of this *in vivo*. There was no expulsion of sperm and the immunized females appeared as comfortable and content in the post-copulatory period as any of the controls. On direct visual examination their intact uteri also appeared the same. The SpC animals had been immunized with vasal and epididymal sperm,⁵ however, and it could have been that the seminal plasma prevented effective contact of the antigen with the uterus. That this was not critical was shown by instilling epididymal sperm suspended in 0.85% NaCl either directly through the uterine wall of sperm-immunized animals or trans-cervically via a polyethylene catheter which then served as a manometer. No contractions were detected by these means either. Ashitaka *et al.*¹⁷ have reported similar results, but more recently, Manclark and Pickett¹⁸ demonstrated "anaphylactoid" reactions radiologically and histologically, in guinea pigs topically challenged with *B. abortus* after being sensitized by uterine infection. Thus, although systemic immunization with sperm was not found to result in post-coital uterine contractions, it seems that locally induced sensitization might do so. As for the possibility that immunological reactions within the uterus could interfere with nidation, Professor Shelesnyak's paper may give some insights.

The possibility that a pathological factor, rather than any specific immunological one, might have been responsible for the infertility was suggested by weight loss among the SpC animals, first noted at about 7 months. It progressed over time, with a greater proportion of that group being affected and with reductions exceeding 50% of previous levels in some cases. At necropsy these individuals had gross renal fibrosis which was also found in all other SpC members sacrificed 14 to 17 months after the first injection. The basic pathological process was determined to be amyloidosis which caused infarction with scarring.⁵ Amyloid was found in liver, spleen, and pancreas as well as the kidneys and affected all 21 SpC females examined. There were no such lesions in 18 Un animals, but there were in three of the 10 Adj. females examined.

Since a specific immunological mechanism had not been clearly established and a severe pathological process had been identified which could impair fertility, it was important to determine the respective roles of immunity and disease in producing the effect. The finding of amyloidosis in animals injected with the standard complete adjuvant and normal saline suggested that emulsions containing 10 times the usual quantity of mycobacteria (MbA, below) might consistently produce the tissue changes without concurrently inducing antibodies to sperm. Comparison of the subsequent fertility of such animals with that of sperm-adjuvant immunized ones could help clarify the respective roles played by specific immunological protection and by disease, *per se*, producing the infertility.

Such an experiment was carried out with 32 animals in each group. In addition to untreated controls a fourth group (SpI) was given sperm and the incomplete adjuvant (SpI) which differs from the complete adjuvant only in having no mycobacteria. Injections were given 4 times at 3 week intervals, and 10 days after the last injection males were placed with the females. After another week 3 representatives of each treatment group were sacrificed for tissue examinations. Following deliveries and weaning, about 10 months after the experiment

began, animals were again injected. Ten days later males were returned to the breeding pens for 18 days. Three more females from each group were removed for study on the seventh day after the boars were reintroduced. The effects of the treatments and of time on fertility is shown in Table II, *a*, where it is clear that even after four injections of the respective materials over the course of 3 months the proportion of females delivering is not different for the untreated and for those injected with sperm and incomplete adjuvant, sperm and complete adjuvant, or with saline and the fortified mycobacterial adjuvant.

Table II. Fertility by treatment, number of injections, and time*

Group†	Proportion of females delivering within 90 days after:	
	(a)	(b)
	Four injections	Five injections
Un	25/29	13/21
SpI	25/29	15/20
SpC	23/29	6/21
MbA	24/29	6/20

*Injections given on days 0, 21, 42, 63 and 303; males placed with females on days 73 and 313.

†Un., untreated; SpI., injected with sperm and incomplete adjuvant; SpC., injected with sperm and complete adjuvant; MbA., injected with saline and adjuvant containing 10 fold the standard quantity of *Mycobacterium butyricum*.

After the fifth injections and the passage of several months, however, there was a significant and equal degree of infertility among the MbA and SpC animals. Note that even after all these injections and time there was still no protection from pregnancy for the SpI females.

Although these findings tend to suggest that disease alone could account for all of the infertility and that immunological reactions to sperm may have added nothing, the histological evidence did not support this interpretation. The examinations revealed mild amyloid involvement of the spleen, the most sensitive organ, in all MbA animals after four treatments and heavy deposits after the fifth. This is consistent with a pathogenic infertility in these females. But there was no amyloid found in SpC sows after four injections and only a slight amount in one of three examined after five. (Because time is so critical in the development of this disease, I suspect that these animals, too, would have shown it if they had been examined 6-9 months later, like the others in the preceding experiment.) Since the MbA group had had at least as great a degree of tissue change after only four injections without any effect on reproduction, it seems that pathological processes alone cannot explain the SpC infertility, and that specific anti-sperm factors were probably involved. The evidence presented earlier suggests that sperm may have been immobilized in the tubes. Why this was not effective after the 3 months' course of four injections is puzzling, considering the potency of adjuvant vaccines. Was there a slow evolution of a different sort of antibody molecule? or perhaps some interplay of antibody and pathology? These are among the many questions which remain unresolved in the study of immuno-infertility.

In summary, female guinea pigs became infertile after repeated injections of homologous sperm and complete adjuvant over a period of months, but this hyperimmunization led eventually to amyloidosis as well as apparent immobilization of sperm in the tube. When the emulsions contained more mycobacteria and no sperm, infertility was produced in association with amyloidosis. When the emulsions contained sperm and no mycobacteria, there was no effect. However, in those given sperm and complete adjuvant the infertility preceded histological evidence of amyloidosis. Thus, although the precise mechanism of experimental immuno-infertility has not yet been established, the method is delayed and incomplete in its effect and, at least in this species, hazardous. These factors limit its prospects for potential human use, in my opinion, and in competition with rapidly developing chemical and mechanical contraceptives, sperm immunization seems unlikely to be of any practical significance in meeting the urgent need for better methods of fertility control.

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Session 14

UTERINE PHYSIOLOGY AND IMPLANTATION

72. THE ECOLOGY OF NIDATION

M. C. Shelesnyak and C. J. Marcus

*Department of Biodynamics, Weizmann Institute of Science,
Rehovoth, Israel*

Nidation is considered to be a process which begins with coitus and ends with the implanting of the egg. This definition, while simple and adequate to define the temporal limits of the process as well as to indicate that ovum-implantation is only the final event in the process, is inadequate to describe the complexity and nature of all the multifarious events comprising nidation. Nidation, in fact, involves a sequence of interdependent events which include transport of semen up through the uterus, transport of ova down the Fallopian tubes and, concurrently, modification of the tubal and uterine milieu, in order both to facilitate zygote transport and produce a suitable environment for the implantation of the fertilized ovum.

In our study of nidation, we have found it convenient to divide arbitrarily the sequence of events which characterize nidation into several episodes or phases according to the dominant or salient influences affecting the uterus and/or ovum and their interaction.¹ Division of the sequence into functional episodes aids in the formulation of experimental approaches to the study of the phenomena involved by providing foci for attention. This compartmentalization also aids in the collation and integration of innumerable diverse pieces of information; in short, it becomes easier for us to design experiments and to relate findings to theories. One consequence of this approach is to consider the totality of ovum-uterus relationships as part of an ecological system: the fertilized ovum is an independent organism interacting with its environment, the oviduct at first, then the uterus. Since ecology has been defined as the study of the inter-relations between organisms and the physical and biological components of their environment, we may then view the phases of nidation as periods in which certain ecological factors dominate. As a corollary to this view, the ecological factors in nidation, being amenable to manipulation, become targets for attack in order to upset the ecological equilibrium and hence permit control, ultimately, of implantation.

As mentioned, we find it convenient to separate nidation into several phases. These are: one, priming of the uterus; two, sensitization; three, stimulation and induction; four, decidualization; finally, five, implantation. Priming, the first phase, begins just before prooestrus and includes the period of mating and ovulation, lasting for two to three days and merging or overlapping with sensitization, the second phase. Sensitization lasts about four days and ends about the time the fertilized ovum enters the uterus. The phase of sensitization produces the third phase, that of uterine sensitivity, in which stimulation occurs and induction takes place. Induction begins with the stimulation of endometrial transformation and continues as more stromal cells are involved or affected by the transformation. Induction initiates the fourth phase, decidualization, which begins with the appearance of transformed stromal cells and continues during the rest of the period under consideration on to placentation. The decidual tissue becomes the maternal component of the placenta. The fifth phase, implantation, occurs during the early stages of decidualization, and includes penetration of the nidus and envelopment of the blastocyst.

Each of these phases is governed or characterized by certain crucial features such as hormonal action by circulating or tissue hormones, nervous stimulation or chemotactic influences. Priming is characterized by oestrogen predominance, the stimulation associated with coition and the deposition of semen in the uterus. The phase of sensitization is introduced by the appearance of infiltrating leucocytes in the uterus, which is followed by storage of histamine in the uterus and a second period of oestrogen action. The phase of stimulation and

PREVIOUS⁴⁰⁹ PAGE BLANK

induction is characterized by entry of the blastocyst into the uterus, shedding of the zona pellucida and histamine release in the uterus. Decidualization exhibits a specific dependence on a continuing supply of progesterone, and is characterized by rapid growth and organization of tissue concomitant with the emergence of new metabolic activities. The final episode of nidation, implantation, is characterized by immobilization of the blastocyst, trophoblastic penetration of the decidual nodes and engulfment of the blastocyst. These features are salient because of their indispensability to the success of nidation, no less than because, as critical ecological factors, they are targets for manipulation, permitting interruption of nidation and therefore provide means of control of pregnancy.

Now let us examine each phase with respect to the inter-relationships which modify or modulate the biotope, that is, the fertilized ovum in its changing environment.

The first-phase, priming, is characterized by the predominance of oestrogen secreted at prooestrus. This oestrogen, which we regard as strictly equivalent to classically described priming oestrogen, acts not merely as aid to progesterone in establishing a progestational uterus, but, in fact, stimulates turnover of uterine components and the formation of new elements, elements which confer on the uterus the potential to respond to sensitization and consequently to induction stimuli.^{2,3} These new elements furnish a target for manipulation since they also confer upon the uterus susceptibility to specific inhibition of decidualoma induction by local treatment with antihistaminic drugs. Such treatment is effective only if instituted after priming has occurred, since the elements which are essential for the uterine response to the stimuli of induction are formed in response to priming and can therefore be blocked only after their appearance.⁴

At the same time, priming oestrogen also stimulates infiltration of the uterus by eosinophilic granulocytes.⁵⁻⁸ This in addition is the beginning of sensitization. Infiltration is greatly amplified, if coitus occurs, by other leucocytes, lymphocytes and monocytes.⁹⁻¹¹ Although the function of such cells with respect to nidation is only conjectural,¹² their appearance in tissue is associated with the accumulation of histamine.^{13,13a} In the uterus, histamine accumulates only when coitus has occurred (i.e. when insemination has taken place).¹¹ Experiments have shown that availability of histamine is an essential to decidualization since ovum implantation and decidualization are impaired or abolished in the animal depleted of histamine.¹⁶ Although the infiltration by migratory cells is associated, among other functions, with making histamine available, the presence of lymphocytes among infiltrating cells¹⁵ is at least suggestive that an immunological sensitization takes place in the uterus during the phase we call sensitization because it is well established that lymphocytes are associated with immunological sensitization and cellular immunity.^{13,17-19} Indeed, the resemblances are manifold, viz. the inflammatory response of uterus to mating, i.e. introduction of foreign body,²⁰⁻²¹ and release of accumulated histamine when the sensitized uterus is challenged by re-exposure to the antigen (in the blastocyst) after a 5-day period of sensitization. In fact, the semen of all species studied contains extremely powerful antigens,^{22,22a} and antibodies to them have been demonstrated in the endometria of some species.²³ Greater success in the implantation of transferred blastocysts is achieved when the host has been made pseudo-pregnant by sterile mating rather than by mechanical or electrical stimulation.^{21,25} This success, in part, may depend on immunological sensitization, resulting from the introduction of seminal plasma into the uterus by mating with vasectomized males.

In one sense, we are proposing an immunological sensitization, but in using the term sensitization to describe a phase of nidation, we refer more generally to all the influences which make the uterus responsive to the induction stimuli. In this sense, the sensitization of the uterus is completed with a second period of oestrogen action, the oestrogen surge, which occurs 4 to 5 days after the onset of priming.²⁶ The induction, the transformation of the elements of the endometrium into decidual tissue, i.e. decidualization, can be achieved only after the oestrogen of the oestrogen surge has acted upon the primed uterus. If the surge be prevented, decidualization, and hence implantation, is thwarted. The oestrogen surge can be blocked by removal of the source of the central stimulus to the ovary, e.g. the pituitary, prior to the release of gonadotrophins which stimulates the ovary,²⁷ or by removal of the ovary prior to its response to gonadotrophin,²⁸ i.e. before the release of the surge-oestrogen; also pharmacological agents may be used to prevent release of the oestrogen^{29,29a} or to antagonize

its action on the uterus.²⁸ If, by whatever means, surge-oestrogen is prevented from acting upon the uterus, the blastocyst enters a state of suspended animation and can be induced to implant only if oestrogen is supplied to complete the preparation and sensitization of the uterus for decidual induction.²⁹ The nature of the primary stimulus for decidualization, delivered by the denuded blastocyst, is unknown, although it may involve lytic action, a specific chemical mediator or an antigen-antibody reaction. The possibility of the latter mechanism is supported by the observations discussed in relation to effects of seminal plasma on the uterus and also by the demonstration of extranuclear inclusions of male origin, i.e. sperm or sperm fragments in or on a blastocyst.³¹ Whatever the nature of the stimulus delivered by the blastocyst, the first response in the uterus is histamine-release.

As mentioned previously, the availability of histamine for release is an indispensable requirement for the induction of decidualization. Moreover, if the action of histamine be prevented, e.g. by the use of pharmacological antagonists to histamine, induction, hence decidualization, and ovum-implantation is frustrated.³² In the absence of the blastocyst, the primary stimulus may be replaced by any means of supplying adequate amounts of histamine to the uterus and deciduomata, which are analogues of the decidua, the maternal components of the placenta, in response.

With the development of decidual foci in the uterine stroma, nidus formation, that is, preparation of the nest for receiving the blastocyst, is completed and implantation occurs by penetration of the nidus and by envelopment of the blastocyst by decidual tissue.

Throughout the succession of interactions outlined, a constant feature of the uterine environment is progesterone, secreted continuously by the corpora lutea, following ovulation and the stimulus of mating. The dependency on progesterone with respect to support for growth, differentiation and maintenance of the decidual tissue has been established,^{33,34} although, during the predecidual phases, there appears to be no direct influence of progesterone on the uterus or ovum. Nevertheless, progesterone is essential for the maintenance of the feedback affecting central control of pituitary secretion which, in turn, controls patterns of ovarian secretion. Interruption of progesterone-dependent feedback, achieved by pharmacological interference³⁵ or by extirpation of the corpora lutea³⁶ or even by altering the environmental conditions of the corpora lutea by autotransplantation,³⁷ is followed quickly by resumption of the non-pregnant cycle.

Although in the foregoing exposition, we have described phenomena occurring in the rat, the available evidence suggests an almost point-by-point congruence with nidation in the human species. In casting an overall glance at the process of nidation, we have described a sequence of events and interactions as ecological parameters and as vulnerable foci and therefore as targets for manipulation in order to achieve control of human fertility. We may, therefore, seek possible means of fertility control by interference with any one of the many factors upon which implantation depends during any of the several phases of nidation which precede implantation. By selection of the parameter to be modified, the duration of the period for which nidation is prevented may also be selected.

In 1955, at the Vth International Conference of the IPPF, at Tokyo, the late Warren Nelson discussed aspects of the reproductive processes which may provide points of attack for achieving fertility control. Although implantation was listed among such points, it was not considered promising, mainly because of our relative ignorance of the nature of the process. At the same conference, some of our early work on nidation was discussed and it was predicted "that an understanding of the mechanism of implantation may be of key importance as a focus of attack for fertility control".³⁸ Now, a dozen years later, we have amassed a body of information which permits the formulation of a general theory and treatment of the process as an ecological phenomenon. The insights thus acquired have engendered tremendous activity in attempting to block nidation, as a means of conception control. Pincus, in his monograph, "Control of Fertility"³⁹ and, more recently at the Sixth Pan American Congress of Endocrinology,⁴⁰ has devoted much attention to the inhibition of implantation, as has Jackson in his recent book.⁴¹ Walpole,⁴² Mayer,⁴³ and Duncan⁴⁴ and their co-workers have been studying new compounds designed to interfere with nidation by specific intervention between interactions essential to nidation, mainly hormonal, e.g. oestrogen, progesterone and gonadotrophins. At least one natural product, ergocornine, is being subjected to clinical trials

to test its effectiveness in interrupting nidation in the human. Thus current events give proof of the usefulness of an ecological framework for design of control mechanisms.

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73. MECHANISM OF ANTI-IMPLANTATION ACTION OF ANTI-OESTROGENS

M. R. N. Prasad and S. P. Kalra

Department of Zoology, University of Delhi, India

Inhibition of fertility by post-coitally effective antifertility agents may be accomplished by compounds which affect one or more of the following steps in early pregnancy, namely (a) early development of zygote (b) tubal transport and (c) implantation. The first two processes may be interfered with by compounds which are cytotoxic or which are oestrogenic in nature.^{1,2} Steroidal and non-steroidal compounds with inherent pro-oestrogenic or oestrogenic activity cause the failure of pregnancy by accelerating the passage of ova through the fallopian tube and result in their elimination from the uterus.³⁻⁸ High doses of oestrogens may also cause tube locking of the ova resulting in their degeneration.^{9,10}

Implantation marks a critical phase in the development of the mammalian blastocyst. This is an event which is regulated by a closely co-ordinated series of changes in the uterus and blastocysts initiated by hormones. The sequential action of oestrogen and progesterone and other hormone-dependent physiological processes characterize the pre-implantation period. Any interference with these processes renders the internal milieu of the uterus hostile to the implantation of blastocysts. In the search for post-coitally effective anti-implantation agents attention has been paid to compounds which either interfere with the action of progesterone (anti-progestins) or of oestrogens (anti-oestrogens).

The hormonal requirements for the survival of blastocysts and the initiation of implantation have been elucidated in the rat, rabbit, hamster and guinea pig. Implantation of blastocysts occurs on day 5-6 in the rat. The delay in the implantation of blastocysts during lactation and the induction of delay by experimental methods in the rat have shown that progesterone inhibits the development and implantation of blastocysts while oestrogen initiates the process of implantation.^{11,12} Shelesnyak and his associates¹³⁻¹⁵ postulate that implantation of blastocysts during normal pregnancy in the rat is initiated by a short pulse or surge of oestrogen occurring on day 3 following mating. This oestrogen causes the release from the uterine mast cells of histamine which sensitizes the endometrium for decidualization. However, in the rabbit¹⁶⁻¹⁸ and hamster¹⁹ progesterone appears to be the only hormone sufficient to ensure the implantation of blastocysts. In the guinea-pig, however, nidation occurs in the absence of exogenous progesterone.²⁰ It therefore appears obvious that the rat is the most suitable species to study the anti-implantation action of anti-oestrogenic compounds, since it is the only species in which definite evidence is available for the oestrogen-dependence of implantation mechanisms.

Of the many anti-oestrogenic compounds which have been tested for their anti-implantation action (Table III) are dimethylstilboestrol (DMS), a derivative of the synthetic oestrogen stilboestrol;²¹ ethamoxytriphetol (MER-25), and clomiphene (MRL-41), derivatives of chlorotrianisene, a synthetic oestrogen;^{1,22-28} a diphenyl-dihydronaphthalene derivative-U-11100A;^{2,29-33} a diphenylindine-U-11555A;^{25,30,31,34,35} an oxazolidine-thione-U-11634;^{36,37} the pyrrolidine derivative-CN-55, 945-27³⁸ and a furanostrenone.³⁹

The dihydronaphthalene, U-11100A = 1-{2-[p-(3,4-dihydro-6-methoxy-2-phenyl-1-naphthyl) phenoxy] ethyl}-pyrrolidine hydrochloride inhibits pregnancy when administered orally during the first 4 days of pregnancy in rats, guinea-pigs, and rabbits.²⁹ This compound is oestrogenic as well as weakly anti-oestrogenic.¹ The anti-implantation action of U-11100A may be due to acceleration of egg transport through the oviduct and uterus, which is an expression of its oestrogenicity.^{1,2,33} Administration of U-11100A to Provera-treated rats at

antifertility doses does not interfere with survival of blastocysts or with subsequent oestrogen-induced implantation or the capacity of blastocysts to implant in the new host. Simultaneous administration of U-11100A along with oestrogen inhibited the expected oestrogen-induced implantation, a result which indicates a transient anti-oestrogenic action of the compound interfering with an oestrogen-sensitive step in implantation.³¹ Schlough and Meyer³⁶ showed that U-11100A suppresses the trauma-induced decidual cell response in pseudopregnant rats and postulated that this effect may be due to the antihistaminic activity of the compound.

The diphenylindene U-11555A, 2-(6-methoxy-2-phenylinden-3-yl)-phenoxy-triethylamine hydrochloride, is an orally active antifertility agent which appears to be devoid of frank oestrogenic activity but is anti-oestrogenic in the inhibition of uterine enlargement and vaginal response to exogenous and endogenous oestrogen.³¹ It inhibits pregnancy in the rat when administered during the pre-implantation stage. Chang²¹ showed that U-11555A accelerates egg transport in some rabbits but causes retention of eggs in tubes in others, a paradoxical effect which is similar to that occurring after injection of oestradiol cyclopentyl-propionate.¹⁰ When administered to Provera-treated rats in which implantation of blastocyst has been delayed, U-11555A has no effect on the survival of blastocysts or on subsequent oestrogen-induced implantation. However, concomitant administration of the compound with oestrogen prevents oestrogen-induced implantation, indicating a specific anti-oestrogenic effect under these conditions.³¹ The compound may also be antihistaminic in inhibiting trauma-induced decidual cell reaction.³²

Two related compounds which have been extensively studied for their anti-fertility effects are clomiphene (MRL-41: 1-[P(β -diethylaminoethoxy)-phenyl]-1,2-diphenyl-2-chloroethylene and ethamoxytriphetol (MER-25); 1-(P-2-diethylaminoethoxy phenyl)-1-phenyl-2p-methoxyphenyl ethanol). These compounds are derivatives of the non-steroidal synthetic oestrogen, chlorotrianisene. The detailed biochemical studies relating to the anti-oestrogenic activity of these compounds have been described by Lerner.¹⁰

MER-25 is a potent anti-oestrogen with little or no oestrogenic activity.¹ High doses of MER-25 hasten the lysis of fertilized ova in the oviduct of rats and rabbits.^{22, 23, 41} Since this compound shows oestrogenic activity in the high dose ranges at which these results were achieved it appears that the antifertility effects under these conditions might be due to the oestrogenicity of the compound.¹ However, Shelesnyak, Kraicer and Zeilmaker¹⁵ administered, in a single injection, MER-25 prior to the oestrogen surge and prevented decidualization and subsequent nidation, an effect due to the antioestrogenic activity of the compound.

The antifertility effects of clomiphene have been studied by a number of workers who have suggested the possibility that the failure of implantation may be due to a direct blastotoxic action of the chemical.^{26, 27, 12} Chang²¹ postulated that the anti-fertility effects of clomiphene may be due to expulsion of ova and blastocysts from the uteri of clomiphene-fed animals. The mechanism of anti-implantation action of clomiphene has been investigated in detail by Kaira^{28, 43} in experimentally induced delayed implantation by ovariectomy and progesterone administration. These results are summarized in Tables I and II.

The data shown in Table I demonstrate clearly the elimination of blastocysts from the uterus following clomiphene administration. A marked reduction seen in the percentage of rats showing blastocysts and in the average numbers of blastocysts recovered from the uteri depend on the increase in dose and time interval allowed for action of the compound. The recovery of normal average numbers of blastocysts from a higher percentage of rats in which the uteri were ligated prior to clomiphene treatment indicate that the blastocysts were possibly being expelled from the uteri of non-ligated clomiphene-treated animals. Similar results of accelerated passage of ova following clomiphene treatment have been reported by Davidson, Schuchner and Wada.¹¹ This effect may be due to the oestrogenicity of the compound. Schlough and Meyer³² noticed a few implantation sites following the administration of 0.3 mg./kg. of clomiphene during delayed implantation and attributed this to the oestrogenic action of the compound; Kalra¹³ and Prasad and Kalra²⁸ were, however, unable to obtain similar results using the same dose of clomiphene under similar experimental design.

Table II shows the results of experiments to determine if the morphologically normal blastocysts forcibly retained in the uterus of clomiphene-fed rats would implant following oestrogen treatment. Initiation of oestrogen even within 6 hr after clomiphene treatment

Table I. Effect of clomiphene on blastocysts

Group	Additional treatment*	No. of rats	Day of autopsy	Rats with blastocysts (%)	Blastocysts/rat
1.	No treatment	8	9	100	4.0 ± 0.72
2.	Clomiphene on day 9	8	10	100	3.8 ± 0.47
3.	Clomiphene on days 9-10	8	11	37.5§	3.6 ± 1.3
4.	Clomiphene on days 9-10-11	8	12	37.5§	2.0 ± 0.05†
<i>Uterine horns ligated on day 9</i>					
5.	Olive oil on days 9-10	16	11	68.7	3.6 ± 0.44
6.	Clomiphene on days 9-10	8	11	75.0	3.8 ± 0.87
7.	Clomiphene on days 9-10-11	8	12	75.0	4.0 ± 0.68

*Rats ovariectomized on day 3 of pregnancy and treated with 4 mg./day of progesterone from day of ovariectomy until autopsy.

†p < 0.05 (comp. group 1).

§p < 0.01 (comp. groups 1-2). Variation in percentage in groups 5, 6 and 7 (p > 0.05).

Dosage: clomiphene 0.3 mg./kg./day.

Table II. Effect of clomiphene on implantation of blastocysts

Group	Additional treatment*	Oestradiol (time of initiation after first feeding of clomiphene or oil) hours	No. of rats	Day of autopsy	Rats with implant. sites (%)	Implant. sites/rat
1.	Olive oil on days 9-10-11	72	8	17	75	3.8 ± 0.67
2.	Clomiphene on day 9	6	6	14	16.6†	4.8
3.	Clomiphene on days 9-10	24	5	15	0.0	—
4.	Clomiphene on days 9-10-11	48	4	16	0.0	—
<i>Uterine horns ligated on day 9</i>						
5.	Olive oil on days 9-10-11	72	11	17	63.6	3.7 ± 0.43
6.	Clomiphene on day 9	6	6	14	0.0	—
7.	Clomiphene on days 9-10	24	6	15	0.0	—
8.	Clomiphene on days 9-10-11	48	7	16	0.0	—

*Rats ovariectomized on day 3 of pregnancy and treated with 4 mg./day of progesterone from day of ovariectomy until autopsy.

†p < 0.01 (comp. group 1).

Dosage: Clomiphene 0.3 mg./kg./day. Oestradiol 1 µg./day.

resulted in the failure of oestrogen-induced implantation. Normal numbers of implantation sites were seen in the control group comparable to the numbers of blastocysts recovered from the uteri. The blastocysts recovered from the uteri of clomiphene-fed rats were viable as shown by their implantation when transferred to the uteri of pseudopregnant rats.⁴⁵ The failure of oestrogen-induced implantation in clomiphene-fed rats may perhaps be due to its effects on the uterus. Clomiphene has been shown to compete with oestrogen for binding sites in the uterus thus preventing the uptake and action of oestrogen injected subsequently.^{46,47,48} It is possible that a similar anti-oestrogenic action manifest even within 6 hr. of a single administration of clomiphene prevents the action of oestrogen injected subsequently. The role of oestrogen and oestrogen-mediated histamine release as a prerequisite to the sensitization of the gravid uterus for decidualization and nidation has been postulated by Shelesnyak.¹³ Schlough and Meyer³⁵ suggested that the suppression of decidual cell reaction in the uterus by clomiphene may be due to its antihistaminic activity. The inhibition of oestrogen-induced implantation even within 6 hr. following the administration of clomiphene

suggests that clomiphene, acting like an anti-oestrogen and/or anti-histamine, may be bound with the receptor sites in the uterus preventing the further stimulation of uterus by oestrogen administered subsequently. On the basis of these observations, Kalra,⁴³ and Prasad and Kalra²⁸ postulated that the anti-implantation action of clomiphene may be due to (a) increased motility of uterus resulting in expulsion of blastocysts, (b) the anti-oestrogenic and/or anti-histamine activity of the compound which prevents preimplantation changes in the uterus normally initiated by exogenously administered oestrogen.

U-11634: 5-(*a-a-a*-trifluoro-*m*-tolylloxymethyl)-2-oxazolidinethione.³⁶ This compound effectively inhibits pregnancy in rats and mice following parenteral or subcutaneous administration. The drug is as effective when administered to rats on day 4 (day 1 is the day when sperms are found in the vagina) as treatment for the first 7 days of pregnancy. The compound is not blastotoxic and is not oestrogenic or anti-oestrogenic.³⁶ Deciduoma formation is inhibited by the compound but the effect is not reversed by progesterone or oestrogen administered simultaneously in ovariectomized, pseudopregnant rats with traumatized horns. Duncan, Cornette, Lyster, Northam and Wyngarden³⁷ showed that in inhibiting decidual cell response, U-11634 does not affect the uptake of labelled oestrogen or progesterone by the traumatized uterus; however, it inhibits the uptake of ³²P into DNA, RNA and protein. Duncan *et al.* postulate that inhibition of nidatory processes may be involved in the anti-implantation action of the compound. The specific inhibition of pregnancy following a single administration of the compound on day 4 *p.c.*, at the time of the expected oestrogen surge may be due to an interference with an oestrogen-dependent RNA and protein synthesis which occurs during decidualization. It is of interest that the compound is not effective in inhibiting pregnancy in the hamster, a species in which implantation is not dependent on oestrogen.

Furanestrenone: Estr-4-ene-3-one-spiro-17 α -2' (tetra-hydrofuran), Bialy, Merrill and Pincus.³⁹ The compound is weakly uterotrophic but inhibits oestrogen-induced carbonic anhydrase activity. It is also antiprogesteronal. The antifertility and anti-implantation actions of this compound have not been tested.

CN-55945-27: (1-[2-(*p*-[*a*-(*p*-methoxyphenyl)- β -nitrostyryl] phenoxy) ethyl] pyrrolidine, mononitrate). This is a non-steroidal compound which is anti-oestrogenic in inhibiting uterine responsiveness to oestrogen. It inhibits pregnancy when administered prior to day 5 *p.c.* Though the compound inhibits implantation, it has apparently no blastotoxic effects. The administration of CN-55945-27 to Provera-treated rats in which implantation of blastocysts was delayed was compatible with the survival blastocysts and oestrogen-induced implantation. However, the compound itself induced implantation in some of the delayed rats, indicating its oestrogenicity. The observation that CN-55945-27 blocks uterine responses to endogenous oestrogen and that it inhibits decidual cell response in intact adult rats indicates that the inhibition of implantation mechanisms may be due to antagonism to endogenous oestrogen.³⁸ The fact that the compound can itself induce implantation in delayed rats, like an oestrogen, indicates that the inhibition of decidual cell response may also be due to the oestrogenicity of the compound in a manner similar to the action of oestrogens in inhibiting the decidual cell response.¹⁸ The compound stimulates the release of LH secretion. It is possible that LH by its luteolytic action in the rat may lower the levels of progesterone and thereby interfere with the responsiveness of the uterus to implantation of the blastocysts.

The anti-implantation action of the antioestrogens studied so far show that their effects may be due to one or more of the following mechanisms:

(a) The compounds may increase the motility of the fallopian tube and the uterus resulting in the expulsion of the ova and blastocysts (DMS, MER-25, MRL-41, U-11100A, U-11555A).

(b) The compound may be cytotoxic and affect the viability of the ova and blastocysts (MER-25).

(c) By their anti-oestrogenic action they may inhibit the uptake of oestrogen by the uterus and interfere with the decidual cell response (MER-25, MRL-41, U-11555A, CN-55, 945-27).

(d) By their antihistaminic activity they may inhibit the oestrogen-induced histamine action on the uterus and subsequent decidualization (U-11555A, MRL-41, U-11100A).

(e) They may inhibit the decidual cell response by blocking the oestrogen-dependent

Table III. Biological activities of anti-oestrogens

Compound	Vaginal response		Uterotrophic response		Inhibition of uptake of labelled oestrogen	Inhibition of decidual cell reaction	Inhibition of oestrogen-induced physiological processes	Antifertility effects			Effects on blastocysts delayed implantation		Mechanism of action§
	Stimulation	Inhibition	Stimulation	Inhibition				Days 1-3	Days 4-6	Blasto-toxic	Drug followed by oestrogen	Oestrogen drug	
Dimethyl stilboestrol (DMS)	+	+	+	+	NI	+	NI	+	+	-	NI	NI	a
Dihydro-naphthalenes U-11100A	+	+	+	+	+	+	NI	+	+	-	I	NS	a, d
Diphenylidine U-11555A	+	NI	+	+	NI	+	NI	+	+	-	I	NS	a, c, d
Ethamoxy triphetol MER-25	-	+	±	+	+	+	+	+	+	±	NS	NS	a, b, c
Clomiphene* MRL-41	+	+	+	+	+	+	+	+	+	-	NS	NI	a, c, d
Oxazolidine thione U-11634	-	-	-	-	-	+	+	-	+	-	I	NI	e
CN-55945-27†	-	-	+	+	NI	+	+	+	+	-	I	NS	c, f

NI Not investigated. — Negative. + Positive. § a-f see text, pp. 416, 418.

NS No implantation sites.

I Implantation sites present.

*Schlough and Meyer²⁵ obtained a few implantation sites after drug treatment alone.

†Implantation sites in some rats after drug treatment alone.

enzyme activities (MER-25) or oestrogen-dependent DNA, RNA and protein synthesis (U-11634).

(f) The compound may enhance the secretion of LH which causes luteolysis; the lowered progesterone level may then interfere with implantation (CN-55, 945-27).

The varied effects of the compounds tested lead to the question: what is an anti-oestrogen? Lerner⁴⁰ defined a hormone antagonist as a "compound that inhibits the activity of a hormone at one or more sites without regard to the route of administration or the dose employed". The methods used for the evaluation of the anti-oestrogenic activity of compounds are: (a) the inhibition of uterine weight or vaginal response to endogenous or exogenous oestrogen, (b) inhibition of oestrogen-induced enzyme activity or (c) inhibition of uptake of radioactive oestrogen by the uterus. The biological activities of some compounds listed in Table III satisfy these criteria while others may not be antioestrogenic by the same criteria. Some compounds inhibit oestrogen-induced biochemical events like the antihistaminic activity^{25,35} or oestrogen-dependent DNA, RNA and protein synthesis without exhibiting other anti-oestrogenic responses.³⁷ It would therefore be necessary to consider these parameters also in determining the anti-oestrogenic action of a compound in relation to its anti-fertility or anti-implantation action.

A number of anti-oestrogens, particularly the dephenylindene derivatives U-11100A, U-11555A and the oxazolidinedithione U-11634, which inhibit implantation mechanisms in the rat (which requires oestrogen for implantation) are ineffective in inhibiting pregnancy in hamsters, a species which is not dependent on oestrogen for implantation. These results highlight the limitation of such studies and emphasize the hazards in extrapolating them to the primates. It would be desirable to test them in monkeys about which much more basic information needs to be obtained concerning hormonal factors regulating implantation.

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74. THE ANTIFERTILITY PROPERTIES OF STILBENE AND BIBENZYL DERIVATIVES

C. W. Emmens

Department of Veterinary Physiology, University of Sydney, Australia

In laboratory animals, oestrogens readily cause failure of pregnancy when given after mating. They disturb transport in the Fallopian tubes, prevent nidation of the ovum if given after normal tubal transport, and cause failure of development if given after nidation. Yet oestrogen is probably needed, at least in some species such as the rat and mouse, for implantation to occur,¹ and it is thus wrong timing or an excess of oestrogen which may be supposed to cause its failure. If oestrogen is needed, then anti-oestrogens should also produce failure of implantation, and perhaps failure of normal tubal transport. Many anti-oestrogens in fact prevent early pregnancy, but there are doubts about the mechanism by which the majority act; since they are often oestrogenic (or pro-oestrogenic) at higher dose levels than their anti-oestrogenic level, they may be acting only as oestrogens. This seems to be true of dimethylstilboestrol (DMS, Fig. 1—cf. Emmens²), while the non-oestrogenic anti-oestrogen, 17 α -2'-methallyl-retrotestosterone (SAP 104, Fig. 2—cf. Emmens, Miller and Owen)³ perhaps significantly, does not interrupt nidation although it prevents oestrous behaviour in the mouse. At any rate in the stilbene or bibenzyl (hexoestrol-like) series of compounds, pro-oestrogenic, anti-oestrogenic and antifertility properties seem to be closely related.

It does not follow, however, that antifertility activity cannot be divorced in such series from oestrogenic or anti-oestrogenic activity, and the ratios of one to the other are known to vary quite widely.^{4,5} For this reason it was felt profitable to investigate compounds bridging

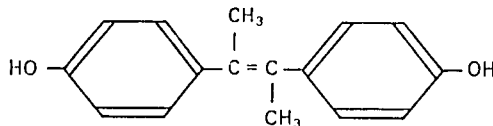


Fig. 1. *trans*-DMS.

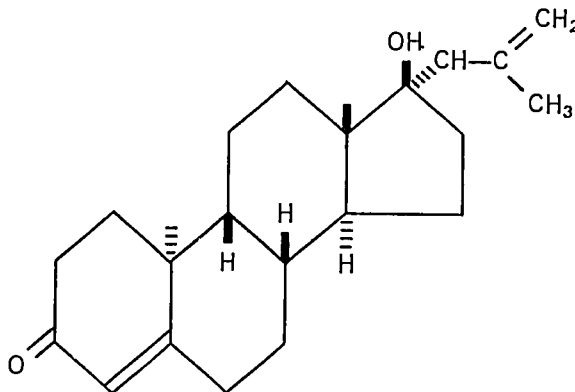


Fig. 2. SAP 104.

DMS and the well-known MER 25 (Fig. 3). DMS is a moderately potent pro-oestrogen with an MED of *ca.* 60 μg , a potent local anti-oestrogen with an intravaginal MED against oestradiol of *ca.* 0.2 μg , and a moderately potent antifertility agent with a daily MED of *ca.* 50 μg , all in the mouse. MER 25 is a very weak oestrogen giving no clear responses in the mouse in vaginal smear tests, but tetrazolium reduction at 1–2 mg, and an MED of 40 mg in the rat in vaginal smear tests, a weak anti-oestrogen with local and parenteral activity at 1–2 mg in the mouse, and a weak antifertility agent, again at 1–2 mg per day, *post coitum* in the mouse. In general its actions are so weak that it is difficult to investigate them satisfactorily. It was thought that intermediates between DMS and MER 25 might well have interesting activities, and these were made in the departmental laboratories.

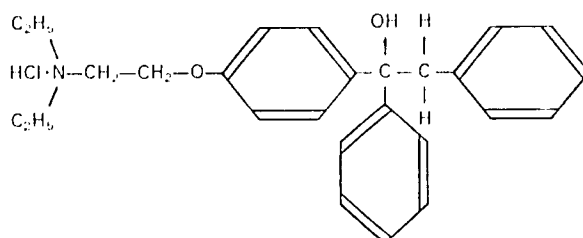


Fig. 3. MER 25.

So far, about 40 such compounds have been investigated in sufficient detail for a brief report, testing with an upper limit of 1 mg in the mouse. Of these, six showed oestrogenic activity, all at the 1 mg level and not below it, while the same six compounds varied in local anti-oestrogenic activity from 3 μg to 1 mg, none showing such activity by injection. Four of the same compounds displayed antifertility activity, at daily doses of from 0.2–1.0 mg, while no other compound in the series showed antifertility properties. Oestrogenic and anti-oestrogenic activities were not closely related, and numerous other compounds in the series showed antioestrogenic activity alone. The results for the six compounds mentioned are shown in Table I, and the coincidence of oestrogenic with antifertility activity in this series of course strongly suggests that MER 25 and the intermediates, like DMS, show antifertility action because they are oestrogens, although some variation in the ratio of oestrogenic to antifertility potency is seen.

There seemed no advantage in the more complex type of molecule, so our investigations into the simpler bibenzyls were intensified, as we had evidence of some interesting properties.

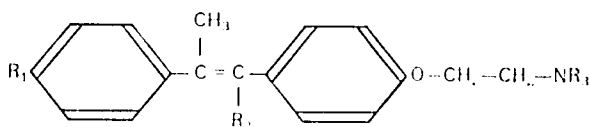


Table I. Activities of some compounds linking DMS and MER 25

R_1	R_2	R_3	Substance	Approx. MEDs (μg)		
				Oestrogenic (<i>s.c.</i>)	Anti- oestrogenic (<i>i.v.</i>)	Anti- fertility (<i>s.c.</i> per day)
OH	CH_3	$(\text{C}_2\text{H}_5)_5$	H-334	1,000	6	> 1,000
OCH_3	CH_3	$(\text{C}_2\text{H}_5)_5$	H-336	1,000	30	> 1,000
OCH_3	CH_3	$(\text{C}_2\text{H}_5)_4$	H-315	> 1,000	100	> 1,000
OCH_3	PhOCH_3	$(\text{C}_2\text{H}_5)_2$	H-282	1,000	<i>ca.</i> 1,000	<i>ca.</i> 100
H	PhOCH_3	$(\text{C}_2\text{H}_5)_2$	H-286	1,000	100	<i>ca.</i> 100
OH	CH_3	$(\text{C}_2\text{H}_5)_2$	H-298*	1,000	3	<i>ca.</i> 200

*An *erythro*-bibenzyl, not a stilbene derivative, like the rest.

Separation of stereoisomers has sometimes been possible, and according to the nature of the compound a member of this series may exist as:

- (i) a single *dl* pair of optical isomers (MHA—see Table II),
- (ii) a *meso*-form and a *dl* pair (DMA),
- or (iii) two *dl* pairs, the *erythro*- and *threo*- isomers (MEA).

Some results, seen in Table II, illustrate what may be encountered. The compound DMA has been fully resolved, although the *d*-isomer is not yet optically pure, *meso*-DMA is like DMS in oestrogenic and anti-oestrogenic activity, but has 10 times the antifertility potency.

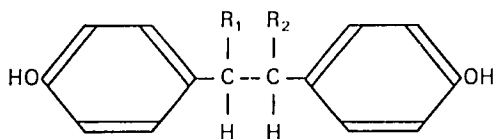


Table II. Activities of some bibenzyl derivatives

R ₁	R ₂	Substance	Approx. MEDs (μg.)		
			Oestrogenic (s.c.)	Anti-oestrogenic (i.v.)	Antifertility (s.c. per day)
H	CH ₃	MHA	> 2,000	8	> 2,000
CH ₃	CH ₃	<i>meso</i> -DMA	60	0.3	5
CH ₃	CH ₃	<i>dl</i> -DMA	600	3	100
CH ₃	CH ₃	<i>l</i> -DMA	> 1,000	3	500
CH ₃	CH ₃	<i>d</i> -DMA*	1,000	3	500
CH ₃	C ₂ H ₅	<i>threo</i> -MEA	1,000	1.5	150
CH ₃	C ₂ H ₅	<i>erythro</i> -MEA	15	0.4	< 1
C ₂ H ₅	C ₂ H ₅	<i>dl</i> -DEA	80	0.1	10

*Not optically pure.

The stereoisomers, *d*- and *l*-DMA, are much weaker oestrogens and anti-oestrogens than *meso*-DMA, and even still weaker as antifertility agents. Curiously, they are of about equal activity and somewhat less potent than the *dl* mixture. The compound MEA has, so far, only been resolved into the *erythro*- and *threo*-*dl* mixtures. *Erythro*-MEA is a very potent compound, approximating oestradiol as an antifertility agent, but with about one hundred and fiftieth of its potency as an oestrogen. Thus, although oestrogenic activity is still better correlated in these compounds with antifertility activity than is anti-oestrogenic activity, there is a very considerable divergence in the oestrogenic/antifertility ratio as compared with oestradiol or diethylstilboestrol. Apart from a few frank oestrogens, *erythro*-DMA is the most potent antifertility compound yet tested in this laboratory.

Erythro-MEA is currently under toxicity testing, and in common with similar bibenzyl and stilbene derivatives, is remarkably non-toxic in the rodent. Since it is so potent as an antifertility agent, it has a very high therapeutic ratio, of the order of 20,000 in the rat or mouse.

ACKNOWLEDGEMENT

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75. ALTERATIONS OF FERTILITY INDUCED BY UNILATERAL INTRA-UTERINE INSTILLATION OF CYTOTOXIC AGENTS IN RATS

J. Zipper, M. Medel and R. Prager

Institute of Physiology, Medical School, University of Chile, Santiago

The endometrium, in some species, is an organ essential to the process of sperm capacitation^{1,2} and implantation,^{3,4} easily accessible in most of them, including Man. The induction of local changes in the endometrium, with the purpose of altering fertility, has been attempted by: freezing of this organ⁵ or by the introduction of endo-uterine foreign bodies made of inert material or skin autografts.⁶⁻⁸ All these procedures cause complex changes in the reproductive apparatus, different in every species, but producing in all of them a change in the rate of fertility. Alterations, biochemically induced by local application of cytotoxic agents to the endometrium, have been used as a technique for the study of physiological mechanisms related to decidualization, since this phenomenon is considered, in some species, essential to implantation. Shelesnyak has studied this topic extensively.⁹

Our aim in this experimental work was to study the effects of different groups of metabolic depressants on fertility, when applied locally to one of the uterine horns of the rat.

We tried to explain the discrepancy found in the response in the same species to local application of different groups of cytotoxics, by determining the rate of diffusion of glucose C¹⁴ from the uterine cavity to the endometrium, and the possibilities of diffusion of this radioactive substrate to the homolateral ovary as well as to the contralateral endometrium and ovary. We also determined the effects of some of these cytotoxics on ovulation.

MATERIALS AND METHODS

Rats bred in the Institute of Physiology were used, of different strains, weighing around 200 gr. Under avertin anaesthesia, both horns were exposed by abdominal incision. 0.2 ml of each of the substances studied, were introduced vaginally through the cervix, into one uterine cavity. The inferior portion of the horn was gently compressed during 15 min. to avoid reflux.

The substances studied and their concentrations, were the following:

- (1) antienzymic substances: cadmium sulphate $0.5 \times 10^{-2}M$
iodoacetate $10^{-2}M$
- (2) antimitotic agents: podophyllin in vaseline ointment 5 mg/ml
colchicine in saline 0.5 mg/ml
- (3) alkylating agents: Thio Thepa 2.5 mg/ml
- (4) non-specific cytotoxics: alcohol (ethanol) 100% and 50%
- (5) non-toxic agents: hypertonic saline 10%

After a single instillation the animals of each group were caged with males for variable periods during the first, second and third month after endo-uterine instillation. Vaginal smears were taken daily to follow cycles and establish the presence of sperms. Five animals each of the cadmium sulphate (Cd) and iodoacetate group were submitted to flushing of both uteri 4½ days after fertilization to observe the presence of blastocysts. These animals were chosen among those that became pregnant 20 to 25 days after instillation. On the 8th day after sperm appearance in the vagina, all animals were laparotomized to observe implantation sites.

Histological examination of both uteri and ovaries of the animals treated with the different substances was done at various periods, from the 2nd to the 90th day after instillation.

A group of 5 animals was injected subcutaneously with the same doses of Cd used endometrially to observe its effect on fertility.

Biochemical techniques

(1) Rate of glucose incorporation from the endometrial cavity to the endometrium.

One μC of glucose C^{14} (μl), specific activity (5 mc/mM) was introduced into both uteri. Sixteen hr. afterwards one uterus was extracted and 24 hr. afterwards the other one, to determine the increase of activity incorporated by the endometrial cells.

(2) Disappearance of glucose C^{14} from the uterine cavity. One endometrial cavity was instilled with 2 μC (μl) of glucose C^{14} , the inferior portion ligated to avoid reflux and at the end of 24 or 40 hr. (in different animals), its contents were emptied and radioactivity counted.

(3) Diffusion of glucose C^{14} from one endometrial cavity to the other and to both ovaries (5 animals).

Two μC of glucose C^{14} are introduced into one of the uterine cavities, and the inferior portion of the cervix ligated to permit vascular interchange in the inferior angle of union of both uteri. After 24 hr. the animals were killed.

After its extraction each uterus was opened longitudinally and submitted to curettage in 1 ml of cold saline, a technique that permits the extraction of the endometrium only (this was demonstrated histologically). The reaction was then stopped with cold ethanol 95%.

DNA and proteins were isolated from the material obtained through curettage of the endometrium, using the technique of Ogur and Rosen.¹⁰ The specific activity incorporated in each fraction was determined, expressing the counts in protein per mg, and the DNA per gamma read in a Beckman-spectrophotometer at 265 and 290 $\text{m}\mu$.¹¹ Radioactivity was counted at infinite thickness in a Fricke-Hoepfner methane flow counter, taking aliquots of the extracted proteins and the DNA.

RESULTS

I. BIOLOGICAL EXPERIMENTS

(a) *Implantation*

Reproductive behaviour in rats was very different when comparing the action of the various metabolic depressants used (see Tables I-IV); in these, the columns on the right indicate the number of implantations in the instilled uterus, and the ones on the left, in the control horn.

Cadmium group: total inhibition in the number of implantations in the first month, the rate rising slightly in the second month.

Iodoacetate group: marked suppression of implantation in the instilled uterus, rate of implantation per animal 1.00, with partial depression in the control endometrium, 3.00 implantations per animal. This rate improved in the second month.

Podophyllin in vaseline ointment group: there is no effect on implantations, 6.3 per horn on both sides.

Colchicine group: slight effect in both uteri.

Thio Thaps group: intense effect in the first and second month, in the instilled uterus, functional reversibility being extremely slow compared with histological reversibility. Only after the third month did the animals start to get pregnant in both uteri.

Alcohol 100% and 50% group: intense unilateral effect due to the potent dehydrating and cytotoxic effect of this highly hypertonic medium, that not only affects the endometrium,

Table I. No. of implantations in the right uterine horn (RH) of rats instilled with podophyllin in vaseline ointment* and colchicine*; left uterine horn (LH), control.

<i>Podophyllin</i>		<i>Colchicine</i>	
<i>First month</i>		<i>First month</i>	
<i>RH</i>	<i>LH</i>	<i>RH</i>	<i>LH</i>
6	9	4	3
7	5	8	5
6	5	3	2
		3	1
Mean: 6.3	6.3	Mean: 4.5	2.75

*For concentrations see text.

Table II. No. of implantations in the right uterine horn (RH) of rats instilled with iodoacetate ($10^{-2}M$); left uterine horn (LH), control.

First month		Second month		Third month	
RH	LH	RH	LH	RH	LH
0	6	6	2	2	1
0	2	0	4	2	4
0	0	0	6	3	5
5	4	6	1	5	5
0	3	5	4	4	7
0	4	0	4		
0	2	0	2		
3	5				
0	5				
3	3				
0	3				
0	3				
1	2				
3	3				
1	5				
1	2				
1	2				
0	0				
Mean: 1.0	3.0	Mean: 2.4	3.2	Mean: 3.2	4.4

Table III. No. of implantations in right uterine horn (RH) of rats instilled with cadmium ($0.5 \times 10^{-2}M$); left uterine horn, control.

First month		Second month	
RH	LH	RH	LH
0	0	1	1
0	0	0	3
0	0	0	0
4	0	5	1
0	0	0	0
0	0	3	0
		4	6
		2	0
		6	0
		5	3
Mean: 0.6	0	Mean: 2.6	1.4

Table IV. No. of implantations in the right uterine horn (RH) of rats instilled with Thio Thepa (2.5 mg./ml.); left uterus (LH), control.

Second month		Third month	
RH	LH	RH	LH
0	3	4	4
0	1	2	3
0	5	4	3
0	4	7	5
Mean: 0	3.2	Mean: 4.2	3.7

but also its muscular layers, producing scarring that locally blocks this horn, though in some cases complete reversibility is observed at the end of the fourth month in both groups (Plate I, Figs. 1, 2). The rate of implantations in the non-instilled uterus in the first month was normal from the first pregnancies.

Non-toxic agents: no effect on implantations.

(b) *Search for blastocysts*

Four and a half days after copulation, blastocysts were found in both uteri, in 4 animals of the cadmium group and in 3 of the 5 animals of the iodoacetate group, also in both uteri.

(c) *Subcutaneous injection of cadmium*

Cd injected subcutaneously in the indicated doses did not prove lethal. Fifteen days after injection all the animals of this group became pregnant. In every case, however, implantations were followed by abortion.

(d) *Histological observations (endometrium)*

All depressants produced marked histological changes, different for each, that gradually returned to normal, with the exception of those induced by alcohol in some cases (Plates II and III, Figs. 4-12). These changes in the alcohol, iodoacetate and Thio Thepa groups were characterized by an initial depression of the glandular system and later, in the iodoacetate and alcohol group, by marked oedema and proliferation of the stroma occupying all the uterine cavity; approximately 10 days after, from the disperse glandular remnants, the endometrial cavity reappears, and is back to normal after 20 days in the iodoacetate group; in the alcohol group the recovery process is much longer.

In the cadmium group histological changes are much less obvious, except for the tendency of the endometrium to develop stratification (Fig. 9); there is no proliferation of the stroma. In the Thio Thepa group there is basically only a depression of the glandular tissue, that returns to normal after 20 days.

(e) *Histology of ovaries*

In every group histological examination shows great numbers of follicles of different sizes, with corpora lutea of normal appearance. Corpora lutea of ovulation were determined by their diameter in serial sections.¹²

II. BIOCHEMICAL RESULTS

The experiments demonstrated the transport of glucose from the uterine cavity to the endometrial cell (Text-fig. 1). It is a very slow process that takes more than 40 hr.

Five experiments showed that the rate of disappearance of the radioactive substance from the uterine cavity keeps a strictly inverse relation to its incorporation into the endometrial cell (Text-fig. 2).

Glucose C¹⁴ diffusion to the other uterine horn and both ovaries:

The series of five experiments carried out to observe the diffusion of radioactivity from one uterine horn to the other and to both ovaries demonstrated that the activity in proteins found in the non-instilled endometrium was 5% of that of the instilled one, 24 hr. later, and that the activity of both ovaries is around 1 to 2% of that of the instilled horn.

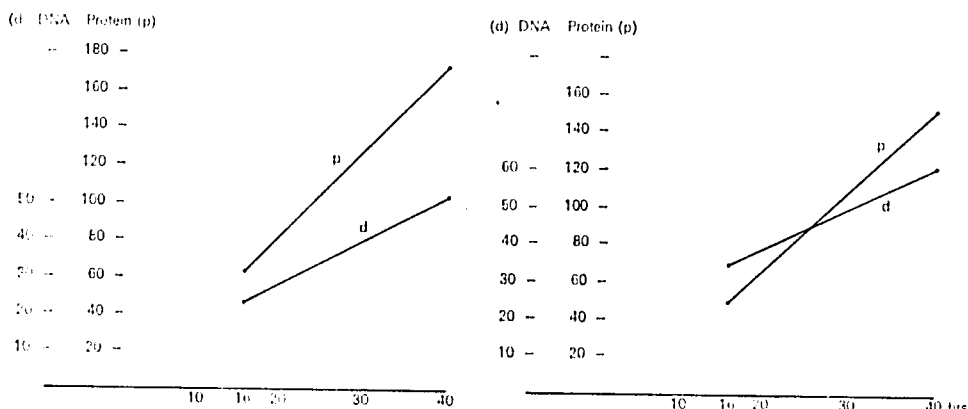
DISCUSSION

Different metabolic inhibitors of rat endometrium produce, as we have demonstrated, reversible changes in fertility which, in this species, are maintained during several oestrous cycles, long after total histological repair of the uterus.

The mechanism seems different for each cytotoxic agent, acting at first at an endometrial level. It is quite possible that metabolic inhibitors such as cadmium also produce an alteration in the quality of the ova produced, without there being an inhibition of ovulation, since animals injected subcutaneously with this substance presented implantations and then aborted.

Alkylating inhibitors, of the Thio Thepa type, the cytotoxic effects of which have been intensively studied by Magee¹³ in various tissues, except the endometrium, deserve a detailed study of their action on this mucosa at the molecular level, because of their prolonged

Text-fig. 1. Increase of activity of the endometrium, counted in protein (p) and DNA (d) in each uterus, 16 and 40 hours after introducing $1\mu\text{C}$ in saline (0.1 ml.), specific activity (5 mc/mM), in both uterine horns.



Protein

cts./mg./min. after 16 hr. = 60
 cts./mg./min. after 40 hr. = 170

DNA

cts./gamma/min. after 16 hr. = 25
 cts./gamma/min. after 40 hr. = 50

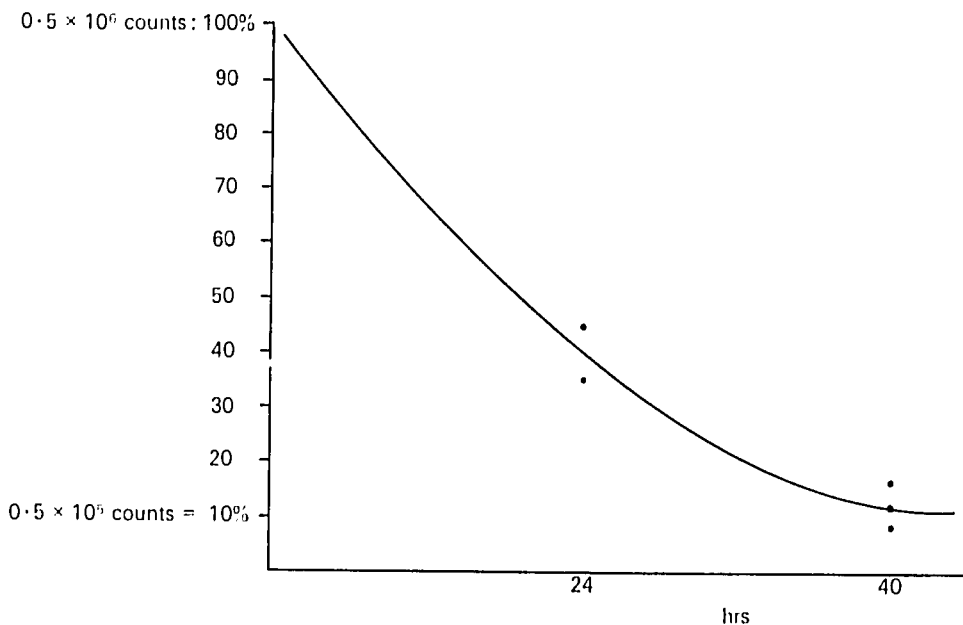
Protein

cts./mg./min. after 16 hr. = 57
 cts./mg./min. after 40 hr. = 149

DNA

cts./gamma/min. after 16 hr. = 35
 cts./gamma/min. after 40 hr. = 56.5

Text-fig. 2. Disappearance of counts from the uterine cavity. Initial material introduced $1\mu\text{C}$ glucose C^{14} (μl) in isotonic saline (0.1 ml.); efficiency of the counter for C^{14} , 50%. Specific activity 182 mc/mM (5 experiments).



Each dot = one experiment.

PLATE I



Fig. 1. Pregnancies of both horns in an animal instilled with ethanol 4 months previously. Right uterus histologically normal.

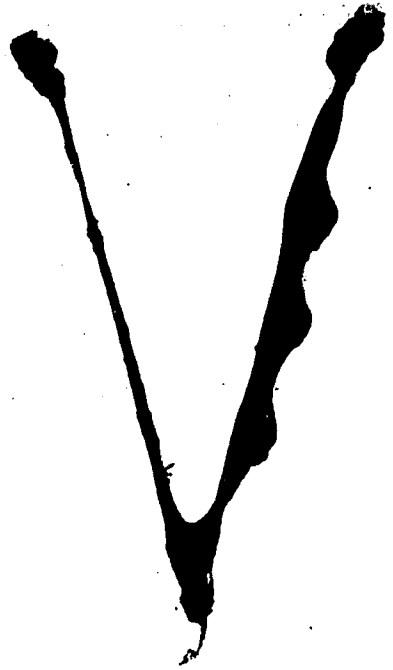
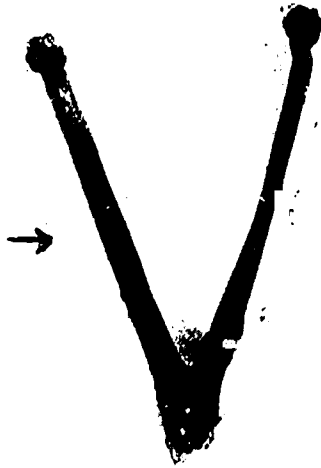


Fig. 2. Horns of a pregnant animal instilled with ethanol 20 days previously.



Cd.

20 days

Fig. 3. Animal instilled with cadmium 20 days previously. Sacrificed 8 days after finding sperms in the vagina. No implantations.

PLATE II

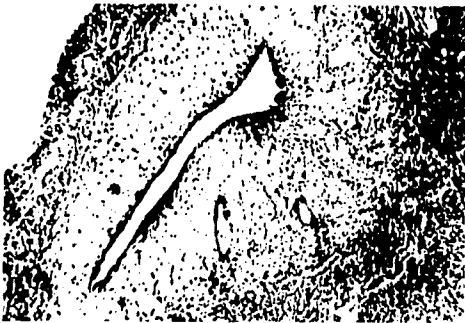


Fig. 4. Section of uterus instilled with ethanol (100%) 6 days previously ($\times 30$).

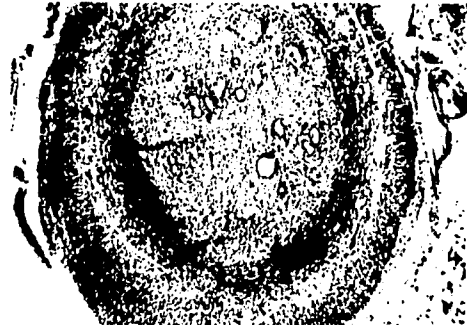


Fig. 5. Section of uterus instilled with ethanol (100%) 14 days previously ($\times 30$).



Fig. 6. Section of uterus instilled with Thio Thepa 10 days previously ($\times 100$).

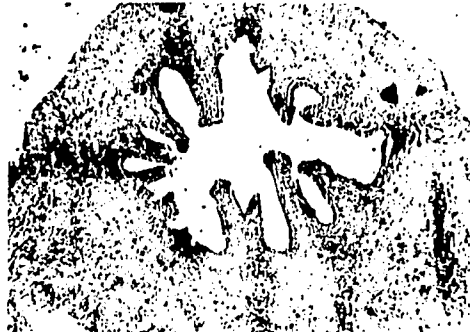


Fig. 7. Section of uterus instilled with Thio Thepa 25 days previously ($\times 30$).

inhibitory effects on implantation without great histological changes, and because of the total reversibility of these changes.

Our experiments have shown a not very important circuit of diffusion of glucose C^{14} instilled in one uterine cavity, to the other uterus and to the ovaries, but a small percentage of C^{14} -activity reaches these organs. It is possible that this may explain the bilateral effects of cadmium and iodoacetate.

A large number of antimetabolites have been used in experiments in various species. The essential feature of these studies lies in the fact that the antimetabolite is distributed systemically, with the exception of local injections of cadmium or other metals,¹¹⁻¹⁷ in testis or ovary where they produce irreversible vascular lesions.

The effect of antimetabolites, administered systemically, different antimetabolic agents, or antioestrogens has been reviewed by a great number of authors.¹⁸⁻²² Their effect is observed at different levels: the horn,¹⁹ ovary,²¹ implantation, embryo,²³ but their essential characteristic is that they, except anti-oestrogens, are highly toxic.

The localized phenomena that have been studied permit us to demonstrate that the endometrial mucosa is easily altered by single, sub-toxic doses of a great number of cytotoxics, creating a chronic toxic environment for blastocysts. If we add the fact that absorption through this mucosa is slow, we find that a new field of investigation opens in the technique of experimental fertility control.

PLATE III



Fig. 8. Section of uterus instilled with cadmium 2 days previously ($\times 30$).



Fig. 9. Higher magnification of Fig. 8 ($\times 430$).

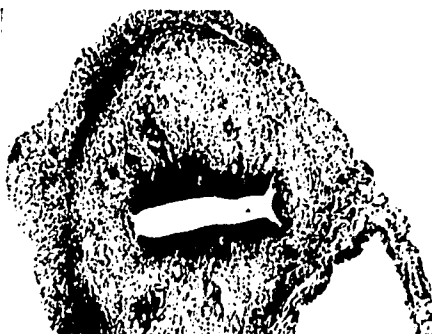


Fig. 10. Section of uterus instilled with cadmium 8 days previously ($\times 30$).

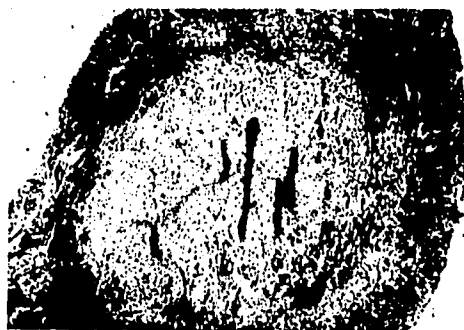


Fig. 11. Section of uterus instilled with iodoacetate 2 days previously ($\times 30$).

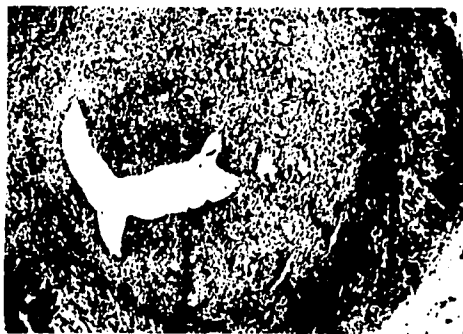


Fig. 12. Section of uterus instilled with iodoacetate 9 days previously ($\times 30$).

SUMMARY

Different cytotoxic agents, such as cadmium, iodoacetate, Thio Thepa, podophyllin, colchicine and alcohol were instilled in one of the uterine horns of the rat during 15 min, to observe their subsequent effect on fertility.

Cadmium and iodoacetate produce a bilateral effect on implantation, without altering ovulation, for periods of 1 to 2 months. Thio Thepa produces a unilateral effect for periods of 2 months. With alcohol this unilateral effect is prolonged. In every group detailed histological changes are described. Reversibility is complete in every group, except the alcohol one.

The rate of diffusion of glucose C¹⁴ from the uterine cavity to the endometrial cells was also studied.

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76. UTERINE ACTIVITY IN NON-PREGNANT WOMEN

E. M. Coutinho*

Department of Biochemistry, Faculty of Medicine, Bahia, Brazil

Several techniques have been used to study the activity of the non-pregnant human uterus by measuring changes in intra-uterine pressure.¹⁻⁴ The intra-uterine balloon technique was the first to be used,¹ and most of the literature available on the activity of the non-pregnant human uterus is derived from data based on experiments with this device.² Balloons of several sizes and shapes have been developed, and it has been suggested that the conflicting results obtained by different authors were due to these variances and to differences in technique.⁵ As an alternative to the controversial balloon method, Hendricks developed an intra-uterine pressure receptor consisting merely of a polyethylene catheter filled with heparinized saline.⁶ Recordings with this device show that a basic repetitive pattern of activity is present throughout the menstrual cycle except during menstruation, when a labour-like activity develops. Hendricks also found that the response to oxytocin was poor, confirming the previous findings of Bygdeman and Eliasson for the human uterus *in vitro*.⁷ These results differ from the earlier work of both Knaus³ and Moir⁴ who employed slightly different balloon techniques. Knaus reported that rhythmical activity occurred during the first phase of the cycle, while during the second phase there was almost no activity. Moir, on the other hand, found uterine activity more intense during the second phase of the cycle.

Hendricks' work has served to revive the old controversy about motility patterns of the non-pregnant uterus and has stressed the need for detailed investigation of this important aspect of uterine physiology. The first part of this paper briefly describes our attempts to re-define existing methods and to explore possibilities for reliable recording of uterine motility. An analysis of the effect of oestrogens and progesterone on the non-pregnant human uterus will be the subject of the second part.

The findings to be described are the product of 1,200 hours of recording on 320 women. Four patients were recorded for 2 hr. every other day for a minimum of two complete menstrual cycles. Several types of balloons and the open-end catheter were used in various combinations. Tracings were made with two-channel Sanborn Recorders (321 carrier amplifier). Fig. 1 shows the intra-uterine terminals employed.

Our preliminary studies indicated that the larger the volume introduced into the uterine cavity, the greater the amount of activity elicited. The introduction of the big balloon (Fig. 1, No. 1) evoked continuous uterine activity, particularly during menstruation and the days preceding menstruation. This stimulating effect is exemplified in Fig. 2 by the marked change in uterine activity following the insertion of large balloons. It should be noted that in addition to this stimulation, recording with a big balloon filled with fluid poses serious technical difficulties. Whenever the balloon is filled to capacity inside the uterus, a pressure of 100 mm. Hg. or more is recorded. To record the uterine resting pressure it is necessary to disconnect the distal end of the catheter from the transducer and release the fluid. Therefore in order to record at the resting uterine pressure, the balloon must be almost empty. Such a flaccid, empty balloon will obviously allow for artifacts caused by obstruction of the catheter tip. More reliable results were obtained with smaller balloons, such as No. 2 in Fig. 1, but, again, recording was only possible with a half-filled balloon. By progressively decreasing balloon size, terminals No. 3 and No. 4 were evolved. These receptors consist only of a catheter

*Contributors to the present work are Drs. A. C. Vieira Lopes, R. V. Xavier da Costa, H. da Silva Maia, and M. C. Chaves, from the Research Section, Maternidade Climerio de Oliveira and Department of Biochemistry, Faculty of Medicine, Federal University of Bahia.

with its tip enclosed by a rubber skin. Fig. 3 shows simultaneous recordings made with the small balloon and the open-end catheter. Use of the latter permits measurement of initial uterine resting pressure—a measure of uterine tone. In this respect the open-end catheter is a distinct asset. On the other hand, distortions of the record may be caused by obstructions or pressure leakage with this technique. An example of such an artifact recorded by an open-end catheter is presented in Fig. 4. Thus while the results obtained with the "closed-end" catheter were very similar to those obtained with an open-end one, the former offered the reliability of a closed system.

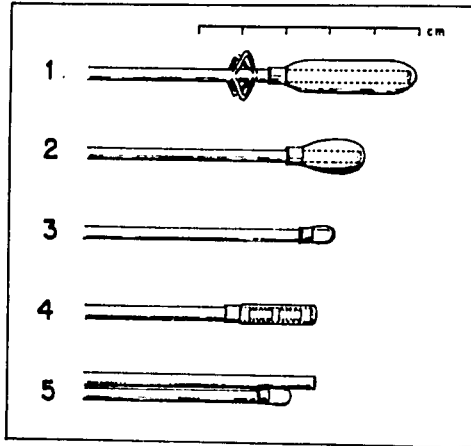


Fig. 1. Terminals used to record intra-uterine pressure changes. Balloon No. 1 was formerly used by Csapo and Dantas.⁹ No. 5 is a combination of an open-end catheter and a small balloon.

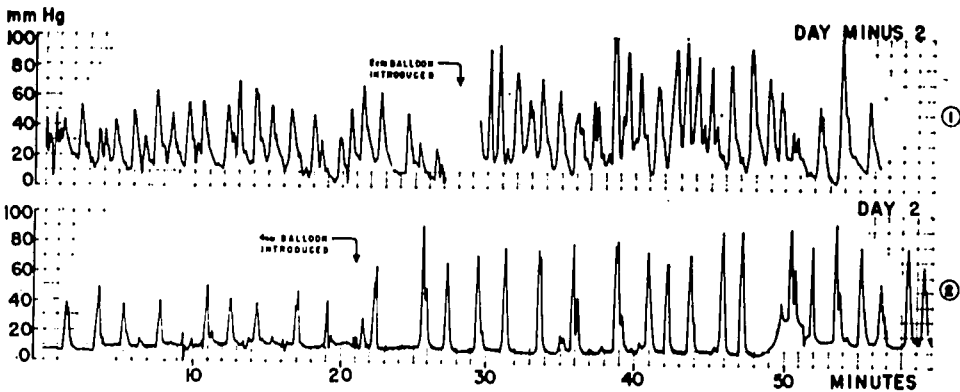


Fig. 2. Changes in uterine activity following the introduction of a rubber balloon. The open-end catheter was used for recording. Note increased activity recorded immediately after insertion of the balloon.

In view of these considerations, we decided to use a combination of the two techniques—the balloon and the open-end catheter—to investigate the changes in uterine motility induced by internal or external stimuli (Fig. 1, No. 5). When a two-channel recorder was not available, however, the enclosed tip catheter was used.

Recordings with the combined use of a balloon and open-end catheter showed that the pattern of uterine activity changed little from the first to the second half of the cycle. Hendricks, as well as Bengtsson and Moawad,⁶ reached the same conclusion with the open-end catheter. However, the insertion of the catheter itself produces a significant change in uterine response. Such a change could be detected by starting the recording before the closed-end terminal was placed in the uterus. Fig. 5 shows the results of these observations in one patient

throughout a complete menstrual cycle. It is clear from these records that the uterus responds to the mechanical stimulus by an increase in tonus. This was particularly evident during the first phase of the menstrual cycle when endogenous oestrogen reaches its first peak. The response, while still present during the second phase of the cycle, was less intense.

There is consensus that in non-pregnant women labour-like contractions occur at the time of menstruation.^{2,5,6,8,9} The cause of this exaggerated motility is still unknown, but it seems critical in solving many of the still unanswered questions about the regulation of uterine activity. The following facts argue against the thesis that this increased activity is primarily

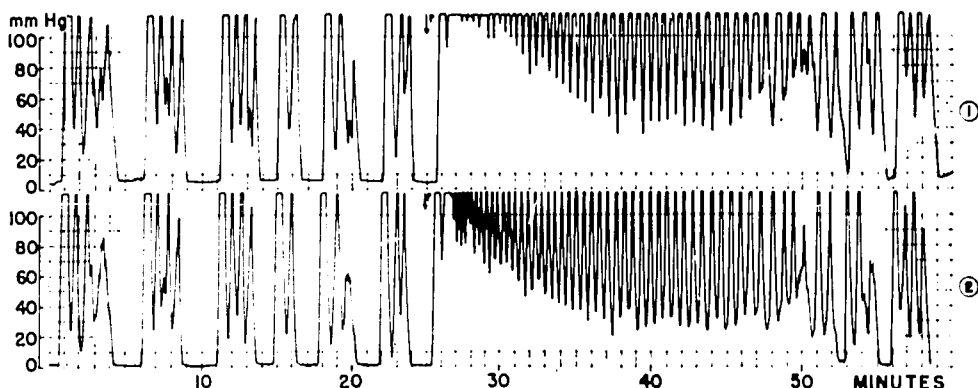


Fig. 3. Simultaneous recording of uterine activity with the open-end catheter (upper tracing) and the "closed-end" catheter (lower tracing). See Fig. 1, No. 5 for the terminal used. Recorded on second day of active menstruation. At arrow, 1 I.U. of pitressin injected intravenously. Note the similarity of the two tracings.

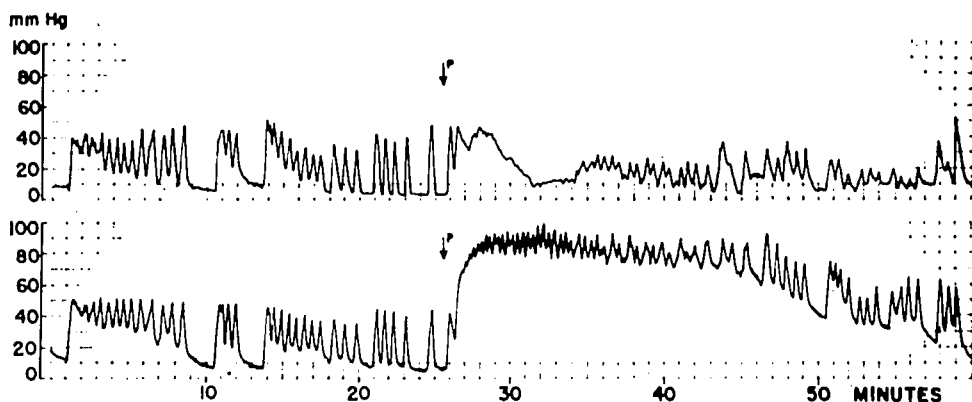


Fig. 4. Simultaneous recording of uterine activity with the open-end catheter (upper tracing) and the "closed-end" catheter (lower tracing). Day 5 of the menstrual cycle. At arrow, 1 I.U. of pitressin injected intravenously. Note that the response to pitressin was not recorded properly by the open-end catheter, giving a false impression of the effect.

produced by stimulating substances in the menstrual blood:¹⁰ (1) An increase in uterine activity precedes menstruation in most patients; (2) uterine activity diminishes during the last day of menstruation while the patients are still bleeding; (3) when, in certain clinical conditions, ovarian function is suppressed, uterine activity increases and occurs without bleeding. If the bleeding is not the primary cause for the increase in uterine activity, how might such a drastic change in motility be explained? By making an analogy between menstruation and labour, two alternative explanations emerge. The first could be a release of neurohypophysial hormones, for instance, from a physiological response to blood loss. Since it has been shown that acute blood loss causes release of ADH,¹¹ this possibility cannot be dismissed. It

is also supported by the fact that the non-pregnant uterus is extremely sensitive to vasopressin.¹² Experimental evidence that uterine sensitivity is augmented during menstruation^{2,9} suggests the second explanation—that increased uterine motility results from the withdrawal of a functional block. In favour of this hypothesis is the fact that an increase in uterine activity occurs only when endogenous production of both oestrogen and progesterone reaches its lowest level. Further, the labour-like activity is suppressed as soon as there is a rise in oestrogen

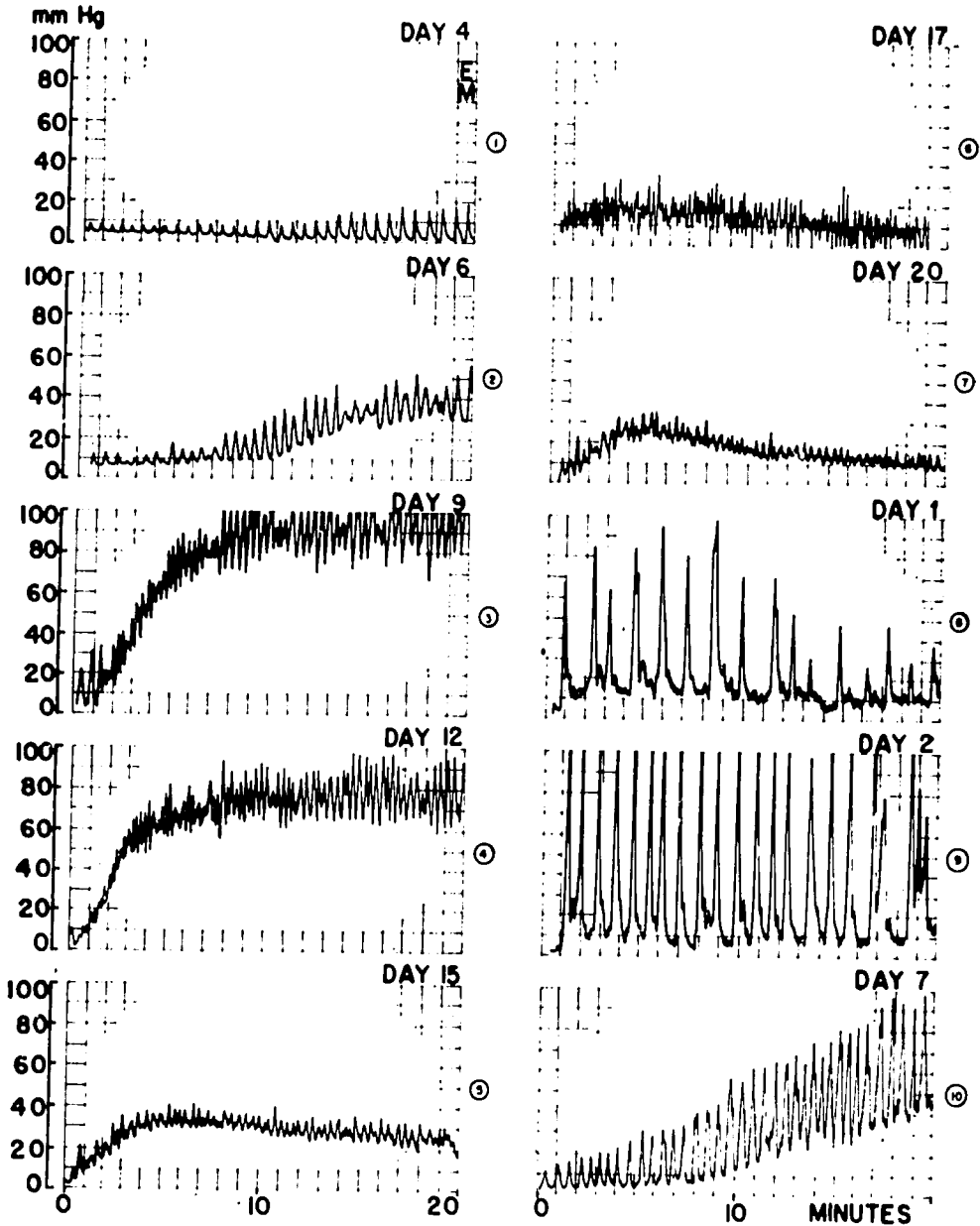


Fig. 5. Uterine activity following the insertion of the "closed-end" catheter. Note the change in response on different days of the menstrual cycle. The increase in uterine tonus seen during the first phase is also found during the second phase, although of lessened intensity. Note that during menstruation there is no increase in tonus following the insertion of the catheter.

level to initiate the new cycle. Since this second possibility was most amenable to testing, we decided to assess the effects of progesterone and oestrogen on uterine activity. The patients selected for this study had low endogenous production of both hormones, as indicated by urinary excretion of pregnanediol and total oestrogens. Twenty-one patients were selected and grouped as follows: (1) 16 normal young menstruating women, (2) 3 menopausal women, and (3) 2 patients with idiopathic amenorrhoea (of 1 and 2 years duration, respectively). In these two patients vaginal smears were atrophic, showing little or no oestrogen effect.

Experiments with these patients demonstrated that following administration of oestrogen, there was a marked decrease in uterine activity. This "block" is rather unique, being characterized by both a decrease in the amplitude and an increase in the frequency of contractions; there was also an increase in uterine tone (see Figs. 6-8). Fig. 6 shows the uterine activity of a patient injected with 10 mg. of oestradiol benzoate on the first day of active menstruation. Recordings made on subsequent days give the typical pattern of the oestrogen effect. Fig. 7 illustrates the effect of 15 mg. of oestrogen on a menopausal patient. Following the 3 daily doses of 5 mg. of oestradiol benzoate, this patient was recorded every day for 2 weeks. There

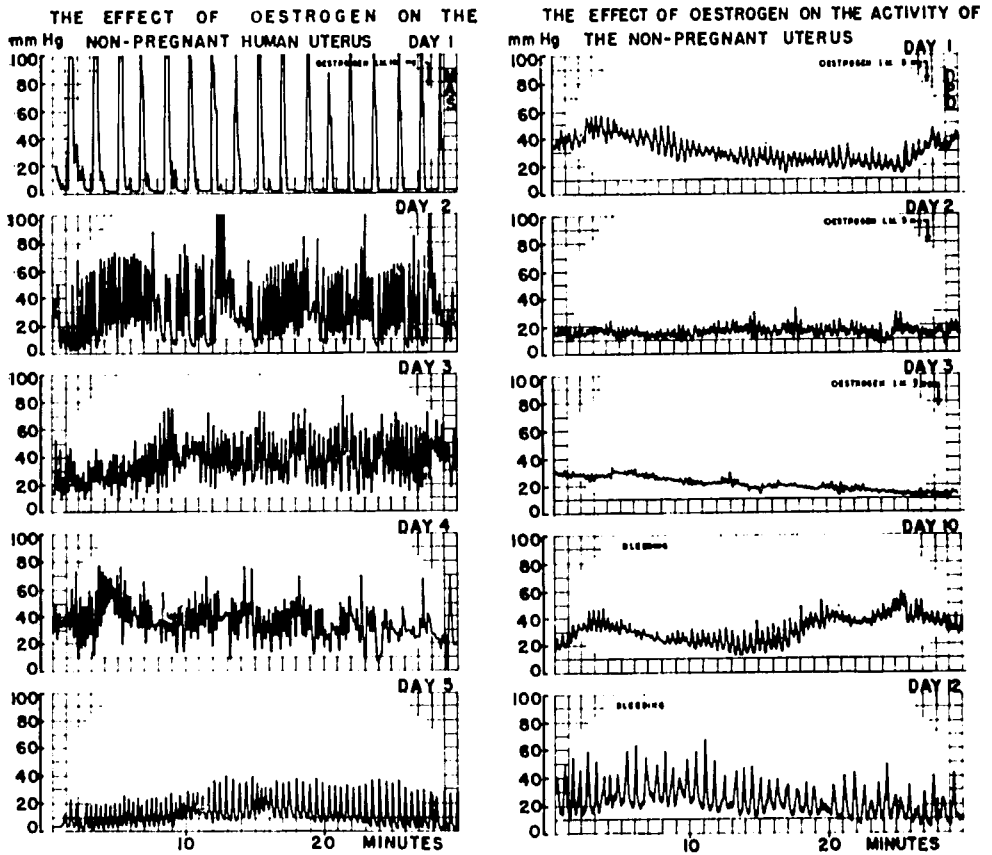


Fig. 6. Effect of oestrogen on activity of the non-pregnant uterus. 10 mg. of oestradiol benzoate in oil injected on first day of active menstruation. Recordings obtained at 24 hr. intervals. Note that on the days following the injection of oestrogen the 1-hour-like activity was replaced by a "mid-cycle" type of activity. The patient was still bleeding on days 2, 3, and 4, indicating that the change in pattern was not due to interruption of bleeding.

Fig. 7. Effect of oestrogen on uterine activity of a menopausal patient (52 years old and in second year of menopause). Intramuscular injections of 5 mg. of oestradiol benzoate in oil given daily for 3 days. For explanation see text.

was progressive decrease in uterine activity, leading to a complete block at the end of the 3rd day. Uterine activity was maintained at a low level for 6 days (not shown in figure) followed by an increase in activity coincident with withdrawal bleeding. Fig. 8 shows the effect of 20 mg. of oestradiol benzoate on a patient with secondary amenorrhoea and reduced oestrogen excretion. Prior to receiving the drug, the patient's uterine contractions were quite strong, reaching a pressure of 90 mm. hg. Twenty-four hours after the oestrogen injection, activity was gradually suppressed. By the end of the 8th day activity was still low, but on the

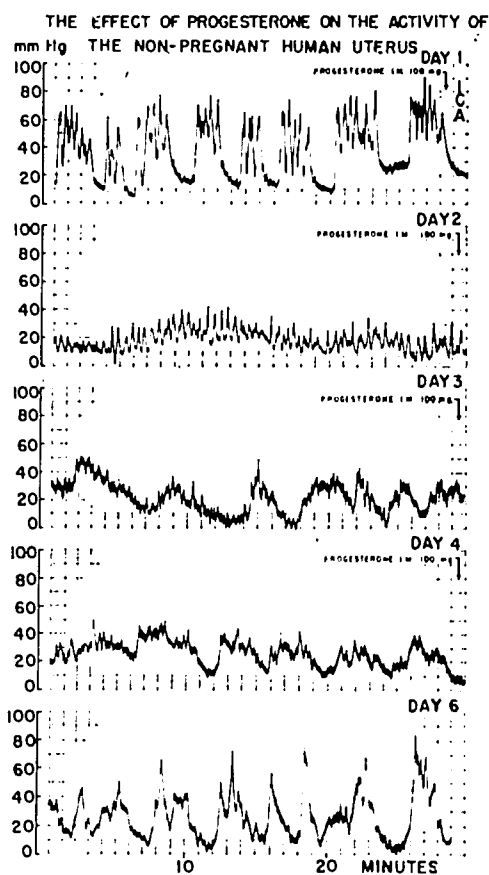
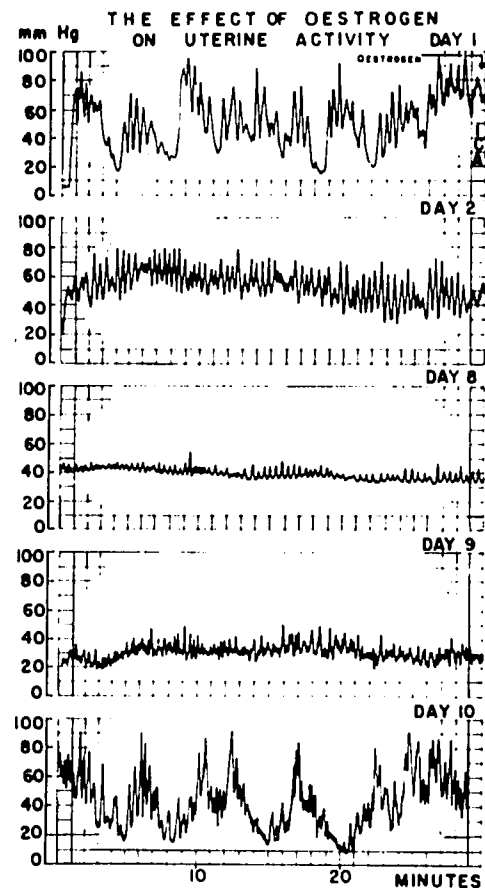


Fig. 8. Effect of oestrogen on uterine activity of an amenorrhoeic patient (38 years old, amenorrhoea for 2 years). The vaginal smear was atrophic. For a period of 24 hr. before the treatment, pregnanediol and total oestrogen excretions were 0.8 mg. and 6.8 μ g. respectively. For explanation see text.

Fig. 9. Effect of progesterone on uterine activity of an amenorrhoeic patient (same as in Fig. 8). 100 mg. progesterone in oil injected daily for 4 days. For explanation see text.

9th day reversal began, and on the 10th day the pre-treatment level was reached. The patient had withdrawal bleeding 11 days after the oestrogen injection (not shown in figure). A comparison of oestrogen and progesterone effects was made on this same patient. The progesterone effect is shown in Fig. 9 where day 1 corresponds to day 15 of the experiment depicted in Fig. 8. One hundred mg. of progesterone in oil was administered daily for 4 days. A blocking effect was clearly evident at the end of 24 hr., but escape from the block occurred on the 3rd day despite continuous progesterone treatment. Forty-eight hours after the last injection, uterine activity was already reverting to the original high pre-treatment level.

These experiments indicate that oestrogens may indeed produce a functional block in the

non-pregnant human uterus. Our results with progesterone are consistent with the concept of the progesterone block advanced by Csapo,¹³ but analysis of the effects of separate administration of oestrogen and progesterone on the same patient demonstrated that the effect of progesterone is of relatively short duration as compared with that of oestrogen.

The reduced uterine activity following administration of oestrogen on the first day of menstruation is similar to that seen after active menstruation subsides spontaneously. Furthermore, the increase in uterine activity following the interruption of treatment resembles that seen prior to the onset of active menstruation as described by Bengtsson and Moawad.¹⁴ These facts suggest that the increased myometrial activity which occurs during menstruation stems primarily from oestrogen withdrawal, and that cessation of activity at the end of menstruation derives from an increase in the endogenous secretion of the hormone. In normal ovulatory cycles progesterone withdrawal certainly complements the oestrogen withdrawal effect. But in anovulatory cycles oestrogen reduction alone should account for the increase in myometrial sensitivity. Thus it is likely that the withdrawal of oestrogen and progesterone which causes endometrial disruption in normal menstruation also causes the increase in spontaneous myometrial activity. Confirmation of this hypothesis would introduce a new concept in uterine physiology—maximum myometrial spontaneous activity and pharmacological reactivity do not occur during oestrogen domination but following oestrogen withdrawal.

By emphasizing the withdrawal response, we are not excluding other possible factors which may contribute to increase uterine motility during menstruation. Such factors as the release of neurohypophysial hormones and substances originating in the menstrual blood may stimulate uterine motility. But it must be realized that only after oestrogen withdrawal would the muscle be free to respond to these stimulants, as it apparently does during menstruation. Within this context we would again like to draw a parallel between the termination of the menstrual cycle and the termination of pregnancy. At the end of pregnancy a progressive increase in uterine sensitivity occurs,¹⁵ implying that a functional block is withdrawn.^{15,16} The withdrawal of the block allows parturition to take place, but other processes such as the release of neurohypophysial hormones seem to be necessary for the completion of normal labour.¹⁷⁻¹⁹ A similar phenomenon may take place at the end of the menstrual cycle. When the muscle is set free from the restraining influence of the ovarian steroids, it becomes responsive to myometrial stimulants. At this stage, release of neurohypophysial hormones and other factors may stimulate uterine motility and facilitate the expulsion of the shedding endometrium. In menstruation blood loss would trigger the neurohypophysial response as cervical stretch possibly does in labour.

Several other studies support our point of view. Allen, almost 30 years ago, demonstrated that parturition could be delayed in intact pregnant rabbits by continuous application of oestrogen.²⁰ The administration of progesterone also delayed parturition, but not indefinitely. Under the progesterone treatment, the rabbits began to deliver oversized foetuses on the thirty-seventh or thirty-eighth day of gestation, in spite of continuous application of the drug. The fact that oestrogen did not produce blocking in ovariectomized animals was interpreted as evidence that the effect of oestrogen was indirect. Nevertheless, these experiments showed that oestrogen given at the end of pregnancy did not induce labour in rabbits but rather prevented it. Heckel and Allen inferred from these and other data²¹ that a combination of oestrogen and progesterone is superior to progesterone alone in the maintenance of gestation.

Pincus and Werthessen²² as well as Courier and Kehl²³ confirmed that oestrogen enhances the progesterone effect in pregnant rabbits. Smith and Smith have shown that oestrogen was also beneficial in maintaining pregnancy in women and for many years advocated the use of oestrogen therapy in cases of habitual and threatened abortion.²⁴

Jung, using electrophysiological methods, demonstrated that, in rats, a block in uterine motility may be induced by oestrogen alone. He found that the rise in membrane potential produced by oestradiol in rat myometrium was commensurate to that produced by oestradiol plus progesterone. Although he felt that the rise in membrane potential was not the sole cause for blockage of activity, he maintained that high doses of oestrogen had a blocking effect.²⁵

These observations add to the evidence presented in this paper that uterine motility is suppressed rather than stimulated by oestrogen. The data also call for a re-examination of the notion that parturition takes place in an oestrogen-dominated uterus.

ACKNOWLEDGEMENTS

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77. STUDIES ON THE EFFECTS OF IUDs ON TUBO-UTERINE MOTILITY IN RHESUS MONKEYS

P. Eckstein

*Department of Anatomy, Medical School,
University of Birmingham, England*

The manner in which the contraceptive effect of intra-uterine devices is brought about in women and lower mammals continues to defy explanation. A study group convened last year by the World Health Organization in Geneva considered possible mechanisms of action, and in its Report¹ listed a number of untenable ones (such as the prevention of ovulation, interference with sperm transport and fertilization or the production of chronic endometritis), as well as several which it thought were either feasible or likely.

I will only deal with one of these factors, the possible action upon the transport of the ovum through the Fallopian tubes as studied in the rhesus monkey.

The view that a tubal mechanism might be involved in women was first put forward by Tietze and Margulies in 1962,^{2,3} on both statistical and clinical grounds. Dr. Tietze pointed out then, and on several occasions since, including this Conference, that the incidence of ectopic pregnancy in women wearing an IUD is only about one-tenth of that which would be expected if the devices acted solely by preventing nidation,^{2,4} and therefore postulated that the site of their action must be the Fallopian tube rather than the uterus. Neither he, however, nor Margulies produced any direct proof for their conclusion that in the presence of an IUD the ovum is rushed through the Fallopian tube and arrives in the uterus in too immature a state to be able to implant.

Some two years later Dr. Mastroianni reported what appeared to be far more convincing experimental evidence for the operation of a tubal acceleration mechanism.⁵ He and his associates used coil-fitted and control rhesus monkeys that had been artificially super-ovulated with gonadotrophin, as well as artificially inseminated, and were then examined within five hours of the assumed time of ovulation. By flushing out the Fallopian tubes at this stage Mastroianni was able to recover eggs from controls. By contrast, eggs could not be recovered by him from the tubes of coil-fitted females, or only if their tubes had been ligated previously.

We feel, and I have said so before,⁶ that the interpretation of these findings, and the assessment of their true significance, is by no means easy. The reality of the difference in the speed of tubal transport between Mastroianni's experimental and control animals is in no doubt. They are baffling, and remain to be explained. What is, however, far more doubtful is whether his findings in monkeys that were artificially and intensely stimulated with gonadotrophin also apply to entirely normal animals ovulating and menstruating spontaneously. His study also did not reveal whether the devices are contraceptive in the untreated monkey.

We therefore, in Birmingham, repeated some of these studies in fully mature, unstimulated and naturally cyclic rhesus monkeys, both fitted with small plastic coils and in controls without them. The coils were introduced surgically into the uterus by means of a narrow plastic tube inserted through a small hole made either in the body or fundus or the uterus, and were lying wholly within the uterine cavity.

The experimental work was carried out by my colleagues, Mr. W. A. Kelly and Mr. J. H. Marston, and the following summary is based on their recent report.⁷

1. Intra-uterine coils are contraceptive in rhesus monkeys. In an experimental period of one year (1966) experimental and control females were caged with proved, fertile males, during days 12-16 of the cycle. Among 24 controls 13 conceived, but of 21 IUD animals, not

one did. The number of satisfactory matings, that is, with sperm present in the vaginal lavage, was similar in both groups.

2. There were no significant differences in cycle length, ovulation rate, egg yields and fertilization of ova recovered from the reproductive tract between control and IUD monkeys.

(a) *Cycle length.* Comparable figures were 28.3 days (40 controls; 265 cycles) and 27.6 days (25 IUD animals; 221 cycles); the difference is statistically not significant.⁸

(b) *Ovulation.* Among 25 mated animals in each of the experimental and control group, examined between days 11 and 18 of the cycle, the incidence of ovulation was 78.7% (controls) and 73.6% (IUD), respectively.⁷

(c) *Egg recovery and fertilization.* In the same two groups of females, attempts to recover ova, either at autopsy or during laparotomy, yielded 15 eggs (six of them fertilized) in controls, and 16 (six fertilized) in IUD animals.⁷ In the latter, all eggs were recovered from the Fallopian tube, but in controls one-third (5/15) of ova were found in the uterus, and the rest in the tube. The fact that fertilized (and cleaving) eggs were present in the IUD group of monkeys appears to eliminate one further possible mechanism of action of the devices—interference with fertilization (and, by implication, sperm transport) in this species.

The possibility remained, however, that the eggs in the IUD animals were shed relatively later during the cycle than in controls, and for that reason became recoverable in the tube. This, too, could be excluded by histologically "dating" the corresponding corpora lutea, using Corner's criteria,⁹ and showing that the corpora, and hence the ova themselves, in IUD-females were of comparable ages to those in controls. Whether eggs fertilized and undergoing cleavage in the presence of an intra-uterine device can implant and be carried to term in monkeys remains to be shown.

These findings are inconsistent with the ones obtained by Dr. Mastroianni in super-ovulated monkeys. Taken together, they are best explained by assuming that in spontaneously ovulating monkeys fitted with coils the speed of tubal transport of the egg is not noticeably altered and that consequently the fertilized ovum enters the uterus at the normal time, but once arrived in the uterus, is either quickly expelled, degenerates prematurely or is somehow prevented from implanting.

This part of the mechanism of action of IUDs is still almost entirely unknown. Various possible explanations, such as alterations in the internal uterine environment, rendering it "toxic" to the ovum, or in the motility pattern of the uterus, causing rapid egg expulsion, suggest themselves, but are still largely unexplored.^{10,11} We are attempting in our laboratory to check on changes in myometrial activity, but the technical difficulties are great, and it is too early for even provisional conclusions.

We can, however, state that our observations on the tubal recovery of eggs in normal monkeys fit in with the evidence obtained in women subjected to elective salpingo-hysterectomy at the time of expected ovulation. In a series of such egg recoveries carried out by American workers in 161 control women (cf. WHO Report, 1966¹), 12 eggs were obtained, four of them fertilized, while a corresponding group of 92 IUD women yielded 11 eggs, one of which was fertilized; the difference in egg recoveries between the two series is statistically not significant.

It would thus appear that in women, as well as rhesus monkeys, tubal transport of eggs is not markedly affected by the presence of a device in the uterus. Whether this is really so, and whether the inference that IUDs exert their contraceptive action in women at the level of the uterus is justified, can we believe not be settled by experiments in rhesus monkeys and other laboratory animals, but ultimately only by further, carefully planned and executed clinical research.

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78. PHYSIOLOGY OF THE HUMAN FALLOPIAN TUBE—*IN VIVO* AND *IN VITRO* STUDIES

C. Gómez-Rogers, A. A. Ibarra Polo, M. Garcia-Huidobro,
A. Morán, E. Guilloff and C. Millán

*Department of Physiological Obstetrics,
University of Chile, Santiago*

INTRODUCTION

The Fallopian tube plays a vital part in the fertilization and transport of the ovum. Its shape, ciliated epithelial lining and contractile wall make the Fallopian tube specially suitable for carrying out this function.

The morphological and functional changes in the uterus and the oviducts, brought about by the ovarian hormones, are well-known. The effects on the uterine musculature and the endometrium have been repeatedly shown by a number of investigators. On the other hand, the relation between the cyclical hormone activity of the ovary and the functional state of the human Fallopian tube has not been clearly established. Davids,¹ in a study of human tubo-uterine contractions in living subjects, using the insufflation method with kymographic recording of contraction waves, found similar tubal contraction patterns in both phases of the cycle. Sandberg *et al.*² carried out *in vitro* studies of tubal contractility without finding marked differences between the hormonal phases (oestrogenic, progestational and menopausal). In this study it was also impossible to obtain contractile activity in 40% of cases.

At the University Obstetrics Clinic in Santiago, a series of studies of tubal physiology have been begun. This paper deals with an original method for the measurement of tubal contractility *in vitro*. The character of the contractions are analysed during the different phases of the cycle, as well as in patients treated with progestagens. In addition, a method is described for the measurement of tubal contractility in living subjects.

SUBJECTS

In vitro studies (Table I)

In accordance with the criteria of the University Obstetrics Clinic, tubal ligation is indicated for fertility control in a number of women. Such indication is subject to certain conditions: age (over 35 years, as far as possible); socio-economic conditions (women with large families, poor economic situation); chronic or hereditary disease. The number of subjects studied is shown in Table I.

Salpingectomy was performed on these patients during laparotomy and a study carried out on the motility of the tubal samples obtained.

There were 24 specimens obtained in this manner. At the time of operation, the phase of

Table I

Age	Number of cases
20-24	—
25-29	3
30-34	4
35-39	17
Total	24

the menstrual cycle of each patient was determined by endometrial biopsy and macroscopic observation of the ovary. Seven were found to be in the oestrogenic and 11 in the progestational phase. Six were undergoing treatment with long-acting medroxyprogesterone acetate (Provera; 250 mg, every 6 months) (Table II). The pharmacological effect of this progestagen on the ovary was determined by parallel biochemical studies (directed by Dr. Marcos Pupkin³).

Table II

<i>Hormonal condition</i>	<i>Number of cases</i>
Oestrogenic phase of cycle	7
Progestational phase of cycle	11
Treated with Medroxy-acetate progesterone	6
Total	24

Studies in living subjects

Unilateral salpingectomy was performed on the 10 patients from whom specimens were taken for study of the tube *in vitro*. The other tube was left in place after dividing it from the uterus, care being taken to preserve its blood supply. The contractility of this tube was measured using the method to be described below.

METHODS

1. IN VITRO MEASUREMENT OF TUBAL CONTRACTILITY

In each case a length of 2 cm. was taken from the isthmic portion of the Fallopian tube and the absence of macroscopic lesions in it established. The specimens were immediately placed in a bath of 25 ml of a modified Ringer's solution having the following composition: NaCl, 8.5 gm; CaCl₂, 0.5 gm; KCl, 0.4 gm; NaHCO₃, 1.5 gm; glucose, 1.0 gm; double distilled water to 1,000 ml; the solution was kept at pH 7.4 and a constant temperature of 37°C, with continuous oxygenation.

The piece of tube was connected to a Statham straingauge in such a way as to produce an isometric record of tubal contractions on a Sanborn (Poly Viso) recorder. Previous calibration with a 1 gm load, following the procedure of Kumar *et al.*,⁴ allowed the increase in tension resulting from the contractions to be measured.

Measurements were made on tubes with the visceral peritoneum intact, in contrast to the technique used by Sandberg *et al.*^{2,5}

After a period of adaptation of about 30 min. the contraction pattern for each tube became stabilized. By renewing the solution every 10 min. the character of the record could be maintained for as long as 3 or 4 hr. (Figs. 1 and 3). If the washing solution was not changed for more than 15 min. tubal contractions gradually diminished (Fig. 2).

Analysis of in vitro contractions

The following parameters were evaluated in each case; (a) strength of contractions (in gm of tension developed), taking averages every 10 min.; (b) frequency of contractions, averaged over 10 min. intervals; and (c) tubal activity, expressed as the product of average intensity and frequency per 10 min. interval (gm/10 min.).

2. MEASUREMENT OF TUBAL CONTRACTILITY IN LIVING SUBJECTS

During the operation for tubal sterilization, the uterus and the Fallopian tubes are inspected to verify their patency. The tube is divided 1 cm from the uterus and its extremity tied with linen thread, care being taken not to alter the vascular supply. A polyethylene catheter (P-50) is then introduced through the abdominal ostium.

The catheter is fixed to the tube by a stitch of '0' catgut. The other end of the catheter is brought out through the abdominal wall. The catheter is covered with sterile dressings until the actual recording, made between 24 and 48 hr. after the operation.

The polyethylene catheter, filled with liquid, is connected to a Sanborn differential pressure transducer, which in turn is connected to the recording equipment.

SPONTANEOUS CONTRACTILITY OF HUMAN FALLOPIAN TUBE *IN VITRO*

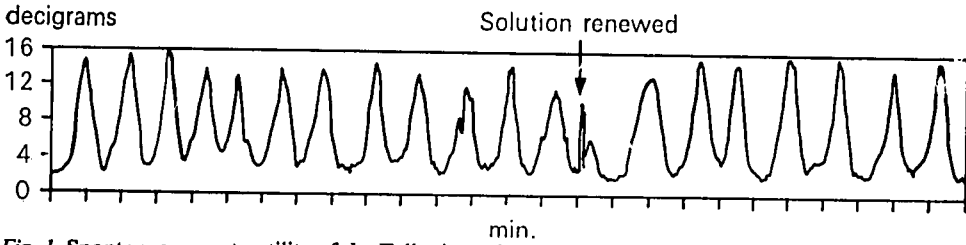


Fig. 1. Spontaneous contractility of the Fallopian tube *in vitro*; maintenance of constant contractions on periodic renewal of the solution containing the segment of tube.

SPONTANEOUS CONTRACTIONS OF HUMAN FALLOPIAN TUBE *IN VITRO*

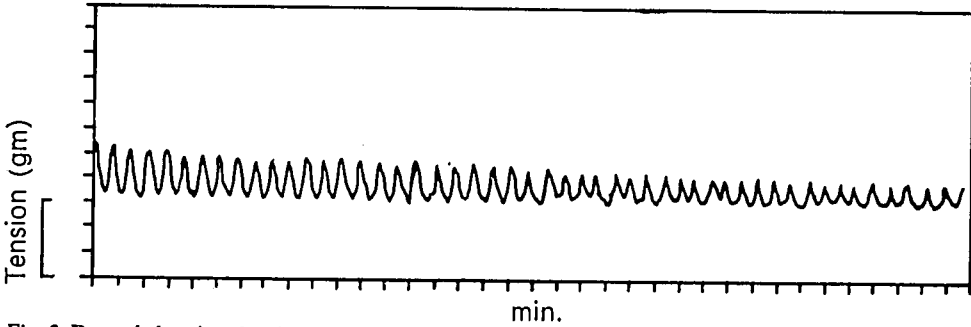


Fig. 2. Record showing that intensity and frequency of tubal contractions diminish when the solution is not renewed periodically.

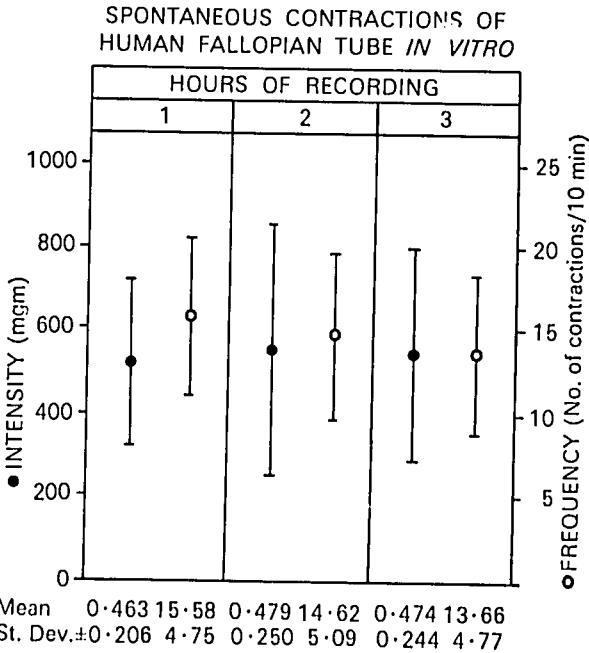


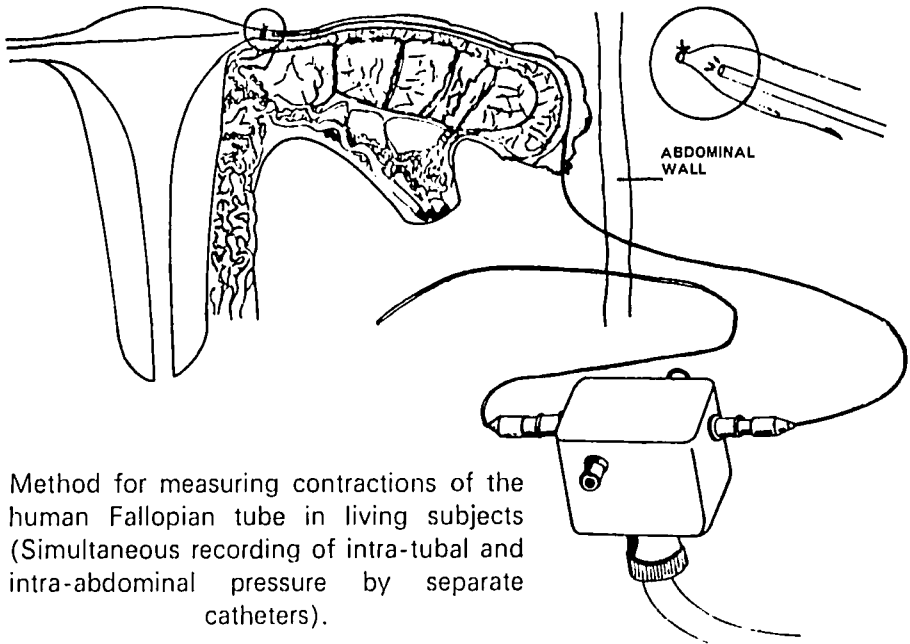
Fig. 3. Intensity and frequency of tubal contractions with progress of time. Each point is the average value of cases during the first, second and third hours of recording. Black points represent intensity and open circles frequency of contraction; vertical lines ± stand. deviation (solution renewed at 10 min. intervals).

In the later cases, a free catheter in the abdominal cavity was added and this was also connected to the differential pressure transducer. The object of this was to eliminate changes in pressure transmitted by the abdominal catheter and to record only changes originating in the Fallopian tube (Fig. 4).

RESULTS

1. TUBAL CONTRACTILITY IN VITRO

Evaluation of the technique. Spontaneous contractions occurred in each of the 24 cases studied at intervals ranging between 60 and 200 min. As mentioned above, frequent renewal of the modified Ringer's solutions (every 10 min.) is essential to prevent a gradual diminution in spontaneous contractility of the tubal segment (cf. Figs. 1 and 2).



Method for measuring contractions of the human Fallopian tube in living subjects (Simultaneous recording of intra-tubal and intra-abdominal pressure by separate catheters).

Fig. 4. Method of measuring tubal contractility in living subjects. The differential pressure transducer is connected by one catheter to the abdominal cavity and by the other to the lumen of the tube. By cancelling out abdominal pressure transmitted to the Fallopian tube, only those arising within the tube are recorded.

Fig. 3 shows that the average values of the parameters studied remain almost constant for the first, second and third hours of the experiment, indicating an acceptable degree of stability for these measurements.

Tubal contraction patterns and hormonal state

A. Intensity of contractions. No significant difference was found between the intensities of contraction either in the oestrogenic or progestational phases or in the group treated with medroxyprogesterone (AMP), even though the average value obtained in the latter was lower and the individual values showed little variability (Table III, A).

B. Frequency of contractions. Results are given in Table III, B. The average values for the oestrogenic and progestational phases of the cycle and the group treated with AMP were very stable, averaging between 14 and 16 contractions per 10 min.

C. Tubal activity. The values are shown in Table III, C and Fig. 5. No significant differences in tubal activity were found under the three hormonal conditions studied. Nevertheless, a fall in activity occurred in subjects in which ovarian function was inhibited by treatment with

Table III. Spontaneous contractility of human Fallopiian tube—*in vitro*

A. INTENSITY OF CONTRACTION (GM)					
Phase of menstrual cycle					
Oestrogenic		Progestational		Treated with Provera	
Record No.	(gm)	Record No.	(gm)	Record No.	(gm)
555	0.590	300	0.385	301	0.358
575	0.355	303	0.324	308	0.384
578	0.740	532	0.612	265	0.282
583	0.410	541	0.512	536	0.190
593	0.524	548	0.272	543	0.447
614	0.461	552	0.168	570	0.296
640	0.240	606	0.939		
		616	0.570		
		637	0.800		
		654	0.501		
Means:	0.475		0.484		0.326
St. Err.	0.060		0.070		0.036

B. FREQUENCY OF CONTRACTIONS (No./10 MIN.)					
555	12.4	300	21	301	12.6
575	14.5	303	16.5	308	12.9
578	21	532	8.6	265	18.5
583	17	541	12.3	536	14.6
593	15	548	12.8	543	20.7
614	15.3	552	20	570	11
640	17	606	10.3		
		610	19.8		
		616	13		
		637	6.7		
		654	6.5		
Means:	16.02		14.15		15.05
St. Err.	1.04		1.44		1.50

C. TUBAL ACTIVITY (GM/10 MIN.)					
555	7.31	300	8.08	301	4.50
575	5.14	303	5.34	308	4.95
578	15.54	532	5.38	265	5.21
583	6.97	541	6.29	536	2.7
593	7.86	548	3.48	543	9.25
614	7.05	552	3.36	570	3.25
640	4.21	606	9.67		
		610	4.67		
		616	6.84		
		637	5.36		
		654	7.76		
Means:	7.72		6.03		4.97
St. Err.	1.38		0.58		0.94
Length of recording					
14 hr. 40 min.		25 hr. 30 min.		9 hr. 40 min.	

AMP, especially on comparison with cases in the oestrogenic phase; activity more closely resembled that in the progesterational phase.

2. TUBAL CONTRACTILITY IN LIVING SUBJECTS

The attempt to measure contractility by means of a catheter in the tubal lumen led to results difficult to interpret since obviously not only intratubal pressures were being recorded, but also intra-abdominal pressures. Furthermore, since the intensity of tubal contractions is about 5 mmHg., any intra-abdominal pressure greater than this value becomes dominant and prevents a correct interpretation.

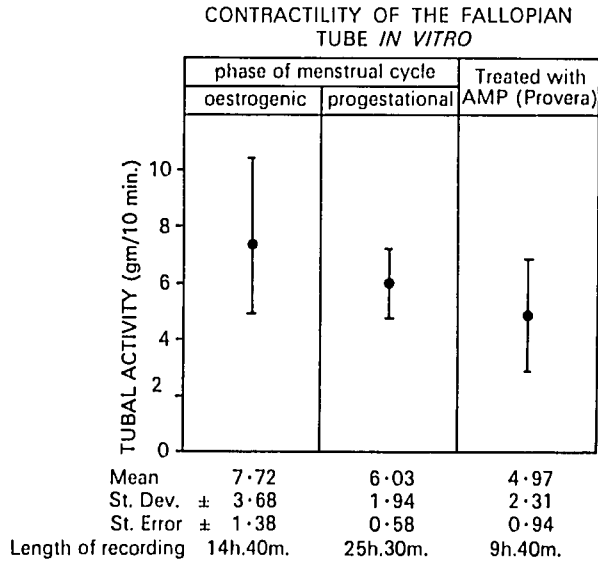


Fig. 5. Average values for tubal activity \pm 2 stand. errors, under different hormone conditions. Although values show no significant difference between the Fallopian tube studied in the oestrogenic and progesterational phases, average tubal activity in the latter is less. A greater difference in activity exists between tubes from patients treated with Provera (medroxyprogesterone acetate) and those in the oestrogenic phase.

CONTRACTILITY OF THE FALLOPIAN TUBE IN A LIVING SUBJECT (LACTATION AMENORRHOEA)

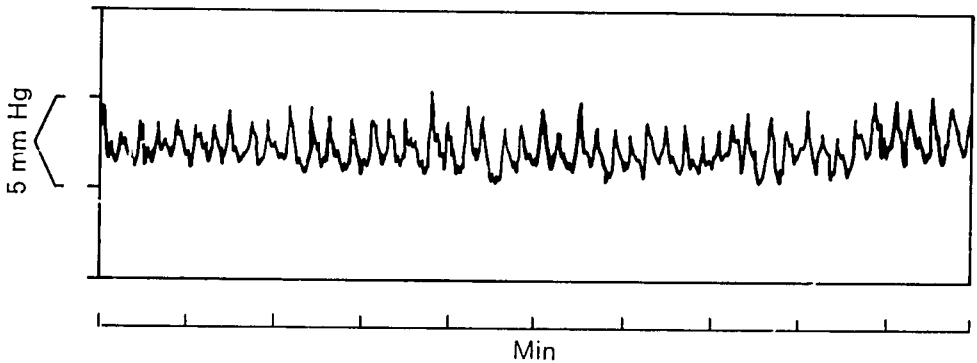


Fig. 6. Record of tubal contractions in a living subject made with the differential tubal and abdominal pressure technique described. Intensity of contractions varies between 3 and 6 mmHg. with a frequency from 4 to 5 contractions per min.

For these reasons, we do not consider the results obtained with a single catheter in the lumen of the tube as satisfactory. The addition of a free catheter in the abdominal cavity has eliminated these errors and made it possible to obtain satisfactory results in three cases.

Fig. 6 shows a record obtained with this technique from a patient with lactation amenorrhoea. Pressure variations are seen to range from 3 to 7 mmHg. with a frequency of 4 to 5 contractions/min. Too little data have been obtained so far with this technique to allow us to draw conclusions of statistical value.

DISCUSSION

Horstmann⁴ (see also ⁷) in his description of the Fallopian tube, distinguishes three muscle layers; a sub-peritoneal longitudinal layer, a middle vasomotor one whose fibres run parallel to the blood vessels, and a deep spiral layer.

The contractions measured with the *in vitro* technique would seem basically to originate in the sub-peritoneal layer of the tube. We believe that excision of the visceral peritoneum of the tube and the adjacent connective tissue, as in Sandberg's procedure^{2,3} could result in lesion of the muscle layer. This might explain the large number of failures in Sandberg's attempts to obtain actively contracting Fallopian tubes.

Our experiments were made with the visceral peritoneum intact, with the result that spontaneous contractile activity was obtained in every case and this, together with changes of the wash fluid at 10 min. intervals, enabled recordings to be made for periods ranging from 60 to 200 min. The stability in the character of tubal contractions over a long recording period, as described, was notable.

In his *in vitro* study of tubal contractility, Sandberg² divided the tube into four parts and, on making independent studies of each, found no differences. This leads us to believe that the results obtained in the segment which we studied would be the same throughout the tube.

The study made of tubal contractions during the two phases of the normal menstrual cycle show no significant differences in intensity, frequency and tubal activity. In patients regulating fertility by the use of long-acting medroxyprogesterone acetate (AMP) tubal activity was less than that observed in the oestrogenic phase of the cycle, although the difference was not significant. It more closely resembled activity during the progestational phase of the cycle, but was somewhat lower. The fall in tubal activity for patients treated with Provera arises from a lessening in the intensity of contractions.

Evidently, a more dependable record of tubal contractility can be obtained with the Fallopian tube *in situ* in the living subject, and with a normal blood supply. For this reason we sought to perfect the technique described. Results in the first 4 cases showed the need to eliminate environmental factors which could show up on the record of tubal contractions, that is to say, pressures transmitted from the abdomen (respiratory movement, coughing, physical effort, etc.). This source of error was therefore eliminated by the insertion of a free catheter in the abdominal cavity to register its pressure and cancel it out in the differential pressure transducer.

The records we have obtained thus far with this technique suggest that with further refinement it will be possible in future to undertake studies on tubal contractility of a more physiological nature, and to carry out pharmacological investigations, as well as elucidate the effects of different contraceptive methods on this organ which is of such fundamental importance in reproductive physiology.

SUMMARY

1. A method is described for the measurement of tubal contractility *in vitro*, which yielded spontaneous contractions in all cases over periods ranging from 60 to 200 min. The contraction pattern is found to be stable and independent of the length of recording.

2. A record is obtained from a segment of the tube with the visceral peritoneum intact. The Ringer's solution in the bath containing the portion of the tube is renewed at 10 min. intervals.

3. Intensity, frequency and total activity of tubal contractions *in vitro* are analysed for three different hormone conditions (oestrogenic and progestational phases of the menstrual cycle,

and following treatment with Provera, medroxyprogesterone acetate, AMP). The differences are not significant: however, Fallopian tubes from patients treated with AMP appear to have slightly less activity than those from patients in the oestrogenic phase, and more closely resemble those in the progestational phase.

4. A technique is described for the measurement of tubal contractility in living subjects; its difficulties and the interpretation of results are discussed.

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Session 15

HYPOTHALAMIC-HYPOPHYSIAL GONADAL AXIS

79. OVULATING HORMONE (LH) SECRETION: A MODEL OF ITS AUTOMATIC CONTROL

V. D. Ramírez

*Department of Physiology,
School of Medicine, University Austral of Chile*

The basis for an automatic control model of LH is: (a) the well-known existence of a closed-circuit hypothalamo-ovarian system; (b) the fact that LH oscillates during the rat oestrous cycle; and (c) the demonstration, in the hypothalamus of the rat, rabbit and other species, of receptors sensitive to oestrogen, and, very recently, to LH, which regulate the secretion of this hormone.

The model consists of two parts:

(1) The control system which is comprised of an error detector (complex ventromedial-arcuate nuclei), an error signal (LH-RF) and a controller (adenohypophysis).

(2) The controlled system (ovary).

The input signal of the controller would be LH-RF. Experimental data point out that the gain of the controller might be of a magnitude of ten times.¹ The controlling signal (LH) acting on the ovary (controlled system) modifies the oestrogen output (controlled variable), but also behaves as a controlled variable of a short feed-back system. On the contrary, oestrogen will close up a long feed-back system. The important point is that both feed-back signals (LH-oestrogen) are detected by sensitive receptors of the brain converting the chemical feed-back signals into bioelectric events. This postulate is necessary because the error detector must algebraically add the bioelectric command signal of the controller with the feed-back signals. The change in the firing rate of the action potentials of the error detector² due to the interaction of the feed-back signals and the command signal might produce a greater or less amount of LH-RF (error signal) which will modify the secretion of LH.

The bioelectric command signal, the origin of which is hypothetically located in the anterior hypothalamus (pre-optic region), may discharge cyclically as a function of time. If this is true our model would behave as a servo-mechanism in which the controlled variables (LH-oestrogen) would follow the command signal of the controller. On the other hand, if the major purpose of the model is to keep the controlled variables equal or close to a constant command signal or set point (genetically determined), the system would function as a regulator.

It is interesting to point out that recently McCann has published two papers which may be analysed using our model. In one,³ he has demonstrated that the responsiveness of the controller to LH-RF does not change during the oestrous cycle, that is to say, the pituitary discharges as much LH after similar doses of LH-RF in the dioestrous as in the prooestrous or the oestrous phase of the cycle. As for the other paper,⁴ their results suggest that progesterone has a positive effect on LH secretion only during the prooestrous phase of the cycle of the rat.

These results would imply in our model that the set point is modified each time that the rat arrives at the critical phase of prooestrus, the pre-optic region sends more command signals to the error detector, that is to say, the model would behave as a servo-mechanism. However, from a physiological point of view it is possible that both mechanisms (servo and regulator) are used by the LH control system.

A model of these characteristics is an oversimplification of the mechanism regulating LH secretion, but offers the possibility of finding new pathways of investigation.

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80. INHIBITORY ACTION OF EXTRACTS OF HUMAN HYPOTHALAMUS ON OVULATION IN RATS

M. de la Lastra and J. Arrau

Department of Physiology, Catholic University School of Medicine, Santiago, Chile

INTRODUCTION

Hopkins and Pincus¹ have demonstrated the presence, in hypothalamic and cerebral tissue of the rat, of factors capable of modifying ovulation induced in immature female rats by means of Pregnant Mare Serum Gonadotrophin (PMS) and of Human Chorionic Gonadotrophin (HCG). There are no details about the occurrence of substances with similar actions in human cerebral tissue, but the discovery in human urine of material which inhibits HCG and Luteinizing Hormone (LH) reported by Soffer^{2,3} induced us to investigate the possibility that the human brain contains substances with actions similar to those described by Hopkins and by Soffer.

MATERIALS AND METHODS

Hypothalamic tissue was collected from men and women of various ages at autopsy carried out within 12 hr. after death. In each case a piece of tissue was removed approx. 1 g in weight and extending from the optic chiasma to and including the mammillary bodies and in depth as far as the white commissure. In every case the median eminence and a basal layer of tissue with a thickness of approx. 1 mm was excluded. The specimens were stored frozen at -25°C , those of the same sex and age being kept together up to the time of preparing the extracts.

The extracts were prepared by homogenizing the tissue in 0.9 per cent NaCl solution in the proportion of 100 mg of tissue/ml. The homogenized tissue was centrifugated and the surface matter dialysed in cellophane bags for 24 hr. against the same solution at a temperature of 0°C . A similar procedure was used to prepare extracts of cerebral cortex and optic chiasma taken from the same sources.

Similarly, extracts of hypothalamus, cerebral cortex and spinal cord from rats killed by decapitation, without anaesthesia, were prepared following the same procedure. The rats were normal females in different phases of the oestrous cycle, and females spayed 3 months previously and kept either without treatment or injected daily for 3 days with 0.1 mg, intraperitoneally, Reserpine (Serpasol, Ciba).

The extracts were tested as follows:

1. Ovulation induced by PMS in immature rats.

Rats of 28–29 days, from the stock maintained in our breeding colony, were injected subcutaneously (s.c.) with a dose of 30 I.U. of PMS (Gormon, Laboratorio Richter) followed 48 hr. afterwards by the injection of the different extracts in a single s.c. dose, or of an equal volume of 0.9 per cent NaCl solution. Twenty-four hours after this second injection, the rats were killed to verify the presence and number of ova in the oviducts by dissection under the microscope.

2. Ovulation induced by means of intravenous (i.v.) injection of LH in adult rats whose spontaneous ovulation had been suppressed by administration of chlorpromazine during prooestrus.⁴

The rats used in this test were kept under artificial lighting from 7 a.m. to 9 p.m. A vaginal smear was taken each morning to detect the rats that were in prooestrus and these were injected before 11 a.m. with an i.p. dose of 5 mg of chlorpromazine/100 gm weight (Largactil,

Laboratorio Colliere). With this treatment spontaneous ovulation in all the rats was inhibited for 24 hr., a period during which they maintained their capacity to ovulate in response to an i.v. injection of LH. The dose of LH was 2.5 mg of a purified hormone of bovine origin supplied by Professor C. H. Li of California. This dose consistently produced ovulation in 21 rats in which it was injected after treatment with chlorpromazine in prooestrus, with an average of 5.71 ± 0.71 ova per rat.

The extracts were injected i.v. simultaneously or within about 10 min. before or after LH, which was injected by the same or another vein. Between 18 and 27 hr. afterwards, the ovaries and oviducts were excised and the ova counted.

3. Tests of the extracts on spontaneous ovulation.

Use was made of rats under controlled lighting whose vaginal cycle was studied daily. Rats in prooestrus were anaesthetized with i.p. Avertin (Winthrop Laboratories) in order to place a cannula of polyethylene in a carotid, in the cephalic direction. Once the effect of the anaesthetic had worn off, after some 10 to 20 min., a dose of extract which had shown an inhibitory effect in some of the previous tests, or an equal volume of normal saline solution, was infused by means of a perfusion pump.

The period of injection was from 4 to 6 hr., the rat remaining conscious. On the following day a recount of the eggs in the oviducts was made.

4. Influence of the extracts on the ovarian ascorbic acid depletion test of Parlow.

Parlow's test was performed in 1 hr., taking both ovaries in accordance with the technique described by the author⁵ to determine the depletion produced by a dose of LH injected alone or together with an extract injected simultaneously or prior to the hormone. The ascorbic acid titrations were made by the method of Roe and Kuether.⁶

Parlow's method was also used to determine the plasma level of LH of rats castrated 3 months previously, and which before being bled had received a single i.v. injection of extract, or a daily s.c. injection for 5 days. The plasma was obtained by centrifuging the heparinized blood obtained from puncture of the abdominal aorta under Avertin anaesthesia: it was injected in doses of 3 ml/100 g rat used in the Parlow test.

5. Test of follicle-stimulating hormone (FSH) by Igarashi and McCann's method.⁷

Immature rats weighing 7.5 to 10 g, were injected s.c. twice daily for 3 days with a combination of HCG and FSH until a total dose of 0.2 I.U. of HCG and 10 mg of FSH had been given. Half of the animals received in addition a daily s.c. dose of extract whilst the other half received an equal volume of 0.9 per cent saline solution. On the fourth day the animals were killed and the uteri carefully dissected, squeezed between filter papers and weighed on a Roller-Smith torsion balance.

RESULTS

Human hypothalamic extracts inhibited ovulation induced in immature rats by means of PMS. No relation was found between the inhibitory activity and the age of the persons from which the hypothalamus was taken. In larger doses, the extracts of cerebral cortex produced inconstant inhibition of ovulation. The extracts of optic chiasma were always inactive (Table I). The hypothalamic extracts from rats showed an inhibitory effect, but it was less intense than those from human subjects. Those from the spinal cord of rats were inactive. The inhibitory activity on ovulation of hypothalamic extracts of rats showed no variation depending on the phase of the oestrous cycle, even after castration or treatment with reserpine (Table II). The s.c. injection of the same extracts for several days did not affect the oestrous cycle, and their infusion via the carotid during prooestrus did not modify spontaneous ovulation or the number of ova released.

The extracts were also active in inhibiting ovulation induced by injection of 2.5 μ g of LH in the adult rat treated with chlorpromazine during prooestrus. This inhibition was produced by injecting the extracts either simultaneously with the LH or within 10 min. before or after it.

The fact that in this test the effect of human hypothalamic extracts appeared slightly greater than that of rats led us to compare the inhibitory activity of both on ovulation induced by the injection of rat or bovine LH, on rats treated with chlorpromazine, with the purpose of eliminating the possible factor of species specificity. As luteinizing rat hormone,

a macerated adenohipophysis of the animal was used in a dose equivalent to 0.1 mg of fresh tissue, a dose which consistently produced ovulation in the rat treated with chlorpromazine in prooestrus. The hypothalamic extracts, both human and rat, were equally effective in inhibiting ovulation induced by bovine or rat LFi (Table III).

Table I. Effect of nervous tissue extracts on PMS-induced ovulation in immature rats

Treatment	Dose (mgEq)	No. of rats	% ovulating	Ova/rat ± S.E.	P
Saline 0.1 ml		7	100	27.9 ± 2.72	
Spinal cord extract (rat)	10	10	90	23.7 ± 5.44	
Hypothalamic extract (rat)	10	10	90	19.2 ± 3.05	< 0.05
Saline 0.1 ml		10	100	29.4 ± 5.26	
Hypothalamic extract, 1 day-old boys	10	10	80	10.4 ± 3.08	< 0.01
Hypothalamic extract, 2-10 years-old boys	10	10	80	9.9 ± 3.29	< 0.01
Hypothalamic extract, 30 years-old men	10	10	90	9.0 ± 3.61	< 0.01
Optic chiasma extract (human)	10	10	100	20.5 ± 2.86	
Saline 0.1 ml		7	100	24.0 ± 6.18	
Cerebral Cortex extract (human)	10	7	100	26.5 ± 6.54	
Hypothalamic extract (human)	10	7	58.4	5.7 ± 2.37	< 0.02
Saline 0.1 ml		10		33.1 ± 6.94	
Hypothalamic extract (human)	10	11		7.81 ± 2.90	< 0.01
Optic chiasma extract (human)	10	10		26.9 ± 5.73	
Cerebral Cortex extract (human)	400	9		7.5 ± 3.89	< 0.01

Rats given a single injection of 30 I.U. of PMS at 28-29 days of age. Extracts administered 48 hr. after PMS treatment. Ova counted 72 hr. after PMS injection.

Table II. Effect of hypothalamic extracts from prooestrous, dioestrous and ovariectomized rats on PMS-induced ovulation in immature rats

Treatment	Dose (mgEq)	No. of rats	% ovulating	Ova/rat ± S.E.	P
Saline 0.1 ml		8	100	42.0 ± 7.70	
Hypothalamic extract, ovariectomized rat	5	8	62.5	21.0 ± 6.83	
Hypothalamic extract, prooestrous rat	5	8	62.5	13.0 ± 4.00	< 0.01
Hypothalamic extract, dioestrous rat	5	8	100	15.9 ± 2.97	< 0.01
Hypothalamic extract, ovariectomized rat given reserpine 0.1 mg/day during 3 days	5	8	100	23.0 ± 6.89	

Table III. Effect of hypothalamic extract on LH-induced ovulation in chlorpromazine-treated prooestrous rats

Treatment	Dose (mgEq)	No. of rats	Ova/rat ± S.E.	P
LH 2.5 µg (bovine)		8	8.62 ± 0.56	
LH 2.5 µg + human hypothal. extr.	10	7	4.57 ± 1.23	< 0.02
LH 2.5 µg + rat hypothal. extr.	10	6	5.33 ± 1.35	< 0.05
LH 2.5 µg + rat hypothal. extr.	5	4	8.75 ± 0.84	
LH from rat (0.1 mg rat adenohipophysis)		7	4.71 ± 1.22	
Same + human hypothal. extr.	10	8	0.62 ± 0.48	< 0.01
Same + rat hypothal. extr.	10	8	1.37 ± 0.49	< 0.05

Prooestrous rats injected with chlorpromazine (5 mg/100 g body weight) and then with LH (bovine) or rat's anterior pituitary extract. Hypothalamic extracts injected immediately after LH. Ova counted 24 hr. after LH injection.

Since the inhibitory effects described in the two previous tests showed an antagonism between the extracts and the LH, a study was made of the influence of the extracts on the ovarian ascorbic acid depleting action of LH, but no modification was found (Table IV).

Table IV. Effects of hypothalamic extracts on the ovarian ascorbic acid depletion (OAAD) produced by luteinizing hormone (LH)

Treatment	No. of rats	% OAAD \pm S.E.
5 μ g LH (bovine)	6	33.79 \pm 6.16
5 μ g LH + 10 mgEq human hypothalamic extract	7	33.82 \pm 2.36

Also, the hypothalamic extracts in doses capable of inhibiting ovulation did not modify the level of plasma LH in the female rats which had been spayed 3 months previously and had received before bleeding an i.v. injection of the extract, or s.c. injections of extract for 5 days (Table V).

Table V. Effect of human hypothalamic extracts on LH activity of plasma from ovariectomized rats, assayed by Parlow's test

Treatment	No. of rats	OAAD* (% \pm S.E.)
Plasma from ovariectomized rat (3 ml/100 g body weight)	4	37.76 \pm 11.05
Plasma from ovariectomized rat injected with 10 mgEq human hypothalamic extract (3 ml/100 g body weight)	5	39.35 \pm 6.72

Plasma obtained from female rats spayed 8 months before and injected i.v. with the extract or saline 10 min. before bleeding. Plasma assayed by Parlow's test, using the 1 hr. and two ovaries modification. *OAAD: Ovarian Ascorbic Acid Depletion.

No antagonism was found between the extracts and a 10 μ g dose of FSH tested by Igarashi and McCann's method (Table VI).

Table VI. Effect of human hypothalamic extract on activity of FSH estimated the Igarashi-McCann test

Treatment	No. of mice	Uterine weight \pm S.E.
HCG 0.2 I.U. + 10 μ g FSH	10	41.54 \pm 5.66
HCG 0.2 I.U. + 10 μ g FSH + human hypothalamic extr. (14 mgEq)	10	34.22 \pm 2.68

Mice of 7.5-10 g weight were injected during 3 days with a dose of HCG to which FSH was added. The second group received, in addition, an injection of human hypothalamic extract.

DISCUSSION

Ovulation induced in immature rats by serum gonadotrophin is attributed to the endogenous secretion of LH, from which it follows that the inhibition of this effect by the extracts could be explained by suppression of LH secretion or by interference with the effect of the latter on the ovary. The second possibility is supported by the demonstration that LH-induced ovulation is inhibited in rats treated with chlorpromazine at prooestrus.

The lack of effect on spontaneous ovulation can be explained by the greater amount of LH involved in the process of ovulation in the adult rat compared with the immature rat, which has a low pituitary content of this hormone and is therefore more suited for demonstrating actions antagonistic to LH.

The lack of modification of the oestrous cycles in the adult rat submitted to prolonged administration of extracts rules out toxic effects of the latter.

The intervention of a species specific factor can be ruled out, too, since the inhibition also occurs with homologous LH.

The inhibiting substance seems to be specially concentrated in the hypothalamic region, but it is also found in the rest of the brain and is probably identical with that found in human urine by Soffer.^{2,3}

The lack of a relation between the hypothalamic content of this substance and the age of the human donor or the phase of the oestrous cycle in the rat, makes it doubtful that it plays any part in the physiological control of gonadal activity.

SUMMARY

Hypothalamic extracts of human origin were able to inhibit ovulation induced in immature rats by the injection of pregnant mare serum. This effect was unrelated to the age of donors from which the hypothalamic extract was obtained, or to the phase of the oestrous cycle in the rat.

Similarly-prepared extracts of tissue of human optic chiasma or of spinal cord from rats showed no inhibitory effect. Extracts of human cerebral cortex were less active as inhibitors than those of hypothalamus and some showed no activity at all.

The extracts also inhibited ovulation induced by LH in adult rats in which spontaneous ovulation had been suppressed by injection of chlorpromazine during prooestrus.

The extracts did not modify spontaneous ovulation when infused for 4-6 hr. towards the brain in unanaesthetized rats in prooestrus.

Extracts capable of inhibiting ovulation did not modify the effect of a dose of LH determined by Parlow's ovarian ascorbic acid depletion test.

The content of plasma LH of spayed female rats was not modified after a single intravenous injection of the extract or after treatment with daily subcutaneous injections for 5 days.

The hypothalamic extracts did not modify the effect of FSH as measured by Igarashi and McCann's test.

This investigation was carried out with the help of Grant No. 65-120 of the Population Council.

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82. THE CLINICAL MEANING OF THE LONG-TERM SIDE EFFECTS AS SEEN IN EXPERIMENTS WITH 19-NOR-CONTRACEPTIVES

A. Lipschutz

Institute of Experimental Medicine, Santiago, Chile

INTRODUCTION

In the course of our experimental work in mice (strain BALB/c) on the prolonged action of 19-nor-progesterone, progesterone and 19-nor-contraceptives, side effects appeared both in the ovary and the uterus.¹⁻⁴ Any one doing experimental work becomes rapidly convinced that the response to steroids, both natural and synthetic, varies greatly according to the species and strains of animals used. Thus, the question is fully justified whether side effects seen in laboratory animals treated with such steroids offer any clinical interest. It can be stated at the outset that the changes observed in the *ovary* of mice receiving contraceptives, also occur spontaneously in women. This is so in the case of the large granulosa-cell tumour. Although in mice the experimentally produced micro-tumour prevails, comparable micro-tumours originating spontaneously have been described also in women.^{5,6} As for the *uterus*, we found in mice receiving progesterone or norethindrone, cystic glands and endometriosis. The cystic glands in our mice may become enormous in size and reach the surface of the uterus. More recently, a similar picture has been found also in rabbits receiving hydroxyprogesterone capronate.⁷ In mice receiving progesterone or norethindrone a tumour of spindle-shaped cells, or sarcoma, appears in the endometrial stroma. In women receiving 19-nor-progestational agents a "fibrous stromal reaction", "fibroblast-like stromal cells", a "cellular stroma which might be mistaken for endometrial sarcoma" have been described.⁸

Thus it is of utmost interest to know whether our experimental findings with 19-nor-contraceptives offer any hint which would be helpful in avoiding similar pathological accidents in women. The respective hints based entirely on experimental observation are summarized below.

1. Duration of treatment

More than half of the animals receiving during 18 months a sterilizing amount of 19-nor-ethindrone had granulosa-cell tumours.

Table 1. Mice receiving, during 18 months, 19-nor-steroids as subcutaneous pellets

Steroid used	Dose ($\mu\text{g/day}$)	No. of animals	
		Total	With ovarian G* (%)
Norethindrone	7.7 ± 0.5	25	13 (52)
Norethynodrel	5.5 ± 0.2	24	2 (8.3)

*G = granulosa-cell tumour.

Several of these tumours were bifocal, i.e. there were two tumours in the same ovary. In other cases the tumours were present in both ovaries, or combined bilateral and bifocal. With 19-nor-progesterone, granulosa-cell tumours appeared even after a treatment of only 13 months.

At first sight, these results seem certainly alarming. And there was in these experiments full evidence that the long duration of treatment with a sterilizing gestagen constitutes the danger.

Not a single animal treated with large quantities of progesterone during 13 months developed an ovarian tumour, but when the same treatment extended to 18 months a third of the animals had ovarian granulosa-cell tumours (Table II).

Table II. Mice receiving, during 13 or 18 months, progesterone (prog.) as subcutaneous pellets

Prog. ($\mu\text{g/day}$)	Treat- ment (mos.)	Age at autopsy (mos.)	No. of animals		
			Total	With ovarian G* (%)	With uterine S† (%)
117-900	13	16	31	0	1 (3)
59-900	18	20-21	83‡	27 (33)	13 (16)

*G = granulosa-cell tumour. †S = sarcoma. ‡10 autopsied at 23-25 mos.

Likewise, in the group of 31 animals treated for 13 months only one had a uterine sarcoma, but this was present in 13 of the 83 animals in the 18 months group. Thus the incidence of uterine sarcoma increased five times with the longer duration of treatment.

However, the clinical significance of these seemingly alarming results changes radically when the length of treatment (13 or 18 months) is related to the comparative life span of mice and women. The life span of our mice is about 23 months. Taking the life span of women as about 70 years, 1 month in mice corresponds to about 3 years in women. Thus our results may be expressed in the following way: ovarian tumours appeared in mice treated with progesterone or 19-nor-contraceptives for a time equivalent, in women, to about 50 years; in our former experiments with the highly powerful 19-nor-progesterone ovarian tumours appeared after a treatment of about 40 years. Clinically speaking, these figures are rather tranquillizing.⁸

2. Continuous and discontinuous treatment

Our former work in guinea-pigs involving prolonged administration of oestrogens gave full evidence that the tumorigenic, or fibromatogenic action of oestrogen presupposes continuity of treatment.⁹ In our studies on the effect of prolonged administration of progesterone or 19-nor-contraceptives treatment was continuous. It would be of considerable clinical interest to study experimentally the question whether the occurrence of ovarium and uterine tumours induced with progesterone and 19-nor-contraceptives presupposes both prolonged and continuous treatment. For the moment, it would seem best to avoid any clinical trial with subcutaneous pellets of 19-nor-contraceptives.

3. Quantity to be administered

In our quantitative experimental work only progesterone was used as a contraceptive. The results are summarized in Table III.

Table III. Mice receiving, during 18 months, progesterone (prog.) as subcutaneous pellets

Prog. ($\mu\text{g/day}$)	No. of animals		
	Total	With ovarian G* (%)	With uterine S* (%)
0	33	1 (3)	0
< 30	76	3 (4)	2 (3)
59-900	83	27 (33)	13 (16)

*See Table I.

The enormous increase in the frequency of ovarian and uterine tumours when larger quantities of progesterone were administered, is fully shown. This may serve as a hint not to exceed the necessary minimum in the clinical use of 19-nor-contraceptives.

4. Differential dynamics of the contraceptive action of various steroids

At the beginning, both in the classical work of Pincus¹⁰ and in the subsequent work of various authors, the contraceptive action was identified with the antioviulatory and antiluteinizing action of progesterone. The synthetic 19-nor-progesterone which from the beginning was known to be a highly active gestagen, became soon known also as one of the most powerful antiluteinizers.^{11,12}

More recently, however, various authorities produced evidence that the contraceptive effect of various steroids is not necessarily associated with any antiluteinizing action. Prolonged treatment of the rat with 19-nor-ethynodrel does not suppress the production of corpora lutea¹³⁻¹⁵ though production of corpora lutea may be inhibited when large quantities of 19-nor-ethynodrel are administered.¹⁶⁻¹⁸ Comparative results of ours in mice treated with progesterone, 19-nor-ethindrone and 19-nor-ethynodrel are given in Table IV.

Table IV. Number of corpora lutea in BALB/c mice autopsied at 20-22 months, after receiving, during 18 months, different steroids as subcutaneous pellets

Steroid used	Dose ($\mu\text{g}/\text{day}$)	Age at autopsy (days)	No. of animals	
			Total	With C.L. (%)
None	0	621-655	33	8 (24)
Progesterone	59.0	620-632	28	0
Nor-ethindrone	7.7	596-610	25	5 (20)
Norethynodrel	5.5	616-649	24	16 (67)

In normal females autopsied at 21-22 months there were 24% of animals with corpora lutea. With about 60 $\mu\text{g}/\text{day}$ of progesterone the antiluteinizing action of progesterone is complete. By contrast, sterilizing quantities of norethindrone, eight times smaller, produce scarcely any change in the percentage of animals with C.L. With norethynodrel two-thirds of aged females have C.L., compared with only a quarter in normal animals.

Sterility as induced by progesterone or 19-nor-progesterone is easily explained by the antioviulatory or antiluteinizing action of these steroids. But how can the contraceptive action of these steroids which are not antioviulatory or antiluteinizing be accounted for? It is evident that, compared with progesterone or 19-nor-progesterone, the mentioned steroids enter into play at a later stage of the ovarian cycle—after the occurrence of ovulation and luteinization. Various modes of sterilizing action have been tentatively discussed by different authors. Pincus¹⁹ refers to the possibility that the eggs during their passage through the Fallopian tubes are rendered unfertilizable by some action of the respective steroids; but, as he remarks, "ovicidal agents acting upon the unfertilized eggs are conspicuously unknown". Another possible explanation would be inhibition of implantation.¹⁹

When approaching the problem of the dynamics of the contraceptive action it must not be overlooked that both nor-ethindrone and norethynodrel have been found to produce changes in the hypophysics of the rat.^{13,20} Thus it would seem that the way is open for an experimental study of the question whether contraceptive steroids act via the hypothalamic-hypophysial axis.

Another most interesting experimental observation appears closely related to the problem of the differential dynamics of the activity of contraceptive steroids. As mentioned, uterine changes, including sarcoma of the endometrial stroma, are induced in our mice by the prolonged action of large quantities of progesterone; as also mentioned, this finding is of considerable clinical interest as somewhat similar changes have been seen in women receiving contraceptives. Uterine sarcoma was induced in our mice with an average of < 8 $\mu\text{g}/\text{day}$ of nor-ethindrone in 4 out of 25 animals. Thus uterine sarcoma occurred approximately as frequently as with quantities of progesterone from fifteen to hundred times larger (cf. Table III). On the contrary, using the sterilizing average of < 6 $\mu\text{g}/\text{day}$ of norethynodrel there was among 24 animals not one with uterine sarcoma.

In 6 of the latter group of 24 animals receiving sterilizing quantities of norethynodrel another clinically interesting change was found: metaplasia of the endometrium or glands, or of both simultaneously. This finding was all the more impressive as a similar change has never taken place in our group of 25 animals receiving during 18 months sterilizing amounts of nor-ethindrone, nor in our group of 83 animals receiving large quantities of progesterone. There has recently even been a statement that the development of uterine cancer can be prevented in women by the prolonged administration of progesterone.²¹

It is possible to explain the metaplasia induced by norethynodrel as due to oestrogen originating in the body from this contraceptive steroid.^{22,23} The metaplasia was, however, never followed by keratinization as it occurs in animals of the same strain with an ovarian-hypophysial imbalance induced by subtotal castration.²⁴

When considering the question of the mechanism responsible for the ovarian and uterine tumorigenesis as induced by progesterone and 19-nor-contraceptives, one cannot avoid referring also to another type of experimental ovarian tumorigenesis. It is known since the work of Biskind²⁵ that granulosa-cell tumours originate in an ovary grafted into the spleen, the second ovary being removed. The prevailing explanation was that under such experimental conditions there is an imbalance in hypophysial-gonadotrophic function. The imbalance may be due to the failure of the intrasplenic ovary to control the hypophysis because of a partial inactivation of the oestrogen passing from the ovarian intrasplenic graft through the liver before reaching the general circulation. The appearance of haemorrhagic follicles in the grafted ovary in most of the mice carrying intrasplenic ovarian grafts is in favour of an imbalance in hypophysial-gonadotrophic function.

Subsequently, ovarian granulosa-cell tumours were found also in intrarenal and subcutaneous grafts, and the conclusion was drawn that ovarian tumorigenesis was not dependent on an hypophysial hormonal imbalance but on local conditions.²⁶ However, the evolution of the intrarenal ovarian tumour is different from that of the intrasplenic tumour. The former is delayed in its growth when compared with the intrasplenic one: it remains small, a micro-tumour only, which only exceptionally reaches the condition of granulosa-cell tumours.²⁷ When one ovary is grafted into the kidney and the other into the spleen "combined" grafts, the tumour originating in the latter also is a tiny micro-tumour structurally similar to the intrarenal tumour.^{28,29} On the contrary, when both ovaries are grafted into the same spleen ("double" grafts), both become large granulosa-cell macro-tumours.³⁰ These comparative experiments with "combined" and "double" grafts give definite proof that an extraovarian hormonal factor is in play which determines the special way of tumour evolution in the graft.³¹

There seems little doubt that ovarian tumorigenesis of variable structure and size is the outcome of differential imbalances of the gonadotrophic function of the hypophysis, favouring the growth of micro- or macro-tumours, of luteomata or granulosa-cell tumours.

Can this scheme, so well based experimentally, be applied also to the genesis and evolution of ovarian micro- or macro-granulosa-cell tumours induced by progesterone and contraceptive 19-nor-steroids? At present, there is no immediate sign of an hypophysial gonadotrophic imbalance in animals treated with the mentioned steroids; haemorrhagic follicles were absent in most of these animals, whereas they are generally present in animals with intrasplenic grafts.

There is also the outstanding fact that the structural evolution of the granulosa-cell tumour induced by the mentioned steroids is fundamentally different from that of the granulosa-cell tumour as present in an intrasplenic or other ovarian grafts. In the graft the tumour starts, in the overwhelming majority of cases, from the luteomatous proliferation of the ovarian stroma cells. On the contrary, the steroid-induced ovarian tumour is always, from its very beginning, a granulosa-cell tumour, even when still minute.

However, it would not be wise to abandon the idea of extending the concept of differential hypophysial imbalances also to ovarian tumours induced by progesterone or 19-nor-contraceptives.

To conclude, I believe that never before in my experimental career of more than half a century, have so many clinical meanings become evident as in our current work with the prolonged administration of progesterone and 19-nor-contraceptives.

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83. EFFECT OF NON-STEROIDAL AND STEROIDAL AGENTS ON THE HYPOPHYSIAL-GONADAL AXIS

S. Roy

Central Family Planning Institute, New Delhi, India

Clomiphene

Clomiphene,* an analogue of the non-steroidal oestrogenic compound, chlorotrianisene (TACE), has been reported to exert varying influence on the physiology of reproduction in different species of animals. In the rat and mouse it has proved to be a very potent anti-fertility agent due to its gonadotrophin-suppressing, antioovulatory, antifecundity, blastotoxic and nidation-inhibiting effects.¹⁻⁸ On the other hand, it is capable of inducing ovulation in anovulatory women.⁹⁻¹⁵ Systematic studies have therefore been undertaken to elucidate further the nature of actions of this agent on the physiology of reproduction.⁶⁻¹⁰

In several experiments graded doses of clomiphene have been administered to intact immature and mature female rats as well as to intact and unilaterally ovariectomized young adult female rats for 16 to 39 days. It was noted that clomiphene in daily doses of 1 mg/kg or higher decreases the weight of the ovaries and disrupts the oestrous cycle. In one experiment with mature animals a significant decrease in ovarian weight was found even at 0.5 mg/kg dosage level. A somewhat progressive decline in uterine weight is also noted in these studies, except that a significant increase in relative uterine weight is seen at lower dosage levels (0.025 and 0.1 mg/kg) in unilaterally ovariectomized animals. Since the lowering of the ovarian and uterine weight could be due to inhibition of gonadotrophin secretion from the pituitary gland and/or due to interference with the action of gonadotrophin on the ovary, the effect of graded doses of clomiphene on the response of the ovaries to exogenous gonadotrophins†‡ has been studied in intact as well as hypophysectomized immature female rats.⁸ Clomiphene does not interfere with the action of gonadotrophins on the ovary, and this is in agreement with the findings of other workers that clomiphene does not inhibit ovarian hypertrophy⁹ or superovulation²⁰ caused by gonadotrophin administration. On the other hand at daily dosage of 20 to 25 mg/kg it seems to have potentiating effect on the gonadotrophin action. Mayfield and Ward²¹ have also reported that clomiphene increases the sensitivity of the ovarian ascorbic acid depletion response to luteinizing hormone (LH) in rats made "pseudopregnant" by the administration of pregnant mare's serum gonadotrophin (PMSG) and human chorionic gonadotrophin (HCG). It decreases the weight of the uterus in gonadotrophin treated intact as well as hypophysectomized animals, which would indicate an antiuterotrophic action of clomiphene. When this compound alone is administered to hypophysectomized rats it exerts an uterotrophic effect without causing any change in the ovarian weight. These findings would indicate that clomiphene has both oestrogenic and antioestrogenic properties. It may be pertinent to mention that in adult guinea pigs clomiphene has been found to cause a lowering in the weight of the ovary but an increase in the weight of the uterus, indicating that it exerts gonadotrophin-inhibiting and oestrogenic actions but not anti-oestrogenic (Roy and Sahay, 1965, unpublished data).

The presence of oestrogenic and anti-oestrogenic actions of clomiphene has been reported

*Clomiphene citrate used in this study has been supplied by Merrell-Richardson Laboratories, Cincinnati, Ohio, U.S.A. In some publications it has been referred to as MRL-41, Chloramiphene or Clomid.

†Gonadogen, pregnant mare's serum gonadotrophin (Upjohn Co.).

‡Synapoidin, combined anterior pituitary gland and HCG (Parke Davis and Co.).

earlier by Holtkamp *et al.*³ in rats. However, the nature of the anti-oestrogenic action has not been clarified. Therefore, the following studies have been undertaken.¹⁶ Graded doses (0.5 to 20 mg/kg) of clomiphene have been administered to bilaterally ovariectomized immature rats over a period of 18 days. In another experiment the effect of same graded doses of clomiphene have been studied in similar rats treated with oestradiol benzoate. In the absence of oestrogen in ovariectomized rats clomiphene exerts an uterotrophic action, whereas in the presence of an oestrogen it counteracts the oestrogenic effect in the same doses which produce oestrogenic action. The results indicate that clomiphene, which has very weak oestrogenic properties compared with oestradiol benzoate, probably acts by competing with the natural oestrogen for the receptor site. It has therefore been of interest to examine whether the presumed oestrogen-competing action of clomiphene could counteract the gonadotrophin-suppressing and ovulation-inhibiting actions of an exogenous oestrogen. In one of the properly designed experiments it has been found that clomiphene in doses of 0.25 to 1 mg/kg counteracts the gonadotrophin-suppressing and ovulation-inhibiting action of 0.5 to 0.75 μg of oestradiol benzoate in rats.¹⁶ To adduce further support to this view of oestrogen-competing property of clomiphene the uptake of intravenously administered radioactive oestradiol by the uterus and pituitary gland of untreated as well as clomiphene pretreated immature rats has been determined at 30 and 60 min. after oestradiol administration.¹⁹ The results indicate that clomiphene prevents the entry of radio-oestradiol to the uterus and the pituitary. The data obtained at 60 min. further show that it probably also accelerates the disappearance of radio-oestradiol from the uterus. Ovarian radioactivity is low and there is no difference between the groups, which suggests that the effect of clomiphene at the hypophysial and uterine levels is a specific one and not part of a generalized non-specific action on oestradiol metabolism.

Oestrogens exert a significant influence on the physiology of ovulation. It has been reported that pretreatment with oestrogen may prevent luteinization of the ovary induced by the administration of luteinizing hormone (LH) or HCG to immature rats.²² Furthermore, anovulation and persistent oestrus associated with cystic changes in the ovaries may be induced by neonatal administration of androgen²³ or by the appropriate hypothalamic lesion.^{24,25} A persistently elevated oestrogenic level in these animals probably prevents cyclic hypothalamic-hypophysial-ovarian activity. However, if the level of circulating oestrogen is markedly reduced by removing the major portion of the ovarian tissue or by autografting the ovary into the spleen, luteinization and even corpus luteum formation readily occur.^{24,17} It is believed that as a result of reduction or elimination of circulating oestrogen the inhibitory effect of this hormone on the hypothalamic-hypophysial axis is mitigated, permitting release of gonadotrophin. This presumption is supported by the observation that administration of oestradiol to such rats with ovarian graft into the spleen completely prevents luteinization.²⁵ In view of the competitive anti-oestrogenic action of clomiphene the effect of graded doses of this agent given for 79 days has been studied in androgen-induced anovulatory persistent oestrus rats. It has failed to produce ovulation or luteinization in the ovaries of such rats, although it has decreased the weight of the uterus mainly by its antioestrogenic action. Clomiphene has caused a significant decrease in the weight of the ovary and in the size of its follicles in these rats at daily dosage of 0.25 mg/kg, indicating that the hypophysial-gonadal axis in these rats is somewhat more sensitive to the inhibitory action of clomiphene. For this direct gonadotrophin-inhibiting action in these rats it is not able to release any gonadotrophin by its antioestrogenic action.

In another experiment with immature female rats clomiphene powder was applied directly to the right ovary.¹⁸ The development of extensive adhesions between the ovary and the uterine horn with adjoining structures on the right side precludes any definite conclusion. There were, however, two important observations in this experiment. Compared with sham-operated control rats the weight of the left ovary in the "clomiphene-applied" animals was significantly increased ($P < 0.02$), and the vagina had opened 6 or 7 days earlier in these animals. This was interpreted by us to be due to a direct oestrogenic effect of clomiphene. In the light of the recent observations by Coppola and Perrine,²⁴ however, this may be of further significance. They found that subcutaneous administration of 0.5 mg/kg clomiphene daily to pre-weaning female rats hastened the time of vaginal opening and that the ovaries

contained corpora lutea. However, the relative weight of the uterus in the clomiphene-treated rats was significantly lower than those of controls, probably due to anti-oestrogenic action of the drug. Coppola and Perrine attributed the other changes to the neutralization of the inhibitory effect of oestrogen on LH release by clomiphene. Evidence that clomiphene at lower dosage (0.1, 0.25 and 0.5 mg/kg) may increase LH secretion in rats has been presented earlier by us^{13,18} by demonstrating the increase in the weight of the ventral prostate and seminal vesicle in male rats, although at higher dosage it decreases the weight of the testis and the secondary sex organs. Furthermore, the findings that at lower dosage levels (0.025 and 0.1 mg/kg) clomiphene causes a significant increase in the relative weight of the uterus in unilaterally ovariectomized rats (see above) is another indication of LH release.¹⁸ Two other recent observations lend support to the view that clomiphene in appropriate dosage may stimulate LH secretion in rats. Coppola and Perrine²⁶ have reported that low doses of clomiphene will induce superovulation in PMSG-treated immature rats. Mayfield and Ward²¹ have shown that clomiphene causes a depletion of ovarian ascorbic acid in rats made "pseudo-pregnant" by Parlow's procedure²⁷ and this is clomiphene dose-dependent. Both these groups of workers have explained their findings on the basis of LH release.

Following initial demonstration by Greenblatt and co-workers^{11,12,15} that clomiphene is capable of inducing ovulation in anovulatory women, this observation has been confirmed by various groups of workers.^{9,10,14,28-30,31-37} Some investigators have felt that it is caused by a direct action of clomiphene on the ovary^{10,28} or by its primary action on the ovarian enzyme system.^{11,38,39} It has been demonstrated by us as well as by others that clomiphene is capable of increasing urinary excretion of gonadotrophins and oestrogens.^{10,12,11,35,4,36,15} It has been observed that the rise in gonadotrophin excretion precedes the rise in oestrogen excretion and ovulation.^{12,36,15,43} Roy *et al.*¹⁵ have reported that following administration of clomiphene to an anovulatory woman a peak FSH level is attained first, then oestrogen rises and a peak in LH level follows. About 48 hr. after the LH peak an ovulatory rise in basal body temperature (BBT) is noted. Such a sequence in the rise in FSH, oestrogen and LH secretion followed by ovulation has been reported by at least two other groups of workers.^{12,43} Clomiphene has been shown to have a mild oestrogenic action in castrated monkeys⁴⁴ as well as in menopausal women.⁴⁵ Anti-oestrogenic action of clomiphene has been demonstrated also in the human: as evidenced by regressive changes in the vaginal epithelium^{25,36,15} and hyperplastic or anaplastic endometrium,^{9,46,47} loss of ferning in cervical mucus,^{35,15} counteraction of stilboestrol-induced vaginal cornification in a patient with Turner's syndrome,⁴⁵ and counteraction of suppression of ovulation or gonadotrophin secretion by oestrogen.^{48,15,15} The relief of symptoms and/or regression in the breast of patients with gynaecomastia or chronic cystic disease of the breast, and occurrence of hot flushes in some individuals treated with clomiphene may also be attributable to its antioestrogenic property.^{15,40} Since clomiphene has been found to produce both oestrogenic and anti-oestrogenic effects in women, it may be presumed that its oestrogen-competing action is also operative in the human species.

In the light of the aforementioned observations made in laboratory animals as well as human subjects it may be postulated that the release of gonadotrophins and consequent ovulation in women may result from the antioestrogenic action of this compound. Clomiphene exerts anti-oestrogenic action in women as well as in laboratory animals, but while it readily inhibits the gonadotrophin secretion in animals it does not do so in humans.¹⁶ This dissociation of action of clomiphene in the human species might be responsible for induction of ovulation in anovulatory women. Thus, clomiphene by its competitive anti-oestrogenic action neutralizes or mitigates the inhibitory influence of oestrogen on the hypothalamic-hypophysial axis without itself suppressing the axis, and thereby helps releasing gonadotrophins and consequent ovulation. Clomiphene has been found to be more effective in those individuals who have some oestrogen secretion, particularly those with persistent hyperoestrogenic function, as is noted in patients with the polycystic ovary syndrome. Nevertheless, it also induces ovulation in some patients with Chiari-Frommel syndrome showing evidence of hypoestrogenism or lack of oestrogenic activity.^{50,15} This suggests that this compound might also have some direct effect on the hypothalamic-hypophysial axis. The relatively greater rise in LH secretion found in male volunteers following prolonged administration of clomiphene⁵¹ may be mainly due to such direct stimulation.

Androgens

Recently it has been shown that the polycystic ovaries of the Stein-Leventhal syndrome contain and secrete abnormal amounts of androgens such as dehydroepiandrosterone (DHA), delta-4-androstenedione (4-AD) and probably testosterone.⁵² In other situations androgens arise from abnormal adrenal cortical function as in congenital adrenal hyperplasia, virilizing adrenal tumours or borderline adrenal dysfunction or from enzyme defects occurring both in the adrenal cortex and the ovary; polycystic ovaries may be associated with them. Studies on the effects of the above-mentioned androgens on the hypophysial-gonadal-uterine axis have therefore been undertaken in rats.^{53,54} At relatively higher dosage levels, DHA, 4-AD and testosterone propionate (TP) causes a lowering in ovarian weight, presumably by inhibiting the pituitary gonadotrophin secretion, and an increase in the uterine weight in immature rats. DHA and 4-AD produce some cystic changes in the ovary at higher dosage levels. In ovariectomized rats 10 mg/kg of DHA or 4-AD does not have any uterotrophic effect, whereas with a 30 mg/kg dose these steroids cause a doubling of uterine weight, which however is one-third of that noted in intact animals. At 10 mg dosage TP causes an uterine stimulation similar to that noted in intact rats. Intra-uterine administration of DHA and 4-AD does not cause a significant increase in uterine weight, whereas that of TP causes a marked increase. The results indicate that DHA and 4-AD do not exert a significant direct uterotrophic effect, the main action probably depends upon their conversion into oestrogens and/or testosterone in ovarian as well as extra-ovarian tissues. The main action of TP, however, is probably exerted directly on the uterus. Furthermore, the inability of clomiphene to counteract the uterotrophic effect of TP would indicate that: (i) the receptor site and mode of action of TP are different from those of oestrogens, and (ii) the action of TP on the uterus may not be significantly mediated through its conversion into oestrogens. These remarks gain some support from the work of Howard⁴⁰ with DHA and testosterone on prepuberal female mice, from which it was concluded that DHA is probably metabolized readily to oestrogen by the ovary, whereas testosterone is metabolized to oestrogen less readily or it interferes more markedly with ovarian function than DHA. It would be of interest to study whether clomiphene would counteract the uterotrophic effect of DHA and 4-AD.

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84. TRANSPLANTABLE SPONTANEOUS AND EXPERIMENTALLY PRODUCED PITUITARY AND TESTICULAR TUMOURS OF THE RAT. TUMORIGENIC AND ANTITUMORAL ACTIONS OF OESTROGENS

R. Iglesias

Institute of Experimental Medicine, Santiago, Chile

This report refers to tumours of endocrine glands involved in reproductive processes, and to the action of the respective hormones on neoplastic processes, and is limited to experimental research conducted in our laboratory. In these studies A × C rats have been used. This is an inbred strain of brown rats started 41 years ago by Wilhelmina F. Dunning in the USA, and obtained by us from Albert Segaloff in 1949. Inbreeding has been maintained by strict brother-sister matings. The animals receive food prepared by a local mill according to a formula from the National Institute for Medical Research, England.

PITUITARY TUMOURS

Spontaneous transplantable pituitary tumours. Pituitary tumours are not rare in the rat. In old animals of some strains their frequency may reach 70%. The morphology of this tumour has been described by several workers, and its transplantability and functional activity were studied by Furth and co-workers in the USA. We have found 159 pituitary tumours in 3,396 adult and old A × C rats, autopsied from 1950 to 1965. The animals autopsied in 1966 are not included. Two transplantable and functional pituitary tumours were found in 1962 and 1964 and are now in the 5th and 13th transplant generation, respectively. Both were found in old intact males. We will refer to the first one only.

In a 777-days-old male, of normal size, a pituitary tumour of 9 mm was found; it was pink in colour, smooth and soft. The mammary glands were developed and contained milk; the adrenal glands were a little larger than normal. The tumour was grafted and grew slowly, the animals surviving from 5 to 8 months.

The grafted tumour must produce: (a) prolactin; (b) adrenocorticotrophin, and (c) somatotrophin.

(a) The mammary glands are enormous and contain abundant milk. They may reach a weight of 50 g in intact females (normally 7 to 8 g in lactating rats). Well-developed mammary glands have been observed also in spayed females with an atrophic uterus. It seems that the adrenal glands are more necessary for the development of the mammary glands than the ovaries. The mammary glands in spayed females with adrenals were larger than in adrenalectomized intact females.

(b) The adrenals may reach a weight of 200 to 300 mg (normal weight: 15 to 20 mg). Polydipsia, polyuria, glucosuria, oedema, atrophy of the thymus, hypertrophy of the liver, kidneys and heart have been observed. The kidneys and heart may develop remarkable sclerotic lesions.

(c) The large size of the animals grafted with the tumour and adrenalectomized is striking. In these animals hypertrophy of the thymus was observed; in one case it weighed 1200 mg (normal weight: 150 mg). Marked body development has also been observed in non-adrenalectomized animals. In the last transplant generations the tumour is functionally less active.

Transplantable pituitary tumour produced experimentally. Pituitary tumours are produced with radiations, with antithyroid drug with thyroidectomy, or with continuous and prolonged oestrogenic treatment. Such tumours are functional and transplantable (cf. Furth and co-workers). The pituitary tumours appearing in mice and rats castrated when young or newborn

have been attributed to the action of oestrogens produced by tumours of the adrenal cortex developing in such animals. Griesbach and Purves¹ observed pituitary tumours in female and male rats castrated at the age of 1½, 3 and 9 months and autopsied when 14½ to 36 months old; they found no adrenal tumours and no signs of oestrogenic action. These authors conclude that the continuous and prolonged deficiency of gonadal hormones is the cause of these pituitary tumours, all of which were *microscopic*. In similar experiments on rats, we have obtained *macroscopic* pituitary tumours; one of these was successfully transplanted.

Fifty male and 35 female A × C rats, of less than 24 hr. to 6 days' age were castrated under light ether anaesthesia. The majority of the autopsies were made 1 to 3 years afterwards. In males, as well as in females, pituitary tumours were found in animals without adrenocortical tumours and without signs of oestrogenic action. Table I summarizes the pertinent results obtained in females. Among 35 females there were 7 with visible tumours in the pituitary glands, although their weight, except in one, did not surpass 30 mg, and some of the tumour-

Table I. A × C female rats spayed between 24 hr. and 6 days after birth.
Female rats spayed at 2 months and intact females for comparison

Hypophysis		Normal weight (8-12 mg)	Survival or age (days)	Uterus (mg)	Animals with mamm. gland > normal
With tumour (10-30 mg)	Large (15-27 mg)				
7	3	25*	755-1,128 979-1,120 362-1,102	31; 35; 40; 47; 64; 81; 115 21; 27; 58 16-86	2 1 2
6 females spayed at 2 mos. (Hypophysis: 10-14 mg)			310-749	50; 60; 63; 84; 94; 117	2
10 intact females (Hypophysis: 10-12 mg)			428-627	288-513	4

*In one animal the weight of the hypophysis was 5 mg.

bearing pituitary glands had a normal weight. In three cases without visible tumours the weight of the hypophysis was from 15 to 27 mg, and in the other 25 the weight was normal and even sub-normal. In all the animals, the uterus was smaller than normal. In the 7 animals with a pituitary tumour, the weight of the uterus was 31-115 mg, as in spayed females without pituitary tumour. In intact females the weight of the uterus was 288-512 mg and of the hypophysis from 10-12 mg.

One of the pituitary tumours, found in a female which was spayed 24 hr. after birth and killed at 26 months, was grafted. It was a big tumour weighing about 100 mg, pink and soft. The uterus weighed 64 mg, the adrenals 18 and 21 mg, the thymus 2.4 mg and the thyroids 8 and 4 mg. The mammary gland was developed as in a 10 days pregnant female. Since atrophy of the uterus is a certain sign of oestrogen deficiency, there seems no doubt that the pituitary tumour was developed in the absence of oestrogens; it was a tumour of chromophobe cells. In the six animals inoculated, 2 intact and 3 spayed females and one castrated male, the tumour grew after a latent period of 200 to 550 days. The survival periods varied from 633 to 680 days. Two animals of this first transplant generation are still alive two years after inoculation. Histologically, the grafted tumour is malignant and non-functional. It is now in the 2nd transplant generation.

TESTICULAR TUMOURS

Transplantable spontaneous testicular tumours. Testicular tumours are not frequent in rats. We have found 75 such tumours in 1,226 A × C rats autopsied at ages of 18½ to 40½ months; 4 of these were transplanted and grew as functional tumours. We will refer to the last one only, which was found in 1962 in a congenitally blind, fertile male, 749 days old. The right

testis was occupied almost completely by a tumour and weighed 2.40 g; the left testis weighed 1.16 g. The weight of other organs was as follows: seminal vesicles 143 mg with and 86 mg without secretion; adrenals 27 and 30 mg; hypophysis 12 mg. The mammary gland was not developed. The tumour was of the interstitial cell type and, as mentioned, both transplantable and functional. It produced androgens, as shown by great development of the seminal

Table II. A × C rats (intact and castrated (♂) males) with spontaneous transplantable functional testicular tumour. (Animals without tumour for comparison)

Groups		Testes (mg)		Seminal vesicles (mg) full	With scrotal hernia
		Right	Left		
With tumour	8 ♂	115-129*	117-142*	650-1,450*	8
	8 ♂	—	—	700-1,250*	8
Without tumour	8 ♂	1,128 ± 69	1,127 ± 42	478 ± 58	0
	8 ♂	—	—	20 ± 3	0

*Only 4 or 5 were weighed, the others destroyed by cannibalism.

vesicles and prostate in castrated males, and by hypertrophy of the clitoris in females. It also produced oestrogens: there is atrophy of the ovaries and great development of the uterus with pyometra in intact and spayed females. There is also great development of the mammary gland and of the hypophysis, with tumours of these organs, as shown below. Another sign of oestrogenic action is the development of scrotal hernia in intact and castrated males. This was already observed in the mouse by Burrows² and subsequently studied by Miller and Gardner.³

Table III. A × C rats. Intact and spayed (♀) females with spontaneous transplantable functional testicular tumour. (Animals without tumours for comparison)

Groups		Ovaries (mg)		Uterus (mg)	With masculinization
		Right	Left		
With tumour	8 ♀	4.5 ± 1.6	7.0 ± 3.5	710-1,400*	5
	8 ♀	—	—	284-800*	8
Without tumour	10 ♀	28.8 ± 5.4	37.6 ± 10.2	374 ± 77	0
	6 ♀	—	—	78 ± 25	0

*Majority with pyometra; weighed empty, but 4 and 5 only.

Transplantable testicular tumours produced experimentally. It is well known that ovaries autografted into the spleen of castrated rats, mice or guinea pigs become tumours if enough time elapses. The Biskinds, who introduced the method, used it also to produce testicular tumours, by grafting testes of very young rats into the spleen of castrated adults. This work has been confirmed, and Twombly and co-workers have succeeded, in one case, in grafting one intrasplenic testicular tumour of the rat to the spleen of another castrated animal. We decided to produce intrasplenic testicular tumours in the rat mainly in order to study their transplantability, in comparison with our spontaneous testicular tumours.

Thirty male and 16 female young adult castrated A × C rats received an intrasplenic graft of one testis from a newborn rat. The autopsies were performed 11 to 28½ months afterwards. In 28 males and in 15 females the intrasplenic testis grew, becoming a tumour of variable size; the weight of the largest one was 1.90 g, which compares with a testis weight in the newborn rat of 2 mg and of about 1 g in the adult. In animals without adhesions of the spleen to the abdominal wall, well-developed seminal vesicles and uterus were observed. This suggests that the testicular tumour may produce androgens and oestrogens, in quantities larger than those the liver is able to inactivate. Macroscopically, the intrasplenic testicular

tumours resemble the spontaneous testicular tumours, being white or pink to yellowish in colour and of soft consistency; they may be cystic. They consist of interstitial cell tumours and may contain vestigial seminal tubules.

Of 13 intrasplenic testicular tumours, 10 of males and 3 of females, subcutaneous grafts were made in intact and castrated males and females. They grew in all the groups, but better in castrated animals. They grow very slowly, the survival time being 2 years or more. In one case, considered unsuccessful, the tumour was found only 32 months after inoculation. Ten of these tumours are maintained by subcutaneous grafts, and are now in the 2nd, 3rd and 6th transplant generation. Some are functional and produce androgens and oestrogens simultaneously, and others oestrogens only.

OBSERVATIONS ON THE FUNCTIONAL SPONTANEOUS TRANSPLANTABLE TESTICULAR TUMOUR

Tumorigenic action of the tumour. Pituitary and mammary tumours are rare in the A × C rat. Their respective frequency in one group of 3,396 adult and aged rats of our strain was 4.7 and 1.6%. The high incidence of pituitary and mammary tumours in animals with grafted functional testicular tumours, is therefore significant. These and the corresponding data for adult and old normal animals are summarized in Table IV.

Table IV. Frequency of pituitary and mammary tumours of normal A × C rats and of rats with the transplantable testicular tumour

Groups	Normal		Groups	With tumour	
	Tumours			Tumours	
	Pituit.	Mamm.		Pituit.	Mamm.
1,226 ♂	38	4	8 ♂	3	3
369 ♂	9	2	8 ♂	4	3
1,578 ♀	100	45	8 ♀	3	5
223 ♀	12	5	8 ♀	4	4
3,396	159	55	32	14	15
%	4.7	1.6		43.7	46.8

In 32 animals grafted with the testicular tumour the frequency of pituitary tumours was 43.7% and of mammary tumours 46.8%.

The *pituitary tumours* are found in animals autopsied 6 months after inoculation with the testicular tumour. They are dark red, soft, and macroscopically very similar to the spontaneous tumours and those experimentally produced by continuous and prolonged action of oestrogens. Their weight ranged from 23 to 324 mg. They have not yet been studied histologically, nor their transplantability.

The *mammary tumours* appeared somewhat later than those of the pituitary, 8 to 12 months after the inoculation of the testicular tumour. They may be small, 2 to 3 mm, or may reach a diameter of 40 mm and a weight of 24 g. They are dark brown with white pinkish zones, soft and multiple; they are mammary adenocarcinoma. The mammary gland is always well developed and contains milk. In one case there was an associated mammary fibroadenoma. So far it has not been possible to graft the mammary adenocarcinoma to intact females, or to castrated ones, either non-treated or treated with testosterone propionate, but it is growing in those receiving oestradiol and still better in those treated simultaneously with oestradiol and testosterone propionate.

As already mentioned, continuous and prolonged treatment with oestrogen produces pituitary tumours in the rat, in our experience in 100% of cases in the A × C strain. As for the production of mammary tumours by oestrogen, this depends upon the strain of rats: it is 85% in the A × C rat and 0% in the Copenhagen rat.^{4,6} It appears that both the pituitary and mammary tumour are due to the action of oestrogens produced by the grafted testicular tumour. What seems strange, on the other hand, is that the androgens produced by the same tumour are not able to antagonize the tumorigenic action of the oestrogens as happens in

other experimental situations. Again, testosterone propionate which does not affect the growth of the mammary tumour grafted, increases the tumour stimulating action of oestradiol when given together with it. Furthermore, Young and co-workers⁶ obtained regression of DMBA-induced mammary tumours with testosterone in the rat.

Antitumoral action of oestradiol. The transplantable testicular tumour in the experiments referred to grows in all the animals inoculated, except in the group treated with oestradiol. It grows slowly, survival varying from 6 to 15½ months and showing no differences among either intact or castrated males and females. But there were differences in the latent periods: this was longer in the intact females than in the other three groups. This suggests that growth of the tumour is affected by the ovary and not the hypophysis; otherwise, the latent period should also be longer in intact than in castrated males, on the assumption that intact females and males are equivalent in gonadotrophic activity.

The results in the group of castrated females treated with oestradiol are noteworthy; while the spayed, non-treated females all died with big tumours of 6 to 20 g, with survival times of 223 to 351 days, of the eight treated with oestradiol no tumours have developed in five, even 516 days after the inoculation, and this 8 months after the treatment was discontinued. They have been under the action of oestradiol—one subcutaneous 10% pellet of 20 to 30 mg, reimplanted four times—during 9½ months. Three out of eight animals in this group died: one without tumour 384 days after the inoculation, and the other two at 287 and 502 days with tumours of 56 and 505 mg. These results acquire greater significance if we consider that in the

Table V. Antitumoral action of oestradiol on the spontaneous transplantable testicular tumour

Groups	Treatment (subcut. pellet)	Number of animals			
		Dead		Alive	
		With tumour	Without tumour	With tumour	Without tumour
8 ♀	0	8	0	0	0
8 ♀*	Oestradiol 10%	2	1	0	5

*Treated for 9½ months, without treatment for 8 months.

other groups, which did not receive treatment or which were treated with progesterone, testosterone or methyltestosterone, and totalling 84 animals, all died with big tumours. It seems as if the oestradiol should have destroyed the inoculated neoplastic cells. This is why we refer to the antitumoral action of oestradiol, although not yet definitely, because there are still five animals alive in which tumours might develop. In animals treated with oestradiol after the tumour had already developed, partial and transitory regression was observed.

We have no explanation to offer on the antitumoral action of oestradiol. We believe that it is exerted not through the pituitary gland, considering that there is no difference in latent periods between intact and castrated males as there is between intact and spayed females. In favour of this view is the lack of action of testosterone on the growth of the tumour and failure of growth of the tumour after treatment is stopped. The effects of the oestrogenic treatment on the gonado-hypophysial functions of adult rats, at least of males, are reversible; when treatment is stopped even fertility recovers.⁷

It might be concluded that the antitumoral action of oestradiol is exerted directly on the tumour. But results of recent experiments, still in progress, are against this assumption: of 32 spayed females which received a tumour implant in the spleen, and in half of which oestradiol was also implanted into the spleen, in the other half under the skin, 12 died in the first group and only 2 in the second (subcut. oestradiol). It must be mentioned, however, that the responsiveness of the tumour has changed somewhat and that the results are not spectacular. This change, though unfortunate, is not unexpected when referring to endocrine tumours. The possibility remains that the antitumoral action of oestradiol is the result of some metabolic derangement, not related to the endocrine glands, and whose nature we cannot guess.

SUMMARY AND CONCLUSIONS

The following spontaneous and experimentally produced transplantable tumours of A × C rat are described: functional spontaneous pituitary tumours producing prolactin, adrenocorticotrophin and somatotrophin; experimental pituitary tumours arising in the spayed rat with evidence of oestrogen deficiency; functional spontaneous interstitial cell tumours producing androgens and oestrogens; experimental tumours developing in the testes of newborn rats grafted into the spleen of castrated adult rats.

Pituitary and mammary tumours developed in animals grafted with the spontaneous testicular tumour are also described. In experiments with the mammary tumour testosterone propionate, which is inactive when acting alone, increases the tumour-stimulating action of oestradiol when acting simultaneously with it.

In experiments with the spontaneous transplantable testicular tumour oestradiol acts as antitumorigenic.

On the basis of the material presented, it may be stated: first, that pituitary tumours may result from the continuous and prolonged action of oestrogen or of its continuous and prolonged deficiency; second, oestradiol may be tumorigenic, tumour-stimulating and anti-tumorigenic; third, endogenous steroid hormones may be tumorigenic.

It is re-confirmed that hormonal polypeptides, the endogenous pituitary gonadotrophins, may be tumorigenic, as exemplified by the tumoral transformation of the intrasplenic testis in castrated animals; in this way experimental tumours are obtained which are similar to "spontaneous" ones.

It is possible that in the production of pituitary tumours in castrated animals the gonadotrophin-releasing factors of the hypothalamus may act as tumorigens.

Finally, we are well aware that experimental results in laboratory animals are not always and necessarily valid for Man. But it is equally obvious that experimental work cannot be overlooked when the health of human beings is at stake.

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Session 16

CONTRACEPTIVE TECHNIQUES:

85. RHYTHM METHOD—THE USE OF BASAL BODY TEMPERATURE

A. Rodriguez

Department of Gynaecology

El Salvador Hospital and the Catholic University, Santiago, Chile

Periodic abstinence, or the rhythm method, is based on the clinical demonstration that in women with biphasic cycles of the type we regard as normal, there is a short, approximately constant fertile period, located in the intermenstrual phase.

This physiological phenomenon offers a simple explanation of the success of the method, but by its very nature it can easily be a source of failure.

It was Ogino¹ who first demonstrated a short fertile period of five days in women. In a Japanese publication in 1923 he described studies comparing the appearance of the ovary at laparotomy with the different days of the cycle in order to determine the day of ovulation. A diligent study of the ovaries in 72 operations proved in retrospect that ovulation had only taken place during the period 12 to 16 days before menstruation. He considered the fertilizing capacity of the sperm in the genital canal to last no more than 72 hours. Later, in 1932, he correlated the fertile period with the length of the previous 12 menstrual cycles and deduced that in the 28-day cycle the time of possible fertilization is from the 10th to the 17th day. If the 12 previous cycles vary in length, the first day of fertility is calculated from the shortest; if it was 23 days, then the calculation is $10 + 23 - 28 =$ the 5th day. To determine the last day in the fertile phase, the longest cycle is used; if this was 43 days, then it is $17 + 43 - 28 =$ 32nd day.

Finally, to verify his results, Ogino added the basal temperature method to his studies. In 1957 he concluded that the two methods concurred in the diagnosis of the fertility period in 82.6% of cases.

The study, interpretation and introduction into clinical practice of the basal temperature curve during the menstrual cycle came from the work of Raoul Palmer²⁻⁵ who, from 1937 onwards, published fundamental contributions on this subject.

In 1947, Férin⁶ published the first work on the use of the temperature curve to determine the sterile premenstrual period, a valuable addition to the rhythm method. From the security of a biphasic temperature curve which rises sharply and then maintains a plateau more or less uniformly throughout the premenstrual phase, comes the so-called "hard" method of Férin and Chartier. Sexual intercourse is permitted only from the second day of the definite temperature rise. The incidence of pregnancies in studies published varies from 0.5% to 2.5% per 100 woman-years.

The method of temperature measurement throughout the menstrual cycle as a means of birth control is based on three biological concepts which are easy to state but difficult to determine with exactitude: the precise time of ovulation; the absence of secondary double ovulation with the resultant formation of two corpora lutea; and the time of day which the sperm retains its fertilizing ability.

As long as no way exists of predicting the onset of ovulation there will continue to be serious difficulties in the chronological evaluation of an event so fundamental to the mechanism of reproduction. It is still taught that pregnancy is the only sure sign that ovulation has occurred.

It has been accepted, since the histochemical correlation studies of the endometrium by Palmer in 1938,² that ovulation takes place in the period from 24 to 36 hours before the rise of the basal temperature curve to its clearly hyperthermal level. Palmer confirmed his deductions by artificial insemination and direct coelioscopic observation of the ovary.⁵ In 1952,

Doyle,¹⁰ using the culdoscopic procedure, verified that ovulation took place on the 10th and 14th days at 6 and 30 hours, respectively, after the lowest point of the basal temperature.

On the other hand, Döring,¹¹ in Munich, in a study of 82 conceptions each following a single insemination during the intermenstrual temperature rise, showed that the greatest number of conceptions occurred the day before the temperature rise and, in decreasing numbers on the 2nd, 3rd, 4th and 5th days before the rise, the day of the rise, and the 6th day before the rise. There was one exception, a single conception that occurred on the day following the rise. These results allow us to evaluate the limitations and failures of the temperature method.

The possibility of successive double ovulation sometimes occurs to the clinician who hears of a pregnancy with fertilization clearly occurring in the hyperthermal plateau. In fact there is only one such published observation—by Stieve,¹² who described the removal of an ovary on the 26th day of the cycle, in which were found together a corpus luteum of perhaps 12 days' duration, and another, very recent, perhaps one or two days old. But neither Stieve nor most experienced investigators and histopathologists have discovered another such case.

The third factor concerned is the duration of the sperm's capacity to fertilize when conditions in the Fallopian tubes are favourable. We leave aside the survival of the ovum, since there is agreement that this can never exceed 24 hours.

We have said that classically it is accepted that the sperm can retain its fertilizing capacity up to 72 hours. However, various investigators have found sperm active on the 5th to 7th day after sexual intercourse.¹³

Data concerning 6,298 cycles with basal temperature curves have been gathered together to compare some of the above concepts with the great number of temperature chart records of couples who, for purposes of preventing conception by the periodic abstinence method, attend the three medical and maternity and child welfare centres in Santiago directed by Dr G. Monckeberg.

The material has been tabulated with a view to computing (a) duration of the cycle, (b) day of ovulation according to the basal temperature curve, (c) duration of the post-ovulatory period, and (d) rate of pregnancy per 100 woman-years.

Fig. 1 shows that 30-day cycles are the most frequent, followed by those of 28 and 26 days. Then, in descending order of frequency, are those of 32, 31, 27 and 29 days, the range extending from 23 to 43 days. A similar concentration and dispersion in the length of cycles was found by Döring for approximately the same total number of cycles.

Fig. 2 confirms that ovulation, according to the basal temperature, normally occurs on the 15th day, followed in order of frequency by the 16th, 14th, 17th and 18th days, with a range extending from the 11th to the 20th day.

Fig. 3 testifies to the constant duration of the luteal or progesterone phase in the normal woman, with the overwhelming incidence 14 days, and a dispersion not exceeding two days on either side of this. It thus coincides exactly with Ogino's conclusions.¹

Table I shows the failures, or the rate of pregnancy per 100 woman-years, which means the approximate risk of fertilization incurred by 100 women using the method for 12 months.

Table I. Pregnancy rates per 100 woman-years of use with the rhythm method

Year	Rate
1964	30.3
1965	2.6 (post-ovulatory phase)
1966	7.8
1967	30.1
1967	68.5 ¹¹

The five rates given correspond to the clinical computations for different groups of couples using the method according to our procedure.

As regards the last two rates which are for this year, 1967, the first, with a failure index of 30.1, corresponds to the analysis of 6,298 cycles in which we found 158 pregnancies. The second, the latest rate for 1967, is 68.5 per 100 woman-years, and represents results obtained

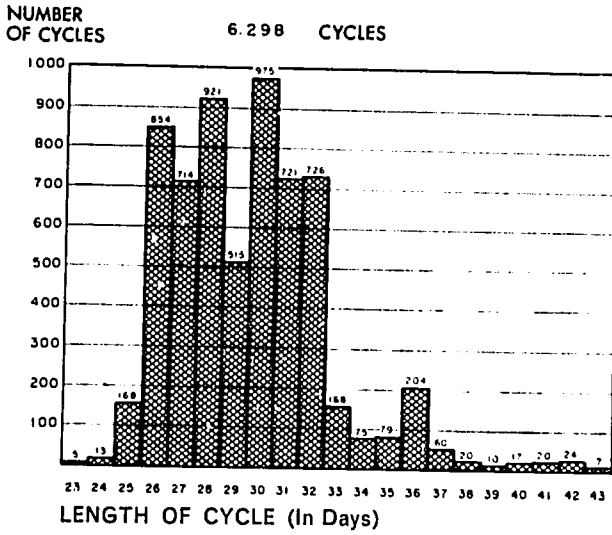


Fig. 1. Lengths of cycles.

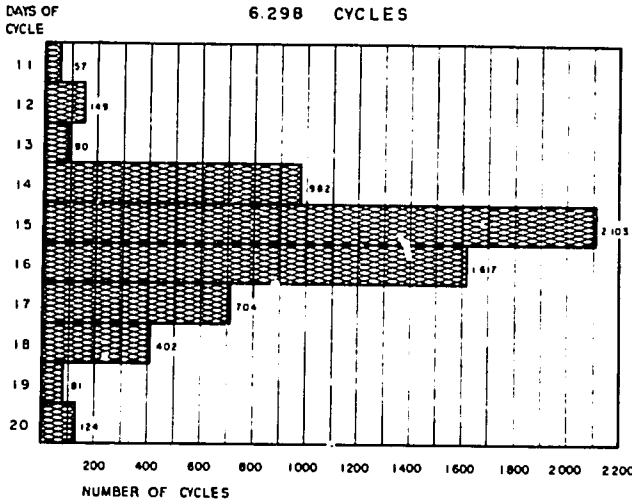


Fig. 2. Ovulation according to basal temperature.

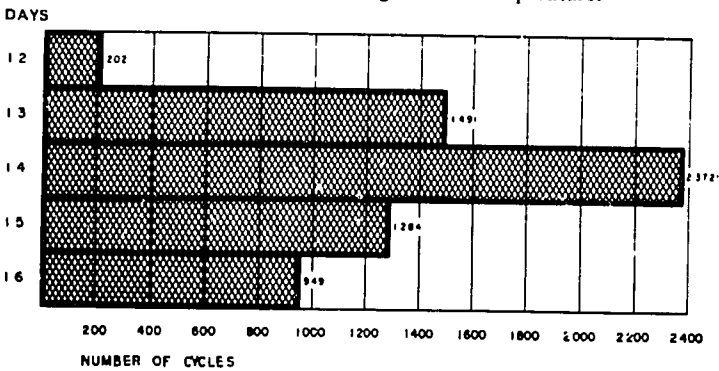


Fig. 3. Length of postovulatory period.

in the Catholic University maternity clinic by Perez, Vela and Espinoza.¹⁴ Sexual intercourse is permitted during the first eight days of the cycle and from 48 hours after the beginning of the thermal rise. The rhythm method is the only one used at the Catholic University, and if couples desire other contraceptive techniques, they are referred to other services where they are used.

The first rate in Table I (for 1964) refers to the first series of women giving birth and mothers, whether nursing or not, studied in the University maternity clinic and described at the Fourth Regional IPPF Conference in San Juan, Puerto Rico, in 1964; the pregnancy rate was 30.3.¹⁵

The second rate (2.36) was computed from a large sample of couples using the strict method of the well-established hyperthermal phase, and was presented before the International Conference of Family Planning Programmes in Geneva in August 1965.⁹

The third rate (7.8) is the result of a study made by myself and Dr G. Monckeberg¹⁶ using the temperature rhythm method, and calculated over 28,616 cycles of exposure. These results were presented at the Central America and Panama Seminar of the IPPF in Tegucigalpa, Honduras, in June 1966.

CONCLUSIONS

By way of summing up and clarifying certain interpretations and deductions made from the above, I should like to add some general ideas and personal conclusions.

Analysis of knowledge and studies concerning ovulation, sperm vitality, sperm fertility, and physiological intermenstrual periods of sterility, shows that evaluation and objective verification are at present partial and incomplete and require new efforts and techniques for positive and precise control and application.

The grade of motivation, except in the 1965 series, the education, technical aid and socio-economic conditions, could all be described as medium or even low for the couples whose failures are shown in Table I.

The pregnancy rates in this table were obtained with groups of women using the temperature rhythm method, except for the 1965 series, in which the strict or hyperthermal period method was used exclusively.⁹

Leaving out the "hard" method (the temperature plateau period), the average of the remaining four groups is discouraging. The figures speak for themselves, showing in numbers what I have stated on other occasions, that the periodic abstinence method has very limited application, at least as regards our own population. In addition, it requires strong, spontaneous and continuous motivation in an enlightened and mature couple, who even then still need the assistance of paramedical technical personnel of proved competence and dedication.^{17,18}

The various methods of periodic abstinence are obviously not the tools or techniques needed for massive application in the field of birth control.

However, in my opinion, the various procedures of the rhythm method need to be completely known in family planning clinics, and explained and applied if requested by couples attending these clinics.

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86. INTRA-UTERINE DEVICES

REPORT FROM THE MEDICAL SESSION

Sarah Israel

Family Planning Training and Research Centre, Bombay, India

EARLY INSERTION AFTER ABORTION

Dr. Lidija Andolšek from Yugoslavia described her experience with the insertion of IUDs immediately after abortion. The advantage of insertion at this time is that these women are more receptive to the idea of using contraceptives, and the procedure can be carried out as a routine while the woman is in hospital; this is of particular value in countries where abortion is legalized.

The women were motivated as soon as they requested an abortion and, immediately after induction, whether by dilatation and curettage or by suction, a Lippes loop, size C or D, was inserted. Some of the women were given antibiotics or sulphonamides, others ergot preparations, and still others no medication at all.

In her series of 340 insertions carried out between October 1965 and February 1967, no serious complications were encountered. Of the 340 women, 91% still had the IUD in place at the end of February, 21 having requested removal for various reasons, while 5 cases had been closed because of expulsion and 4 because of pregnancy. Bleeding was not a troublesome complication, and in only 6 cases mild pelvic infection occurred, but did not warrant removal of the loop. *Dr. Andolšek* felt, therefore, that there was no necessity for covering the insertions with antibiotics.

Dr. Andolšek reported on a smaller series of insertions performed immediately after incomplete abortion. Up to now no complications have been observed in this series.

EARLY INSERTION AFTER DELIVERY

Mr. Tye-Hin Lean from Singapore then presented his study of 8,935 insertions performed on women soon after delivery. These constituted 24% of the hospital deliveries during the year of study. Altogether, 31,000 women were interviewed immediately after delivery and 29% of them had the loop inserted.

Three groups, i.e. those with IUDs inserted immediately or up to 1 week after delivery, those with insertions at 4 to 6 weeks postpartum, and those with insertions 8 weeks after delivery, were compared. In all cases the device used was Lippes loop size D.

The expulsion rate in this series was 20.7 per 100 woman-years of use, the highest number of expulsions being in group A, i.e. those inserted up to 1 week postpartum. Three-fourths of all expulsions in this group had occurred within a month, and almost all within 3 months.

The overall removal rate was 29.6 per 100 woman-years of use, the proportion of removals being unrelated to the time after delivery at which the device was inserted. As a result of a whispering campaign against the loop, 60% of these removals were done at the husband's request, and only 30% for medical reasons. The pelvic infection rate in this series was remarkably low. Post-insertion bleeding did not constitute a serious problem, and was much the same whether the device was inserted immediately after delivery or several weeks later. The pregnancy rate was 2.03 per 100 first insertions, the risk being lowest in the group of insertions immediately after delivery and highest in the group of insertions at 8 weeks.

In a surprisingly large number of cases the IUD was found to have passed partly or wholly through the uterine wall, the numbers being highest (over 10 per 1,000) in the group of insertions at 4 to 6 weeks postpartum. *Dr. Lean* felt that these were not a result of mechanical

perforation of the uterus at the time of insertion. The uncoiling of the loop could itself provide enough force to drive the head of the loop into the uterine wall. Or, the head of the loop might pick out a point of least resistance, usually in the lower uterine segment, and be forced out by the uterine contractions during involution. Dr. Lean calls this the "pick-axe" effect.

The advantages offered by early postpartum insertion are the relatively easier motivation of pregnant women and the technical ease of insertion.

THE ZIPPER RING

Dr. Jaime Zipper of Santiago described the results with the use of his nylon ring in a series of 3 000 women with a period of exposure of 87,000 months. He stressed the simplicity and low cost of the device and indicated that the overall loss of women who had this ring inserted was less than with other currently used devices.

At the end of 5 years the cumulative pregnancy rate with the Zipper ring *in situ* was found to be 11.1.

The expulsion rate was 17 per 100 insertions at the end of the first year, but after most of them were reinserted, the expulsion rate was reduced to 3.4. At the end of 5 years the primary expulsion rate was 23, and after reinsertions it was 5.5.

The cumulative removal rates for bleeding and pain were 4 per 100 insertions in the first year and 9 per 100 insertions in the fifth year.

The total percentage of women under study, who still had the loop in place at the end of 4 years, was 68% as compared with 52% for Lippes Loop D in Tietze's series after the same period.

The life of the Zipper rings might be 8 to 10 years as compared with about 4 years for most other devices.

IUDs AND LACTATION

A study on the effect of IUDs on the duration of lactation was described by Dr. Carlos Gómez Rogers from Santiago. The five groups of women studied by him and his co-workers included normal lactating women without treatment, women in whom the IUD had been inserted, and three groups of women on medroxyprogesterone acetate (MPA), combined oral contraceptive therapy, and sequential oral contraceptive therapy.

The lactation performance of these five groups was compared over a period of 6 months. The IUD appeared to be associated with a longer lactation period than was found in the control group, the mean lactation period being 8 months in the IUD group and 6 months in the control. MPA appeared to have much the same effect, namely an increase in the duration of lactation to an average of 7 months.

On the other hand, with the use of combined therapy, the duration of lactation was reduced to 5 months, while with sequential therapy it was reduced to 4 months.

Dr. Gómez Rogers stated that the inhibitory effect of various modes of hormonal therapy on lactation appeared to be related to the amount of oestrogen administered. He suggested that the galactopoeitic effect of oxytocin is increased in the presence of the IUD.

COMPARATIVE EVALUATION

Dr. Christopher Tietze from New York presented the programme report on the Cooperative Statistical Program for the evaluation of IUDs, covering 39 months of operation with a total of about 24,000 women using IUDs for 382,000 woman-months. The Lippes loop, Margulies spiral, Binberg bow and Hall-Stone ring were used in this study.

A comparison showed that the spirals had the lowest pregnancy rate followed by the loops, while the bows had the highest pregnancy rate. The stainless steel ring was also associated with a high pregnancy rate.

With regard to first expulsions, the large bow was least likely to be expelled, while the expulsion rate for the small spiral was as high as 33 per 100 women. The loops occupied an intermediate position. Even within these three types of device, the expulsion rate was lowest with the larger sizes.

Removal rates for bleeding and pain were much higher for the large spiral than for the small spiral and lower for Loop A than for the larger loops.

On the whole, loop D appeared to have given the most favourable all-round experience, with relatively low rates of expulsion, removal and pregnancy.

The cumulative rates showed a drop-out for loop D of 20% in the first year, 30% in the second year, 40% in the third year and 50% in the fourth year. The experience with these loops showed a steep decline in expulsion rates with advancing age of the women and, to a lesser extent, with increasing parity.

Follow-up of those women from whom the loops were removed indicated that about 50% conceived within 3 months of removal, while 90% conceived within a year.

UTERINE BACTERIOLOGY AND THE IUD

The bacteriology of the uterus in the presence of the IUD was dealt with by *Prof. Daniel Mishell* of the University of California.

Bacteriological and histological studies were carried out after hysterectomy. Using sterile techniques, material taken directly from the uterine cavity of 61 hysterectomy specimens was cultured on aerobic and anaerobic media. Material from the endocervix was also cultured. The endometrial material thus obtained showed negative cultures in 49 cases while the corresponding cervical material was positive. In all these cases the loop had been in place for from 43 hours to 7 months. In 6 of the 10 specimens which showed positive endometrial as well as endocervical cultures, the loop had been in place for less than 48 hours and in the other 4 for less than 30 days.

In a second group of women, material was taken from the endocervix by means of a sterile cotton swab and from the endometrial cavity by means of a curette passed through the cervical canal. In this group all the endocervical cultures were positive, whereas half the endometrial cultures were negative. All the endometrial specimens obtained within 24 hours of loop insertion yielded positive cultures, while all those from uteri where the loop had been in place for more than 30 days yielded negative endometrial cultures. The staphylococcus was the most common organism identified.

These findings indicate that (1) the positive endometrial cultures are the result of mechanical transfer of bacteria from the endocervix to the endometrium, and (2) the natural defence mechanism of the body overcomes the bacteria so that after insertion the endometrial cavity quickly returns to its original sterile condition.

About half the uteri removed by hysterectomy showed chronic endometritis as judged by plasma-cell infiltration. There was no relationship between this finding and the presence of viable bacteria.

The suggestion was made by Professor Mishell that infections of the upper genital tract with the IUD in place are unrelated to the presence of the IUD, but are secondary to coitus. He also stated that the IUD should not be inserted in the presence of upper genital tract infection.

EFFECT OF IUDs ON THE ENDOMETRIUM

The effect of the IUD on the endometrium was further discussed by *Dr. Eneida Aguilera* from Santiago, who suggested that the IUD acts either directly on the endometrium or its presence sets up a neuroendocrine reflex which brings about a functional imbalance of the endometrium.

In 325 women using the Zipper nylon ring for from 6 to 60 months, endometrial biopsies were examined for the functional condition of the endometrium as well as for the presence of inflammation.

In 36% of cases there was no correlation between the day of the cycle and the functional state of the endometrium. In 35% inflammatory reaction as indicated by the presence of focal or diffuse endometritis with plasma-lymphocytic infiltration was observed. In this group of women, 17% had experienced a change in the menstrual pattern while 83% did not report any menstrual disturbance. Among those women with menstrual irregularities, 70% showed some histological change in the endometrium, while in the group without menstrual irregularities, 6% showed histological changes which could have been responsible for preventing implantation of the ovum.

CONCLUSIONS

The papers presented in the sessions and the discussions which followed have drawn attention to a few important aspects of the use of intra-uterine devices. The impression that insertion of a device in the period immediately following full-term delivery or abortion is fraught with danger of infection, has not been borne out by the experience presented at this conference. With postabortal or postpartum insertion no serious complications or troublesome bleeding have been encountered over and above the incidence reported with insertion at times unrelated to delivery. Expulsions were relatively higher if the device was inserted immediately after delivery. The finding that translocation of the loop was high when it was inserted 4 to 6 weeks after delivery requires further investigation.

Comparative studies of various types and sizes of device appear to show that of the spiral, bow, stainless steel ring and loop, the loop has the best all-round performance and, of the loops, size D is the most useful with regard to rates of expulsion, removal and pregnancy. The results with the Zipper nylon ring were very promising and warrant more widespread use of this device by workers in countries other than Chile.

Bacteriological studies indicate that the usually sterile endometrium does show positive cultures immediately after insertion of the loop because of cervical contamination, but the endometrium very soon returns to its original sterile condition. There is, therefore, no necessity for routine coverage of insertions by antibiotics.

Regarding the histological response of the endometrium to intra-uterine devices, the importance or otherwise of the finding of chronic endometritis in some of the women using IUDs should be further investigated.

87. RECENT DEVELOPMENTS IN THE BIOLOGICAL CONTROL OF FERTILITY

REPORT FROM THE MEDICAL SESSION

Margaret Jackson

Devon Family Planning Clinics, England

This session, which is entitled "Recent Developments in the Biological Control of Fertility", was chaired by Dr. M. K. Krishna Menon for the discussion and by Prof. F. T. Sai, of Ghana, for the speakers' papers. We had four workers who are very experienced in the use of oral contraceptives and other forms of hormonal control to talk to us about two well-established methods and two not so well-known methods of hormonal control.

In the first instance, *Dr. J. Martínez-Manautou*, from Mexico, spoke about low-dosage orals. This is a fairly new concept, and he told of his experience using one particular form of this therapy, i.e. 500 µg. of chlormadinone acetate, without any oestrogen, given daily for evermore—with no break. He had records from some 1,100 fertile women during more than 13,000 months of use. Of these, 126 had taken the tablets for more than 20 months; 40 became pregnant (a 3.7 pregnancy rate per 100 woman-years); six were regarded as true failures of the method, and 34 as patient failures because they omitted to take their tablets. Perhaps they gave them to their husbands! To begin with there was considerable alteration in cycle range and the length of bleeding. The cycle was as variable as 21 to 59 days; the amount and number of days of bleeding also varied and there was intermenstrual bleeding in about 20% of women which gradually got less, so that by the 21st cycle it occurred in only 2.1%. Cycle length also gradually returned to normal after a matter of months. The following investigations were done on these women: 138 pregnanediol determinations on samples collected in the second half of the cycle—in 71% this was negative, i.e. 71% of these cycles were apparently anovulatory and nearly 29% were ovulatory. The endometrium was studied in great detail by various means in 380 biopsies, and an irregular secretory picture was found in about 38%, 30 had a normal (secretory) picture, 15% showed irregular development with different types of glands, 10% were proliferative, and 7% were inactive or rather atrophic. Endocervical histology and the character of the cervical mucus were also studied. Culdoscopy examination was carried out in 50 cases and 37 showed signs of a corpus luteum; 18 of these were examined histologically and in only 12 was the corpus luteum found to be active. This partially explains the discrepancy between the results of the pregnanediol determinations and the histology of the endometrium. Many other examinations were done, including liver-function tests, blood examinations, urine, thyroid-function tests, and so on. No important abnormalities were found. Side-effects were low and the method was surprisingly, to Dr. Martínez's way of thinking, acceptable. The mode of action is still very uncertain.

Then *Prof. R. P. Shearman*, from Sydney, Australia, spoke about the well-established sequential method of oral therapy. This is a purely oral method and he gave us his experience with five types of preparation, each with slightly different formulations and slightly different arrangements in days. He gave pregnancy rates ranging from 4.7 to 0. Side-effects were not troublesome. These patients had a fair amount of nausea in the first cycles, but this tended to get less. There was some weight gain, a certain amount of break-through bleeding, and very little menorrhagia or amenorrhoea. On the whole this was found to be a very acceptable method. Mid-cycle estimations of oestrone were carried out and these showed evidence of suppression of ovulation in most cycles, but not in all. Follicular maturation seemed to be

taking place, but not ovulation. This is a well-established and useful therapy and it was discussed again in the question period.

Prof. J. McLean Morris, from Yale, USA, then spoke to us about the rather new idea of a post-coital pill. He had examined a number of these and he told us about some of them. One has the rather pleasant title of ORF-3858. What ORF stands for, I don't know! Another is ordinary stilboestrol. Now, the important point about this particular type of therapy is that it must be taken between fertilization and implantation. It cannot prevent pregnancy if it is taken after nidation. This, of course, presents certain difficulties. Really it should not be called "post-coital", but rather "post-ovulatory" contraception. Professor Morris used, or some other workers have used, between 25 and 30 mg. of stilboestrol, given over these few days. He has used as little as 0.5 mg. of ethynyl oestradiol, but he considers that a safer dosage would be 2-5 mg. of ethynyl oestradiol. Now, given in these dosages, i.e. 25-30 mg. of stilboestrol or say 2-5 mg. of ethynyl oestradiol, starting when the basal temperature chart shows a sustained rise, this therapy in his experience has given very good protection against pregnancy. Failures can be due to inadequate dosage or improper timing. One important point, of course, is how much a basal temperature chart can be relied on. Another point on which we have incomplete information is how long sperm do in fact survive in the human female genital tract. Endometrial biopsies were examined and they showed retardation or a mixed secretory picture after these tablets have been ingested. Mechanism of action is possibly accelerated transport or possibly a retardation of the endometrium. Various other possibilities were discussed.

Prof. E. T. Tyler, from Los Angeles, gave an excellent summary of his experience with another rather new idea; this is using a progesterone in an injectable form. He has studied a fairly large series using Depo-Provera (medroxy progesterone acetate), 150 mg. every 90 days. There are various other dosages and other suggestions of how frequently the injections should be given. He gave us information from 136 patients; these women were in the fertile years and they had all had a recent pregnancy. As with the small continuous dose the cycle was considerably disturbed; the smallest interval was three days and the longest was 146, and the average duration six to 30 days. This was the average, but there was a range of bleeding from one day to 87 days; obviously, this kind of therapy needs considerable education. The women have to get used to the idea of losing cycle control and not worrying about when they are going to bleed or if they are going to bleed at all. Professor Tyler pointed out that the ordinary menstruating woman spends roughly very nearly a fifth of her life bleeding, and in these ladies this amount of bleeding wasn't vastly increased. The major complaints—there were some complaints—comprised things rather similar to what one gets with oral contraceptives, including nervousness, nausea, headache, dizziness, bloating and loss of libido, flushes and breast tenderness. This is a curious selection of side-effects, and one wonders how many were really due to the injected progesterone. There were a fair number of drop-outs, but not as many as expected. The reasons were the irregular bleeding, which some of the women disliked, and weight gain, which was marked in some cases. In this series there was one pregnancy in more than 1,100 woman-months of use, which is a pretty good record. Resumption of ovulation after this form of therapy was studied. In about one-third of the patients, ovulation was resumed six months after the last injection, but it was not consistent—it came at irregular intervals for a time. All had ovulated once in one year after the last injection.

There followed a paper by *Dr. S. Chinnatamby*, from Ceylon, in which she gave the results of her study into the effect on lactation of various oral contraceptives. She had given orals to 600 lactating women, starting at their postpartum visit, which usually occurred round about six weeks after delivery. She has analysed 150 of these cases; their ages ranged between 16 and 40 and their parity ranged from 1 to 11. It is interesting to note that 80% of these women weighed less than 100 lb. They had all delivered within three months. She had used four different tablets in various strengths. There were two different strengths of one, and five different dosages with another preparation. The effect on lactation was compared with that in previous pregnancies, as experienced by these women. In previous pregnancies, 16.7% of these women had lactated for only 1 to 3 months, while 83.3% managed to lactate for 4 to 18 months. While they were on orals, these percentages altered; about 30% were able to

lactate for only 1 to 3 months and only 70.9% managed to continue for between 4 and 18 months. Thus there is undoubtedly some degree of suppression. It appears to be less as the dosage of the tablet goes down, but there is an interesting point here; in Dr. Chinnatamby's tablets the dosage that went down was that of progesterone, whereas we have just been told that with progesterone injections the lactation period is not altered. So this obviously needs further investigation. Endometrial biopsies were examined. The baby's weight was recorded at 3 months, 6 months and 12 months, and the weight gain appeared to be satisfactory, but Dr. Chinnatamby found the babies' weight a very difficult parameter to keep in order. She asked the mothers their opinion on this method and rather more than 50% of them regarded it as not affecting their breast performance as far as lactation was concerned. She noted no important effects whatever in the babies; she had seen no cases of enlarged breasts and no withdrawal bleeding. One baby did vomit and the mother was taken off orals, and the vomiting apparently ceased then. One rather interesting baby, as soon as his mother went on to orals, said "no thank you" and refused to take the milk any more. He was very firm.

A paper was presented by *Dr. Roberto Nicholson*, from Buenos Aires; he discussed the long and short-term effects of orals and summarized these for us in a very excellent manner. He discussed them under the various systems of the body: digestive, central nervous, cutaneous, vascular, breast, endocrine, genital and reproductive. He went over these various areas of the body and described the complaints and the observed effects and came to the conclusion that none of them could be regarded as serious. The cerebrovascular accidents and coronary thromboses that have been reported, he found not very disturbing because these things would certainly be found in such a very large group of women as are now taking orals. Fluid retention he also mentioned, especially in relation to people inclined to get heart failure or troubles associated with their kidneys. He listed among the later effects, either known or theoretical, prolonged amenorrhoea and persistent anovulation, a return to a menorrhagic picture after stopping orals, postponement of the menopause in women at the change of life, cancer of the uterus and cancer of the breast. He pointed out that there was no conclusive evidence at present that the incidence of carcinoma in these two areas connected with the sex hormones has been in any way increased by the taking of oral contraceptives. Perhaps he was rather wise not to discuss the use of orals at the menopause. This is a very difficult problem.

Finally, we had the other side of the penny, discussed by *Prof. Bruno Lunenfeld*, from Israel, who gave us some information on the two new compounds which have come into the armamentarium of those who are attempting to treat women who want babies which they can't get. These, of course, are clomiphene and human menopausal gonadotrophin (HMG). He pointed out, very rightly, that success would not be obtained with these products unless the cases are carefully and properly selected, and he summarized the ways and means of doing this. The important type of case that is going to be helped is the woman with evidence of insufficiency, owing either to pituitary failure or to failure of release of pituitary gonadotrophins. He also pointed out that she must have an ovary that would respond. He gave a report on a series of some 52 patients treated with clomiphene, in which he had obtained a 47% pregnancy rate, which is very encouraging. He also discussed 34 patients treated with HMG and reported a 44% pregnancy rate. I think this underlines how very well and skilfully Professor Lunenfeld had selected his patients.

In the discussion, which was very lively, I think the focus was rather on the questions of possible liver damage, and the use of orals in countries where malnutrition is prevalent. The effect on the breast was also discussed and how these things act upon the endometrium. Somebody asked how the injection of a progestogen acted and how and when the dose should be given; Dr. Tyler answered this and told us that he usually gave the dose on the 4th or 5th day of the cycle (days 4 to 7) and he gave an injection every 90 days, but it could be given at shorter intervals, or it could be given with larger doses in the original injection, at say six-monthly intervals. Those were the chief points in the discussion.

88. COMPARISON OF LONG-TERM EFFECTIVENESS OF INTRA-UTERINE DEVICES AND ORAL CONTRACEPTIVES

A. Hernández Torres

Department of Obstetrics and Gynaecology, School of Tropical Medicine, San Juan, Puerto Rico

INTRODUCTION

Our laboratory for clinical investigations, in the Ryder Hospital, in the city of Humacao, Puerto Rico, began its studies on contraceptive agents in 1957. With the economic aid of philanthropic bodies and private agencies a programme of education, service and investigation for the urban and rural zones of Humacao and the neighbouring townships was organized.

Up to the end of 1966 a total of 4,354 women had used oral contraceptives and intra-uterine devices (IUDs). Of the group of 68 women who began to use Enovid in 1957, five continue to take part. The family planning service is completely free for all those who request it. Expenses incurred through complications which warrant hospitalization and which are related to the method used are borne by the pharmaceutical house whose product is under investigation.

METHOD

For the purpose of this study, we began by scrutinizing the clinical records of all the patients who were introduced to contraceptive tablets and IUDs during the years 1962, 1963 and 1964. We brought the details obtained up to date by means of interviews in our offices or during home visits. Every woman was followed-up until July 1966 to find out how many had continued to take part and how many had withdrawn in the first part of the study. The first part was the period from the start of the use of the method up to its discontinuation.

A total of 1,558 women were admitted to our programme during the years 1962, 1963 and 1964. Of these 56% (870) chose the IUD and 44% (688) preferred the Pill.

RESULTS

As can be seen from Table I, the greatest number of users were between the ages of 20 and 24, with 41.9% in the IUD group and 42% in the Pill group. About 50% of women using both methods were under 25, and more than 90% of all users were under 35.

It was interesting to find that in the 15 to 19 years' age group, the percentage of women who chose the Pill was double (16.6%) that of those who chose the IUD (9.3%). The reverse occurred at the other end of reproductive life—in the 35 to 39 years' age group.

Table I. Percentage distribution of total users admitted during the period of study, by age and method

Age (years)	Method	
	IUD	Oral
15-19	9.3	16.6
20-24	41.9	42.0
25-29	26.4	27.8
30-34	12.4	9.9
35-39	6.0	3.7
40	4.0	—
Total users	870	688

In Table II it can be seen that the greatest percentage of users had 2-3 previous pregnancies: 48.6% for the IUD and 41.6% for the Pill. Two out of every three users had had three children or less when choosing either of the two methods. As in the 15 to 19 years' age group, Table II shows that a greater number of women in the parity group 0-1 preferred the Pill to the IUD.

Table II. Percentage distribution of total users admitted during the period of study, by parity, method and year of admission

Method and parity	1962	1963	1964	Total
<i>IUD:</i>				
0-1	13.8	19.3	16.9	16.6
2-3	43.6	48.6	53.1	48.6
4-5	22.0	15.1	17.8	18.4
6 and over	20.6	17.0	12.2	16.4
Total users	291	259	320	870
<i>Oral:</i>				
0-1	21.6	23.9	25.7	23.1
2-3	41.5	44.3	40.6	41.6
4-5	20.1	12.5	16.4	18.0
6 and over	16.8	19.3	17.3	17.3
Total users	398	88	202	688

As can be seen in Table III the proportion of withdrawals is higher for the Pill than for the IUD in each of the years under review. Also we note that the proportion of withdrawals by age groups among the users of the Pill is higher than that among the users of the IUD.

Table III. Percentage withdrawals of total users admitted during the period of study by method, age and year of admission

Method and age (years)	1962	1963	1964	Total
<i>IUD:</i>				
15-19	62.2	43.2	29.4	44.5
20-24	83.3	42.8	35.7	52.5
25-29	45.8	43.9	20.0	44.4
30-34	45.0	45.8	32.1	47.8
35-39	60.0	44.7	37.1	47.2
40 and over	42.1	23.5	12.5	26.9
	18.6	30.0	15.4	22.9
<i>Oral:</i>				
15-19	66.6	52.3	46.0	50.7
20-24	74.0	52.9	54.2	42.6
25-29	72.1	51.4	47.5	42.4
30-34	61.3	58.8	42.0	54.0
35-39	56.1	54.5	37.5	51.5
40 and over	45.5	33.3	25.0	34.0
	0.0	0.0	0.0	0.0

The significant drop in the proportion of withdrawals between the years 1963 and 1964 in comparison with 1962 and 1963 among the users of the IUD is possibly due to the fact that from 1963 onwards Lippes loop D was used in place of loop A, the Birnberg bow and the small Margulies spiral.

Table IV shows that in all the parity groups the proportion of withdrawals was greater among the users of the Pill than among those using the IUD. For the women who accept the IUD the proportion of withdrawals tends to diminish on increase of parity. In the case of the Pill this relationship is not so clear, although among paras 3 or less, the proportion of withdrawals is greater (61%) than among paras 4 and more (53%).

In Table V, it can be seen that about 50% of the withdrawals for both methods occur during the first two years of use. Apparently there is a greater proportion of withdrawals during

Table IV. Percentage withdrawals of total users admitted during the period of study, by parity and method

<i>Parity</i>	<i>Method</i>	
	<i>IUD</i>	<i>Oral</i>
0-1	57.6	59.1
2-3	44.0	62.9
4-5	41.9	52.4
6 and over	25.7	54.6
Total	44.5	50.7

Table V. Percentage distribution of withdrawals during the period of study by method and period of use

<i>Period of use (months)</i>	<i>Method</i>	
	<i>IUD</i>	<i>Oral</i>
0-12	57.6	48.4
13-24	27.4	30.2
25-36	10.1	13.8
37 and over	4.9	6.9
Unknown	0.0	0.7
Total withdrawals	387	405

the first year for IUDs than for the Pill. After 12 months of use withdrawals for both methods show a progressive decrease. The great majority of withdrawals from both methods occur during the first two years of use.

Table VI shows that the four main reasons given for discontinuing the use of the IUD were: expulsion, the desire to have another child, loss of blood, and marital separation. These four reasons were apparently responsible for almost 60% of withdrawals from use of the IUD during the period of the study. Nevertheless, if we separate the time of use into intervals of 12 months, we notice that the order of reasons changes. Thus, for example, we see that expulsion, loss of blood and lower abdominal pain were the three fundamental reasons, in that order, for discontinuing the use of the IUD in the first 12 months, while after 12 months the order was: the desire for another child, sterilization and marital separation.

It is of interest to note that the principal reasons given for discontinuing the use of the IUD during the first 12 months were apparently the consequence of complications peculiar to the

Table VI. Percentage distribution of users who discontinued the use of IUDs during the period of study, by reasons and period of use

<i>Reasons</i>	<i>Period of use</i>		<i>Total</i>
	<i>0-12 months</i>	<i>Over 12 months</i>	
Expulsion	26.4	8.6	18.9
Wanted another pregnancy	8.1	31.1	17.9
Loss of blood	14.3	7.3	11.4
Marital separation	9.4	11.0	10.1
Sterilization (F & M)	5.4	11.0	7.0
Pain in lower abdomen	11.2	7.3	9.5
Fear	8.1	6.7	7.5
Opposition of husband	5.0	3.0	4.6
Other	6.3	3.0	5.4
Unknown	5.0	11.0	7.7
Total number of users	223	164	387

method. On the other hand, the reasons given for discontinuing the IUD after 12 months' use do not appear to have any direct relationship to the method.

During the first 12 months, the proportion of expulsions of the IUD was three times greater than in subsequent periods. On the other hand, the discontinuation of the use of the IUD owing to excessive bleeding was twice as great in the first 12 months as subsequently.

The most important reasons for discontinuing the IUD by age groups (Table VII) were: expulsion, wish for another pregnancy, loss of blood, and marital separation. The proportion of expulsions was more significant among the users under 25 years of age. Of the women who discontinued the IUD because they wanted another pregnancy, most were between the ages of 25 and 29.

Table VII. Percentage distribution of users who discontinued the use of IUDs during the period of study, by reasons and age

Reasons	Age (in years)				Total
	15-19	20-24	25-29	30 and over	
Expulsion	18.2	21.1	16.5	16.2	18.9
Wanted another pregnancy	15.9	15.5	23.0	14.8	17.6
Marital separation	13.7	11.7	5.5	14.8	10.6
Loss of blood	13.6	10.6	12.9	12.2	11.4
Sterilization (F & M)	6.8	3.8	11.0	12.2	7.2
Pain in lower abdomen	13.6	11.8	5.4	5.4	9.0
Fear	6.8	5.6	8.2	9.5	7.5
Objection of husband	6.8	5.0	3.7	4.1	4.6
Unknown	4.6	14.9	13.8	10.8	13.2
Total number of users	44	161	109	74	387

Permanent or temporary marital separation as a reason for discontinuing the IUD is more in evidence at the extremes of the reproductive cycle, i.e. among women of from 15 to 19 and from 30 years of age onwards. The loss of blood does not register changes of greater prominence in any age group, nevertheless pain in the lower abdomen as a reason for discontinuing the method decreases significantly from 25 years of age onwards. Surgical sterilization showed a considerable increase after 25 years of age. In Puerto Rico surgical sterilization is much more frequent among females than among males.

It is to be noted that among those who began using the IUD during the years 1962-63-64 and who were followed-up until 1 July 1966, the frequency with which the IUD was expelled during those years was 25.1%, 13.1%, and 6.9% respectively (Table VIII). With respect to age, everything seems to indicate that IUD expulsions tend to lessen with increasing age.

Table VIII. Expulsions of IUDs as a proportion of total users admitted during the period of study, by age and year of admission

Age (years)	1962		1963		1964		Total 1962-64
	Users	%	Users	%	Users	%	%
15-19	8	33.3	5	17.8	1	3.6	17.5
20-24	37	31.6	12	12.2	16	10.7	17.8
25-29	16	20.0	11	15.2	4	5.1	13.5
30-34	9	25.7	5	13.2	1	2.9	13.9
35 and over	3	8.6	1	5.9	0	0.0	4.6
Total users	73	25.1	34	13.1	22	6.9	14.8

Table IX shows that during the years under review the tendency towards a gradual decrease in the rate of expulsions was maintained as parity increased.

Marital separation was the principal reason for discontinuing the use of the Pill, followed in order of importance by the desire to have more children, gastrointestinal effects, and surgical sterilization (Table X).

The desire to have more children increased in importance among the users who discontinued the Pill after having used it for more than 12 months. This shows that a large number of patients asked for these services with the idea of spacing out their children.

Table IX. Expulsions of IUDs as a proportion of total users admitted during the period of study, by year and parity

Parity	1962		1963		1964		Total 1962-64
	Users	%	Users	%	Users	%	%
0-1	15	37.5	8	16.0	4	7.4	20.3
2-3	35	27.6	16	12.7	15	8.0	16.1
4-5	13	20.3	4	10.3	2	3.5	11.3
6 and over	10	16.7	6	13.6	1	3.6	11.3
Total	73	25.1	34	13.1	22	6.9	14.8

Table X. Percentage distribution of users who discontinued the use of oral contraceptives during the period of study, by reasons and period of use

Reasons	Period of use (months)			Total
	0-12	13-24	25 and over	
Marital separation	18.3	22.9	16.3	19.3
Wanted another pregnancy	8.7	15.6	16.3	12.4
Gastrointestinal effects	9.2	1.7	12.8	7.6
Chloasma	2.0	4.9	1.2	2.7
Sterilization (F & M)	4.6	10.7	3.5	6.2
Religious objection	1.5	0.8	4.7	2.0
Objection of husband	1.5	4.9	5.8	3.5
Loss of weight	3.1	0.8	—	1.8
Headache	1.6	3.3	—	1.7
Abdominal pain	3.1	3.3	1.2	2.7
Fear	4.6	0.8	2.3	3.0
Other	29.1	21.3	15.0	22.7
Lost to series	12.7	9.0	20.9	13.4
Total number of users	197	122	86	405

Table XI. Percentage distribution of users who discontinued the use of oral contraceptives during the period of the study by reasons and age

Reasons	Age (in years)				Total
	15-19	20-24	25-29	30 and over	
Marital separation	26.4	17.4	14.6	28.9	19.5
Wanted another pregnancy	12.5	13.6	11.7	4.4	12.1
Gastrointestinal effects	8.3	8.6	6.8	4.4	7.6
Chloasma	—	3.2	1.9	6.6	2.7
Sterilization (F & M)	5.8	4.4	8.7	8.9	6.2
Religious objection	—	1.1	4.9	2.3	2.0
Objection of husband	4.2	2.7	4.9	2.3	3.5
Loss of weight	—	2.7	2.0	—	1.7
Headache	1.4	2.2	0.9	2.3	1.7
Abdominal pain	1.4	2.2	1.9	6.6	2.4
Fear	2.8	3.8	2.9	4.4	3.5
Other	19.4	20.7	21.4	20.0	20.5
Lost to series	18.0	17.4	17.4	8.9	16.6
Total number of users	72	185	103	45	405

As in the case of the IUD the opposition of the husband and conflicts of a religious nature do not appear to have made the patient abandon the method to any extent.

Marital separation was the main reason for discontinuing the Pill in every age group (Table XI). Discontinuation of the method because of the wish for another child was the second reason of considerable weight among women under 30; in the 30 years-and-over group the second most important reason after marital separation was the search for a method of greater permanence such as sterilization.

Of the total of 870 users of IUDs, only 24 became pregnant with the IUD *in situ*, making 2.8% (Table XII). Of these, 31% terminated in abortion, an abortion incidence three times greater than that accepted for the population in general. It is interesting to note that in 1962, when several types of IUDs were used, the percentage of pregnancies with the IUD was the highest (4.5%). Among the 688 users of the Pill there were no pregnancies.

Table XII. Percentage distribution of total users who became pregnant using the method during the period of study, and outcome of pregnancy

Year and method	Users admitted	Pregnancies using the method, %	Outcome (%)				
			Abortion	Stillbirth	Live pre-mature	Normal	
1962	IUD	291	4.5	30.8	7.7	7.7	53.8
	Oral	392	—	—	—	—	
1963	IUD	259	1.9	40.0	—	—	60.0
	Oral	88	—	—	—	—	
1964	IUD	320	1.9	33.3	—	—	66.7
	Oral	202	—	—	—	—	

Average % of IUD users: 2.77

About 44% of the women who abandoned the IUD returned to the programme, while in the case of the Pill only 35% came back. Of the group which abandoned the IUD and later returned to the programme the majority (46.5%) chose the Pill, and 23% chose sterilization. Only 9.4% went back to using the IUD.

Of the group which abandoned the Pill, almost 30% had recourse to sterilization and 27% preferred vaginal foam; 19% chose the IUD while 13% went back to the Pill (Table XIII).

Table XIII. Percentage distribution of users withdrawing from the use of IUDs and oral contraceptives during the period of study, by method to which they changed

Change to:	Withdrawal	Sheath	Dia-phragm	Foam	Sterili-zation	Rhythm	Orals	IUDs	Total users
Withdrawals from:									
IUDs	0.6	4.8	3.6	11.0	22.9	1.2	46.5	9.4	387 (44%)
Orals	0.0	6.2	1.5	26.8	28.9	4.1	13.4	19.1	405 (35%)

In our experience a great number of women use vaginal foam as a temporary method while they decide on a more permanent method.

As can be seen, Table XIV indicates that the use of the IUD or the Pill does not significantly alter the coefficient of fertility in a woman. More than 80% became pregnant during the first 12 months after discontinuation of the method.

Of the total of 870 women who chose the IUD, 31 (3.7%) had abnormal cervical cytology during the period of use. For the users of the Pill the percentage was 1.9 (Table XV). In consequence, the number of diagnostic procedures, i.e. biopsies, conizations, curettages, was greater among the users of IUDs than among those using the Pill. Nevertheless, the presence of carcinoma in the area was not significantly different in either method.

Table XIV. Percentage distribution of users who discontinued the method during the period of study because they wanted another pregnancy, and time required to become pregnant

Time required (months)	Method	
	IUD	Oral
0-3	67.7	60.9
3-6	17.8	12.5
7-9	—	6.2
10-12	3.2	6.2
13-18	3.2	1.4
No information	8.1	12.4
Total users	62	64

Table XV. Incidental findings during the study in users of IUDs and orals

Incidental findings	IUDs				Orals			
	1962	1963	1964	Total	1962	1963	1964	Total
Patients admitted	291	259	320	870	396	88	202	686
Abnormal cytology	{ 20 6.9%	{ 7 3.1%	{ 4 1.3%	{ 31 3.7%	{ 9 2.3%	{ 2 3.4%	{ 1 0.5%	{ 12 1.9%
Carcinoma <i>in situ</i>	1	2	1	4	2	1	—	3
Anaplasia	—	1	1	2	—	—	—	—
Atypical cells	2	—	—	2	—	—	—	—
Cervicitis	7	2	1	10	3	—	—	3
Cervical polyp	—	—	—	—	2	—	—	2
Ectopic pregnancy	1	—	—	1	—	—	—	—
Number of biopsies	9	7	4	20	2	1	—	3
Uterine curettage	5	4	4	13	3	1	1	5
Conization of the cervix	4	3	1	8	2	1	—	3
Hysterectomy	1	3	1	5	2	1	—	3
IUD removed under anaesthesia	—	1	—	1	—	—	—	—

89. THE PLACE OF LOCAL AND VAGINAL METHODS OF CONTRACEPTION

Helena Wright

IPPF Medical Committee

At this date, 1967, the many-nation interest in methods of controlling world population to bring numbers within the practical size appropriate to each nation or country, has produced such a variety of ways of dealing with the whole question that the subject has to be divided into sections. The advantages and disadvantages of each section have to be described in detail and compared with one another before any informed and balanced opinion can be created. The object of this paper is to describe all the methods of local and vaginal contraception and to attempt to place them in perspective with regard to the other methods.

Living conditions, financial resources, climate and social customs in various parts of the world differ to such a degree that it seems probable that no one method, nor even one principle, will ever be found which will prove universally acceptable. It seems to me that our 30-odd years of effort, experiment, and comparisons of experience have at least taught us that fundamental lesson. So I should like to suggest that as new ideas are conceived, and new methods are worked out to express the ideas, that attention should be given from the beginning of each new departure to planning the method in all its details with a definite field in view.

As things are at present in the 50 member countries of the IPPF, we have to acknowledge that though we have achieved a measure of success here and there, our combined effect on the ever-increasing world population is not yet large enough to be significant.

Many of the difficulties we have to overcome in the separate situations of our member countries are clearly known to us; many other papers at this Conference will doubtless explain some of them in detail. What I think we have to keep in mind as we listen is the extreme complexity of our problem.

It is possible to imagine and to list the elements of success in any one national situation:

1. The method, or methods, must have been proved by laboratory and clinical experience to be completely effective when properly and continually used.
2. The principles of the methods must not clash with the social customs or religions of the field in question.
3. The cost of the necessary equipment must be within the range of the local average cost of living, or be supplied by the local government or family planning association (FPA) free, or nearly free, of charge.
4. If there is patient participation in the employment of the methods, there must be adequate and appropriate teaching facilities available in the area.
5. Educational propaganda by the local government or FPA must be widespread, continuous, and sympathetic to the people concerned, so that adequate patient motivation can be created.

Consideration of these five equally essential factors of success will immediately reveal the improbability that there are even two regions in the world where conditions are exactly comparable.

In support of this analysis of success it will be found that in all instances where any method has proved to be acceptable, reliable and continuously used, these five factors have been present.

In order to assess the results of the use of a contraceptive method, compilation and study of the relevant statistics of the situation must be undertaken. There is no other way available to find out to what degree the method is succeeding or failing.

Luckily in the IPPF we have realized the essential importance of continuous statistical watchfulness, and we are rich in having frequent and exhaustive statistical reports in constant circulation among our members. The practical value of any set of statistics is, however, strictly limited. The results obtained can apply only to the particular people and circumstances under analysis.

In this peculiarity it is obvious that assessments of results of contraceptive techniques cannot be compared with statistics of, say, an experiment in physics, when the constituents of the process in question are always the same.

So it behoves us to be careful, when we try to make practical deductions from a set of statistics of contraceptive techniques, always to keep in mind the exact circumstances under which the results were calculated. Nevertheless, there are non-statistical ways in which different methods can be compared with one another from the practical point of view.

Local and vaginal barriers are good examples of this. Not only can they usefully be compared with one another, but there are also ways in which they are comparable with quite different methods.

Local methods can be listed in order of reliability. It must be insisted upon that success in all the local and vaginal methods that are in themselves properly designed for their purpose depends on the presence of at least three essential conditions, all of equal importance. First, the patient must have presented herself or himself voluntarily, from a strong and spontaneous motive. Second, the doctor or teacher must be expert enough always to choose a method suitable and acceptable to both partners. Third, the method must be taught so thoroughly that the patient accepts that the only condition of success is uninterrupted faithfulness in carrying out the method on every occasion of intercourse.

These three conditions seem too obvious to be worth mentioning, but long experience in analysing the reasons which have caused unwanted pregnancies has taught us that by far the commonest are patient failures from either weak motivation or lack of understanding of the vital importance of carrying out all the details of the method being used.

LOCAL METHODS

There are two local methods which are completely reliable when properly used: (1) Condom (or sheath) either with or without a spermicidal chemical in the vagina. (2) Barrier (some form of cap) and appropriate chemical in the vagina.

CONDOM

To ensure success the following rules must be followed on every occasion:

1. The condom must be put on before there has been any contact whatever between the erect penis and the external parts of the vulva.
2. On first penetration the man must make sure that the sheath remains in place.
3. Separation of the ensheathed penis from the vagina must take place before the penis becomes limp.
4. The sheath must be removed and the penis meticulously and carefully dried before it is safe for the couple even to lie together face to face.

It is obvious that even these rules will not be successful unless the condom is of a reliable brand. Even with the rigorous individual testing that most condoms undergo, a weak or imperfect one may be sold. To guard against the results of accidental breakage of such a condom, a spermicidal chemical may be used in the vagina; and the less reliable the brand the more necessary this additional protection will be.

When it is understood what a high degree of attention and care is necessary for the successful use of a condom, it is easy to account for the failures which occur. Failures, moreover, which generally are very distressing because the reasons for them are seldom understood.

On the other hand it must be recognized that theoretically the use of the condom is a reliable method. It will therefore always have a place in a programme of contraceptive techniques.

BARRIER AND SPERMICIDAL CHEMICAL

This is the second of the two local and vaginal methods which is reliable when correctly carried out on every occasion.

There are two principles in its use. The first is a barrier, usually called a cap, which is placed in the vagina before there has been any contact whatever between the erect penis and even the external moist parts of the vulva. The function of the cap is a single one and when it is correctly in place it absolutely prevents direct insemination of the os, because it is impossible for the penis either to dislodge the cap, or to pierce it. Caps are made in six shapes, many sizes, and two materials—rubber or plastic. Full descriptions of all kinds of caps are to be found in the *IPPF Medical Handbook*. The second principle of this method is a chemical spermicide which is put into the vagina with the cap, usually one dose on the cervical side and one on the vaginal side of the cap. Its function is again single, and that is to kill all the sperms in an ejaculation within a given time. For complete safety the addition of a spermicide to a cap is necessary because sperms are small and active enough to swim past the rims of all shapes of caps and so have a chance of reaching the cervical os.

There are many different kinds and different forms of chemical spermicides, and it is of vital importance for every doctor who teaches contraceptive techniques to have lists of all those brands which have successfully passed the spermicidal tests which are now in operation in a number of countries of the IPPF.

The two local reliable methods can be contrasted and compared in a number of ways.

Condoms, with or without chemical spermicides, only need full printed instructions for their correct use to be understood. No fitting or advising by a doctor is necessary. They are on sale to the general public without restriction in every country in the world which either manufactures or imports them. The price varies from country to country, but on the whole it is reasonable.

The disadvantages of the sheath method are two. Successful use for any length of time imposes severe demands on the man's character and this, in turn, is likely to have an anxious effect on the peace of mind of his partner, because the responsibility is his and she can do little to share it.

Where sheaths are of unique value is during short emergencies, such as the time between the birth of a baby and the visit of the wife to her doctor or clinic for re-fitting of her contraceptive method.

The situation in the barrier and chemical method has several advantages over the sheath, and in the opposite direction. Responsibility lies entirely with the wife. She must see to it that she finds a good doctor and teacher through whom she can learn to understand the details of the method completely. Her attitude to the continual routine cap care and insertion must be cheerful and faithful and last through, possibly, a large number of years. Given these conditions, the barrier and chemical method is completely reliable.

A disadvantage that is common both to the sheath and the barrier and chemical method is that application in each case is related to sexual intercourse and is therefore difficult to ignore. This is most obviously true of the sheath method, when indeed the relation to intercourse is impossible to forget. The barrier and chemical method, using cream or jelly spermicides, is more flexible, and if the wife can be persuaded to put the cap in every night on going to bed the process soon becomes a habit, and can be ignored emotionally like any other daily process such as teeth cleaning. The resultant experience of emotional freedom for the timing of intercourse and complete protection from an unwanted pregnancy is a rich reward.

COITUS INTERRUPTUS

In this method penetration takes place in the normal way, but withdrawal of the penis must be accomplished before ejaculation. It is one of the oldest and most obvious methods of contraception, but in spite of the amount of publicity which the family planning movement has given to the high rate of failure involved, it is still unfortunately all too common for victims to be in ignorance of the reason for the unreliability of the method. The small amount of male physiology necessary for understanding is seldom included in whatever education in sexual matters has been received either by the man or the woman, and the truth when acquired can be something of a shock.

The physiological rhythm of ovulation and menstruation is a necessary part of any school instruction in human biology, but the equally important facts about spermatogenesis and the path of sperms from the testicles to the penis is often evaded. Essential here is the knowledge that the tip of an erect penis can harbour many sperms because there is no obstacle in the spermatic tubes to prevent their presence there. The first light contact of the tip of the penis, even outside the entrance to the vagina, must mechanically brush off any sperms present, and the danger of their passage into the vagina and so into the cervix is immediately present. So actual is this danger that pregnancy can occur when the hymeneal opening is too small for the insertion of one finger and penetration could not possibly have occurred. I have had five such cases, and in each the shock of unbelief has caused grave psychological trauma. In the practice of coitus interruptus the danger is much greater because of the friction of the penis in the vagina before ejaculation has begun.

CHEMICAL ALONE

In this method a dose of a chemical spermicide is either placed or injected into the vagina as soon as possible before intercourse, and no other protection is used. The theory of the method is that either the quantity or the consistency or both, or the kind of chemical used, will be powerful enough to kill such a large number of sperms that those which escape will be too few to reach the os and cause fertilization.

The weakness of the method lies in the absence of a barrier, and this, therefore, allows the possibility of direct insemination during ejaculation.

The degree of danger of direct insemination depends on the position and size of the cervical os. In marked antelexion or retroflexion of the fundus, the cervix will be at an angle to the axis of the vagina and out of range of direct contact with the tip of the penis. A cervical os which is pinhole in size will present the smallest danger from a mechanical point of view. Danger will be greatest in a multipara with a widely open os in the direct axis of the vagina.

Despite all these disadvantages, the statistical results of some trials with chemicals alone used by young and provedly fertile couples are surprisingly good. When the chemical employed is a thick foam rather than a jelly or cream, the chances of safety are higher.

OTHER TYPES OF BARRIER

When properly fitting barriers are for any reason unobtainable, attempts have been made to use homely materials cut or shaped in approximately suitable sizes as barriers. Materials are either in flat pieces of fabric, square or round, with a thread sewn on to the centre for easy removal, or spongy substances such as foam rubber, foam plastic, or natural sponge. These must be cut in shapes either as discs or spheres, and again provided with an attached thread for removal. Barriers of either kind of material can be only partially effective because there is nothing to keep them in place to cover the os when ejaculation occurs. A form of spermicide can easily be added to these barriers, also made of domestic ingredients. These must be acid, such as lemon, citrus juice, or vinegar, suitably weakened with water. The barrier is dipped into the fluid and thoroughly soaked. Any kind of domestic fat, as oil, except mustard oil, is usable. In this case the fat is smeared over the surfaces of the barrier.

The best that can be said for any of these last three methods is that they are better than no method at all.

COMPARISON OF METHODS

Before the best method of contraception can be chosen for any set of people, or any individual couple, it is necessary to be able to compare and contrast the various methods among themselves.

The following features must be considered:

1. Degree of reliability offered by the method itself.
2. Necessity, or not, of a doctor or teacher for applying the method.
3. Simplicity or complication of the procedure itself and therefore the degree of responsibility which falls on the patient.
4. Timing of method in relation to coitus.

5. Duration of protection provided.
6. Cost of the materials reckoned in relation to local living standards.
7. Necessity, or not, of regular supervision of the patient by doctor or clinic.
8. Relation of the principle of the method to the culture of the people concerned.
9. Relation of the complexity of the method to the local standard of education.

It is possible to list all the contraceptive methods in regular use alphabetically, and to append to each whichever of the nine factors are applicable. This information is set out in tabular form in Table I.

A. CAP AND CHEMICAL

1. Reliability certain with perfect application.
2. Doctor or teacher necessary.
3. Simple method—patient responsibility absolute.
4. Time relation to coitus—adjustable.
5. Eight to 12 hours' protection.
6. Cost negligible in Western society. Considerable in poorer countries.
7. Regular supervision necessary.
8. Applicable to all cultures except Roman Catholic.
9. Unsuitable for people of primitive education.

B. CHEMICAL ALONE

1. Poor reliability.
2. No teaching necessary.
3. Simple method—patient responsibility absolute.
4. Time relation to coitus absolute.
5. Duration of protection—one intercourse.
6. Cost very low.
7. No supervision necessary.
8. Applicable to all cultures except Roman Catholic.
9. Applicable to lowest standards of education.

C. COITUS INTERRUPTUS

1. Unreliable.
2. No teacher necessary.
3. Very simple—patient responsibility necessary.
4. Time relation to coitus absolute.
5. Duration—one intercourse.
6. No cost.
7. No supervision.
8. Applicable to all cultures except Roman Catholic.
9. Applicable to all standards of education.

D. CONDOM ALONE OR WITH CHEMICAL

1. Reliable when correctly used.
2. No teaching necessary.
3. Patient responsibility absolute.
4. Time relation to coitus absolute.
5. Duration of protection—one intercourse.
6. Cost negligible in Western society.
7. No supervision necessary.
8. Applicable to all cultures except Roman Catholic.
9. Too strict for low standards of education.

E. HOME-MADE METHODS

1. Very unreliable.
2. Teacher necessary.
3. Simple method—patient responsibility absolute.
4. Time relation to coitus absolute.
5. Duration—one intercourse.
6. Cost very low.
7. Supervision useful.
8. Applicable to all cultures except Roman Catholic.
9. Not applicable to people of very low standards of education.

F. INTRA-UTERINE DEVICES

1. Reliability variable from absolute to nothing.
2. Doctor essential.
3. Patient participation nil.
4. No time relation to coitus.
5. If reliable, duration indefinite.
6. Cost of material very low. Cost of insertion varies with conditions.
7. Supervision necessary.
8. Applicable to all cultures except Roman Catholic.
9. Applicable to all standards of education.

G. ORAL CONTRACEPTIVES

1. Completely reliable.
2. Doctor and teaching essential.
3. Patient participation absolute.
4. No time relation to coitus.
5. Duration of protection—permanent while method is in use.
6. Cost fairly high.
7. Supervision necessary.
8. Widely applicable.
9. Not suitable for people with low standards of education.

H. RHYTHM METHOD

1. Very unreliable.
2. Teaching essential.
3. Patient participation absolute.
4. Relation to coitus absolute.
5. Duration of protection depends on menstrual pattern of patient—variable number of days.
6. Cost very low—not negligible.
7. Supervision unnecessary.
8. Only applicable to Roman Catholics.
9. Only applicable to people with high standards of education.

Study of these nine factors in relation to each of the present methods of contraception, strictly as applicable to the individuals, or community to be served, should provide a reasonably accurate forecast of the degree of success which is likely to be had, in both short- and long-term estimates.

Most of the failures which have caused us so much disappointment can be traced to lack of attention to one or more of the essential factors necessary for success.

The application of contraceptive methods to all the different nations with their varying social customs and standards of living is so complex that to my mind the only promising

attitude of mind in the people who are responsible for choosing and organizing methods in any new district or country is *first* to study the people, habits, standards of living, and cultural beliefs, and then to begin with whichever method seems to fit all the circumstances best. It is essential to maintain the strictest possible system of follow-up of every patient, and to subject the results of the follow-up to regular statistical analysis.

In the accompanying table an attempt is made to analyse the methods and their applications. From it I think it can confidently be prophesied that any method which is simple, cheap and reliable, when the patient has full motivation, is certain to continue its general usefulness unless or until an equally cheap simple method capable of universal application is discovered.

Table I

	Reliability	Doctor or teaching required	Patient responsibility	Exact timing with coitus required	Duration of protection	Cost	Regular supervision required	Applicable to which cultures	Degree of education required
Coitus interruptus	+	No	+	Yes	Short	0	No	All except Roman Catholic	0
Rhythm	+	Yes	+	Yes	Days	0	? Yes	Only Roman Catholic	+++
Home-made methods	+	Yes	+	Yes	Short	+	Yes	All except Roman Catholic	+
Chemical alone for woman	++	No	+	Yes	Short	++	No	All except Roman Catholic	0
Condom (+ chemical)	++	No	+	Yes	Short	++	No	All except Roman Catholic	++
Cap and chemical	+++	Yes	+	Relative	Hours	+++	Yes	All except Roman Catholic	++++
Intra-uterine device	++	Yes	None	No	Indefinite	+	Yes	All except Roman Catholic	0
Oral contraceptive	++++	Yes	+	No	Indefinite	++++	Yes	Widely applicable	++++

Meanwhile, one or two of the present methods can be used in combination in cases where absolute safety is essential to the patient. If such a patient wishes to start on a course of oral contraceptives, it is wise first to teach her the cap and chemical method and to allow her a short time to prove her competence. Then, if she finds that orals cause side-effects which she finds intolerable, she can stop taking them at once and go back to the cap and chemical method, and so avoid danger of pregnancy while she is deciding on her next plan. The same precaution can be taken before an intra-uterine device is inserted, and the cap and chemical can be used in addition during whatever time her doctor thinks is enough to indicate whether or not the device is going to be effective.

90. FUTURE TRENDS

A. S. Parkes

University of Cambridge, England

Prof. A. S. Parkes' address on "Future Trends" has been combined with his commentary on the proceedings of the four Basic Science Sessions and appears below.

I. FUTURE TRENDS

My assignment, as I understand it, is to consider future trends in contraceptive techniques and, at the same time, to report on the proceedings of the Basic Science Sessions. This seems to me to require a combination of the arts of the rapporteur and of the prophet, and being at best no more than a minor prophet, I will restrict my thoughts about future trends to future possibilities. At the same time, it is obviously impossible for me to deal with all the proceedings of four long Basic Science Sessions, so I shall try to carry out my dual task by indicating where we have had gaps in our programmes and to see to what extent the gaps may point to the future.

But, first of all, a word about these Basic Science Sessions. In a way they may appear to be rather academic, and when they were first added to the programme of the IPPF International Conferences at the Tokyo meeting in 1955, there was some doubt as to whether they really had a place in such a programme and if so, whether they could be maintained in a useful way. I think that time has answered this question decisively. In Tokyo, we had two hours on one single afternoon and somebody took away our projector after about one hour. In New Delhi, and then in Singapore, the Basic Science Sessions improved both in quality and quantity, and on this occasion, as you will all realize, there has been a very considerable interest in our programmes. This seems to me to be very satisfactory. It is most important that biologists should be encouraged to understand the problems of the family planners and that family planners should be able to appreciate the possibilities lying in advances in biological knowledge. Much the best way of achieving this reciprocal enlightenment is to meet together on such occasions as this. On general grounds also, I would say that the family planning problems are basically—I say basically with great caution—a biological problem in so far as they arise from the excessive reproductive potential of the human race, which was necessary in the days when the survival rate was low. This high reproductive potential, which the human race still retains, is anachronistic in these days of medical sciences and welfare services.

Perhaps the most notable thing about the Basic Science Sessions at this Conference is the fact that only one of the four has been devoted to the male. This does not indicate an outbreak of gynaeophilia on the part of the organizers; it indicates the relative amount of work on male and female in current research programmes. This difference arises, at least partly, from the fact that the reproductive processes of the female, to the biologist, are much more interesting than those of the male, but it probably arises partly from the fact that more men than women are working in the field and that there is still a vague idea that it is the job of the female not only to carry the baby, but also to use the contraceptive.

What can we do about the control of fertility in the male? We can castrate him, vasectomize him, or talk him or precondition him into abstinence and even into impotence, but perhaps these are not very practical policies. Obviously, the easiest way of controlling fertility in the male is to control spermatogenesis, and here we have some choice of method. We can make use of the feed-back machinery which is the basis of the use of the Pincus-Rock Pill in the female, or we can adopt other methods. The difficulty about using the feed-back mechanism in the male by administering sex steroids to depress pituitary gonadotrophic activity is that

depression of such activity applies not only to follicle-stimulating hormone, which is responsible for the activity of the spermatid tubules, but also to the luteinizing hormone, which is responsible for maintaining the androgenic activity of the interstitial tissue. As a result, this non-specific depression of gonadotrophic activity of the pituitary leads not only to a decline of spermatogenesis, but also to a decline in the production of male hormone. How long that would take to have an effect on a man's potency is uncertain, but at least it is a sufficient hazard to proscribe the use of this method at present. What is wanted here is a steroid, or other substance, which will selectively depress the production of FSH by the pituitary gland, or else we need a good orally active androgen which, at the same time as it depresses pituitary activity will replace the lost androgenic activity of the interstitial tissue. Rather curiously, it seems that a really good orally active androgen is not available in spite of the vast amount of work which has been carried out on steroid substances.

Failing use of the feed-back mechanism, it is possible to make a direct attack on spermatogenesis by the use of pharmacological compounds. The late Dr. Warren Nelson was working very actively in this field at the time of his death, but work seems to have somewhat lapsed since that time. Nearer home (for me) Dr. Harold Jackson in England is obtaining significant results with pharmacological substances which attack spermatogenesis at various stages, but, unfortunately, the type of compounds he is using are not such as could easily be taken into human use. His work is, however, giving valuable fundamental information about the possibilities of cutting off spermatogenesis at various stages and, therefore, about the latent interval between the beginning of treatment and the appearance of infertility and, conversely, between the end of treatment and the re-appearance of fertility. A third possible method of controlling male fertility lies in immunological techniques, and these formed the subject of the greater part of the first of our four sessions. The conclusion seems to be that whereas dramatic effects can be obtained in certain laboratory animals by rather ferocious methods, there is no immediate probability of such methods being applied to the human male.

I emphasize this matter of the control of fertility in the human male because it seems to me to be a very important subject, which is not having currently the attention which it should have. I say this because we hear a great deal about the possibility of harmful long-term effects from long-term use of the oral contraceptives, and it seems to me that an obvious solution to this difficulty would be an effective method of fertility control in the male, so that husband and wife could take alternative turns, say alternate yearly shifts, in the control of their fertility in the hope that it would thus be possible to avoid long-term harmful effects of continuous use on either.

So much for the male. In the second of the Basic Science Sessions, we considered ovum transport and fertilization and these, of course, are extremely important matters for many aspects of biological contraception. We overlooked the very urgent problem of finding means of detecting ovulation in the human female either at the time it occurs, or preferably, shortly before. In the lower mammals, the overt stage of the cycle is the time of ovulation. In many monkeys and apes there are external indications both of the time of ovulation and of the end of the progestational stage, that is menstruation. In the case of the human female, the sign of ovulation has disappeared, leaving menstruation as the overt stage of the cycle. Obviously, all methods based on the so-called "rhythm" technique would be vastly improved by some method which enabled one to detect ovulation as soon as it happened, instead of a couple of days later, or even to be able to predict it two or three days before it happened. So far, there is no very promising lead in this direction, but when such a lead appears its urgent exploitation would be worth a tremendous research effort.

In Session 14 we came to the endocrinology and pharmacology of implantation. This, too, is a very important theme, particularly in connection with any possible technique of post-ovulatory contraception. It also raises, of course, the question of what exactly constitutes conception, and it was most encouraging to hear it stated categorically, that conception means implantation. It would appear, therefore, that contraception can properly be exercised up to the time of implantation.

Our programme did not include an account of a very interesting new development, which may bear importantly on our subject. This derives from a problem which has puzzled all of us for very many years, and that is how does the organism know that a blastocyst has reached

the uterus and by what means does it stave off the next menstruation which would be fatal to an implantation? Various basic data have been available for a long time, but only recently have they been brought together and developed by experiments on domestic and laboratory animals. It now seems that in some animals, at any rate, the decay of the corpus luteum which leads to the next menstrual period in the absence of conception is brought about by a uterine luteolytic factor and that the blastocyst on arrival in the uterus produces a substance which inhibits or neutralizes this uterine factor and thus prevents itself being swept away by another menstrual period. The possibilities of this for future methods of contraception need no emphasis, and it will be interesting indeed to see how soon this kind of information can be applied, if it is applicable at all, to the human subject.

Our Session 15, which happens tomorrow and about which I am not going to prophesy very much, will deal with the relation between the gonads, the hypothalamus and the anterior pituitary body. This relationship, of course, includes the feed-back mechanism about which I have already spoken. Knowledge of the gonadal-hypothalamic-hypophysial mechanism is increasing rapidly—but it is not yet apparent how we shall be able to apply this growing information about the control of the pituitary by the hypothalamus to the needs of family planning. One paper, however, will be important from current points of view—the one which will deal with the effects of exogenous gonadotrophins on women taking the pill.* The importance of this lies in the suggestion that one effect of the pill is so to damage the ovary as to make ovulation impossible, that the ovulation-preventing effect is a direct one on the ovary rather than one acting through the feed-back mechanism. It would be good to hear once again, that there appears to be nothing very significant in this rather loaded suggestion.

Tomorrow, also, we shall hear from my old friend, and the old friend of many others here, Professor Lipschütz, who will tell us about his long-term experiments on rats with 19-nor steroids. His results may appear somewhat disturbing, but he will be the first to point out that it is a long way from rats to women and that three-quarters of a rat's life equals 40 years in a woman's life.

This brings me almost to the end of what I have to say. I have been asked, this week, two questions which are relevant. The first was: "What has happened to that olfactory contraceptive you promised us some years ago?" I had to say years ago, and I have to say again now, that there is no immediate prospect of a contraceptive perfume and that, even if there were, the localization of its effects might be difficult.

The other question is even further out on a limb. I was asked two days ago at a Press Conference: "Why isn't hypnotism used for contraception?", and it seems to me to be a very good question, and one I, in fact, asked myself some years ago. It is well known that extraordinary physiological results, for instance, a disturbance of the menstrual cycle, can be produced by a post-hypnotic suggestion, and it would be extremely interesting to see some attempt to apply it to the control, say, of ovulation or of certain male functions.

Perhaps then, when the IPPF meets again, we shall have further Basic Science Sessions dealing with such things as olfactory contraceptives and hypnotism, luteolytic factors from the uterus and so on, but at least we can be sure that a great deal more knowledge will be forthcoming in future.

II. COMMENTS ON BASIC SCIENCE SESSIONS

The Basic Science sessions included, among others, papers giving background information on four important practical themes, three of which formed a major part of the proceedings of the Medical sessions.

IMMUNOLOGICAL CONTROL OF FERTILITY

Four papers in Session 12 and one in Session 13 bore on the most interesting and important, but most obstinate, problem of controlling fertility by immunological means.

Dr. P. Rümke dealt with the spontaneous appearance of auto-antibodies to sperm in the human male and their probable association with infertility. These auto-antibodies agglutinate and sometimes immobilize the spermatozoa, which thus have no chance of passing through the

*See summary of papers pages 505-506.

female reproductive tract. It should be noted, however, that only a small proportion of men possess such antibodies in circulating blood, so that this immunological complication is not a common form of infertility. It is, however, an extremely interesting pointer to a possible immunological method of controlling male fertility. Unfortunately, little is known at present as to the mechanism of the reaction, although Professor M. H. Burgos' paper on the basis of selective absorption of colloidal particles along the sperm pathway, which preceded that of Dr. Rümke, indicated a way in which the antigens liberated by disintegrating spermatozoa might enter the blood stream.

Two other papers in this series dealt with the production of active immunological responses by the experimental administration of sperm antigens or similarly effective substances. These studies were partly aimed at the problem of controlling male fertility by immunological methods and partly to throwing light on the mechanism of the auto-antibodies sometimes produced in intact men. The experiments of both these authors were carried out on rabbits and results of considerable technical interest were described, although the practical applications of immunological techniques to the control of male fertility appears to be as far off as ever.

The other side of this problem, immunizing the female against spermatozoa and thence against pregnancy—a project which has received a good deal of interest over 50 years or more—was dealt with by Dr. S. J. Plank in the course of Basic Science Session 13. This author has conducted a long series of experiments to try to establish the mechanism of the experimental immuno-infertility in guinea-pigs previously reported by Katsh and others, using Freund's complete adjuvant. Dr. Plank's findings were extremely significant in that he obtained a relative, though not absolute, infertility, and then only when using the complete adjuvant containing micro-bacteria. Moreover, the greatest degree of infertility among such animals appeared later than the time of maximum antibody response. For this reason, and others listed in his paper, he concluded that, although other factors may be involved, the principal cause of infertility in female guinea-pigs immunized with homologous sperm plus adjuvant may be pathological processes manifested by amyloidosis. This was, indeed, a disappointing end to the papers dealing with immuno-reproduction, at least in the context of the control of fertility, and evidently short of some spectacular break-through, a vast amount of work will be necessary before practical application to man becomes possible.

MECHANISM OF ACTION OF IUDS

Several papers in Session 13 were relevant to the vexed problem of the mechanism of action of intra-uterine devices.

The effects of steroids on the fertilization and transport of mammalian eggs was considered by Dr. M. C. Chang, who pointed out that oestrogen acts to increase the rate of egg transport whereas progesterone apparently decreases it for three days. The administration of oestrogen after ovulation or progesterone before also increases the rate of transport so that the eggs enter the uterus prematurely and thus fail to implant. The problem of the rate of egg transport is, of course, much involved in the study of the mechanism of action of intra-uterine foreign bodies, a subject which was dealt with in the next paper by Dr. A. B. Kar. The problem is also of particular interest in view of Dr. Mastroianni's interpretation of his experiments on IUDs in Rhesus monkeys, in which it appeared that in the presence of an IUD ova passed through the female tract so rapidly as to make fertilization unlikely and implantation almost impossible. Dr. Peter Eckstein, however, reading a paper in the third of the Basic Science sessions, challenged this conclusion, especially on the grounds that observations made on monkeys producing an excessive number of ova under the influence of exogenous gonadotrophin—superovulation—and examined by laparotomy might well not apply to strictly normal animals or women. The work of Dr. Eckstein's group in Birmingham confirmed conclusively that the IUDs are contraceptive in monkeys and do not disturb the menstrual cycle or prevent ovulation. Using otherwise normal monkeys, however, they have shown that fertilization takes place in IUD-type monkeys and, quite contrary to Mastroianni's results, that the eggs can be obtained from the Fallopian tube as regularly as in controls. Dr. Eckstein summarized these results as follows:

"In the Rhesus monkey the present situation can be adequately summarized in this way.

If we take the several points of action of IUDs listed above I think we have excluded any effects of these devices upon the menstrual cycle, upon ovulation, upon sperm transport, and upon fertilization as well as on ovum pick-up, and transport of the ovum through the tube. What happens to the ovum once it gets into the uterus, that is, what is the fate of the ovum immediately after fertilization, we do not know".

The intriguing point remains that after a considerable amount of research, the ultimate mechanism of the contraceptive action of IUDs in monkeys remains so far unexplained, and, as Dr. Eckstein pointed out, it is not likely, therefore, that in the face of the much greater difficulties of investigation we can expect to know quickly the mechanism of their action in women.

PREVENTION OF IMPLANTATION

Several papers bearing on this problem were given in Basic Science Session 14 and they formed a very interesting technical background to a Medical Session paper given by Morris on fertility control by the administration of oestrogens or related compounds to women during the third week of the cycle.* This possibility has been mooted ever since the reaction was first demonstrated 40 years ago in experimental animals, and it was the subject of a memorandum presented to the Oliver Bird Trust in 1957. For whatever reason, however, no serious attempt to extend this work to monkeys or women was reported until last year, when Dr. Van Wagenen described the anti-fertility effects of injecting monkeys with a synthetic oestrogen shortly after ovulation and mating. Morris's results, as reported at the Medical Session, dealt with 100 mid-cycle exposures of patients which produced no pregnancies when either stilboestrol or oestradiol in high doses were given for four or more days post-coitally. The background of this successful inhibition of implantation is evidently far more complex than the original idea of a simple disturbance of the balance between oestrogen and progesterone, as was well shown by other papers given at the third of the Basic Science sessions. In the course of this session Professor M. C. Shelesnyak gave a review of what he called the ecology of nidation, thereby implying a complicated interaction of factors. Some of the complexities were well indicated by Prasad and Kalra in their paper on the possible mechanism of action of anti-oestrogenic compounds which have the power either by competitive inhibition, or otherwise, of inhibiting the effect of the two chief oestrogens, although they may be oestrogenic to some extent in their own right. According to Prasad and Kalra, anti-oestrogens may increase the motility of the Fallopian tube and uterus resulting in the expulsion of the ovum or blastocyst, or the compounds may be slightly toxic and affect the viability of the ovum and blastocysts, or by interfering with the effect of oestrogen on the uterus they may interfere with the decidual cell response and subsequent decidualization, or finally, they may inhibit the oestrogen-induced histamine activity which appears to be essential for implantation. Coutinho's direct observations on the contractility of the human uterus were in agreement with the first of Prasad's conclusions, namely, that oestrogen withdrawal, not oestrogen activity, is responsible for myometrial activation in women. How such a conclusion squares with the classic experiments of Hermann Knaus and others on oestrogen-induced myometrial activity of the uterus in experimental animals is not clear. The complexity of the situation is well shown by Professor Emmens' statement made in his paper on the anti-fertility properties of stilbene and bibenzyl derivatives that "both types of anti-fertility compounds contain members which prevent pregnancy because they are oestrogens and others which may do so because they are anti-oestrogens". Again, some of the changes brought about are reversible while others are irreversible, as shown by Dr. Zipper's experiments on the rat.

MECHANISM OF ACTION OF THE PILL

Papers bearing on the biological background of this problem were given in Basic Science Session 15 under the general title *Hypothalamic-hypophysial-gonadal Axis*, and they bore on almost every aspect of the problem. It was originally supposed that the Pincus-Rock pill worked by means of the feed-back mechanism by which excess steroid hormone in the circulation depresses hypothalamic and thence hypophysial activity, so that the supply of

*See Session 10, page 256.

pituitary gonadotrophin is decreased and with it the production of germ cells and of the gonadal hormones. Later it was suggested that the prevention of ovulation might be contributed to by direct effects on the ovary which in the long run might be highly undesirable. Almost every aspect of this matter was touched on during the course of the fourth Basic Science session. On the reassuring side Dr. Carlos Gual described clinical experiments which showed that the ovaries in women under anti-ovulatory steroid therapy were still capable of responding to exogenous pituitary hormone, so that the anti-ovulation treatment did not act directly on the ovary. On the other hand, both Professor Lipschutz and Dr. Iglesias described the appearance of transplantable micro-tumours in the ovaries of rats long-treated with 19-nor-steroids. These experiments were commented on in my address on "Future Trends" but one point may be added—it has often been said that the 19-nor contraceptive compounds are entirely artificial and for this reason alone may be harmful to the body. This is not correct, at least one 19-nor compound, 19-nor androstenedione, has been identified in the ovary.

Session 17

CLOSING SESSION

91. SUMMARY OF THE CONFERENCE

T. Sjövall

Psychiatric Service, Mental Health Agency, Stockholm

INTRODUCTION

I am afraid you will have to bear with me for not being able to give you a full and concise summary of this large conference. The reasons are in the main: firstly personal limitations of intellectual and characterological equipment, secondly the fact that the conference has been running in two different places for a good part of the time. So all I can do is to present some rather scattered personal impressions and make some comments on them as they have been covered in the proceedings. There is a theme though, in what I want to say and I shall try to develop it as follows. You will remember my compatriot headmaster and the school class he had with you the other day when he was talking about the fruit flies multiplying in the closed bottle. A couple of months ago there was an article in a leading Swedish paper which, incidentally, publishes much about our problems these days. This was another description of our problem that perhaps was even more illustrative of the situation. It was said there, that our planet earth under the sun with its rapidly increasing crust of human beings can be compared to a closed incubator containing a culture of germs growing on a nurture substratum. Spontaneous growth in such a closed biological system, although unchallenged by competitors and outside forces, appears at a certain point to put an end to further growth by self-limiting or even self-annihilating mechanisms of a poisonous nature. In the case of mankind this poison may be of a material as well as of a mental kind.

This is a nasty but, as I believe, not too inappropriate simile. There are many phenomena in modern technical development which along with beneficial effects also have self-destructive implications, and technical inventions, particularly in the field of preventive medicine, leading to an unmanageable increase of mankind, certainly belong to them. My pointing to this rapid growth with self-destructive implications of several kinds may serve as a reminder that the scope and implications of our subject matter at this conference, as well as the future tasks ensuing from them, are both fateful and immense. This has been rather modestly expressed in the main title of the programme "Planned Parenthood—a Duty and a Human Right" and in the four subtitles "The Revolution of Rising Expectations", "Meteoric Growth of Population", "Abnormal Expansion of Cities" and "The Role of Medicine and Science".

Summarizing the contributions I shall turn the handle of the kaleidoscope just a trifle, or reshuffle the cards, as it were, thereby getting four new and different sets under a new retrospective headline. I should like to call this new headline "The Race with Involuntary Self-destruction". Using another metaphor I shall liken the vehicle of this race to a Roman chariot pulled by four horses by the name of "Demography", "Bio-medical Sciences", "Technology" and "Education".

Thus, in my summary I should like to muster our chief resources for this stupendous contest against severe odds, and I shall try to emphasize the remedial aspects of our task as they have appeared or been hinted at in the various contributions and discussions. The subtitles I have chosen do of course overlap, yet they are useful for a broad classification of our main tools as well as for a retrospective view of the contributions to the conference.

DEMOGRAPHY

Starting with demography it is worth remembering that this was the science first to introduce the main problem facing us, namely that of global over-population and its consequences. It happened, which is also worth remembering, without any recourse whatsoever to vital

statistics in the modern sense of that concept, i.e. out of purely theoretical calculations made by Malthus and his followers. Since then we have got the vital statistics on a global scale, at least to an extent sufficient to prove for all practical purposes the alarming qualities of the situation. As is well known, all numerical estimates of the population increase based on available statistics have proved to be under-estimates in the light of more recent census data from various parts of the world. Thus, the first task of demography, that of exposing the tidal wave of increasing numbers, may be considered as already fulfilled. However, it is notable that even this accomplishment only very recently has been recognized to an extent that seems really convincing to reasonably large and influential groups of mankind. In this respect the UN Population Conference in Belgrade in 1965 may be regarded as the turning point.

The second, and according to several contributors by far more intricate task of demography, then, would be to refine already existing methods and to invent new ones, particularly such methods which are suitable for demonstrating the impact of population increase on various living conditions, and for checking up on the results of spontaneous or induced changes of population structure.

1. The first seven contributions to this conference were devoted to the impact of population growth on various social and economic conditions. The universality of these contributions, in contradistinction to the more restricted and local reports of this kind presented at previous conferences, marks, I think, a definite progress towards the type of broad views that it should be the aim of these conferences to provide.

For instance, we learned from Mr. Bridger's paper about the employment flow in Latin America from agriculture through industry to service, the latter sector being an essentially unproductive one. This development, stimulated by democratic ideals, is in a sense the inversion of the slavery society but apparently with very definite consequences for productivity. The only form of large-scale slavery still persisting in our time, and I here refer to contributions and discussion made under the section "Patterns of Family Life", is the male half of mankind dominating the female one. Another clash between old patterns of production and modern technology is contained in the following quotation from Mr. Bridger's paper: "It can be seriously doubted whether sub-division into family smallholdings [of agriculture] is an economically justifiable measure, for it sets up ownership structures which are inimical to the use of modern techniques of production." And a third point of apparently grave significance is the problem of to what extent modern technology, although inevitable and indispensable, is at all appropriate or helpful in some developing countries. Mr. Bridger does not say anything about the remedial aspects of birth control but Mme. Arenas de Touraine, dealing with similar problems, very definitely comes to the conclusion that birth control is no solution to employment problems.

In contrast Director-General Sen, in his impressive report on the present and future situation of global food supplies, leaves us in no doubt as to the urgency of the matter. Let me only remind you of his concluding remarks: "It follows that providing food for the growing millions of the developing countries with a view to achieving the *minimum* nutritional goal will be a formidable task reckoned in terms of resources, cost and effort. There seems no alternative but to fight the battle on both fronts, agriculture as well as population."

Almost equally suggestive of a well-nigh unmanageable situation was Professor Lim Tay Boh's presentation of the impact of population growth on education. It is a pleasure to remind you, in this connexion, of the fact that UNESCO finally seems to have decided to pay some serious attention to this problem.

Closest among the "impact papers" to my own notion of self-destructive forces being at stake in modern development come Professors Gorynski and Carstairs in their contributions on housing problems and mental health respectively. It is tempting to put together Professor Gorynski's practical observation about the inverse relationship between housing density and housing equipment on the one hand and Professor Carstairs' psycho-biological emphasis on the importance of an optimal degree of dispersion of the species on the other. Personally, however, I would doubt that even the best equipment would totally eliminate the ill-effects of density. Certain observations on urban mental health in my own country seem to justify this doubt. Nevertheless, Professor Gorynski's recommendation to start improving the rural instead of the urban "shanty houses" is a most intriguing one, because that would obviously

help to solve the density problem as such. I totally agree with both these contributors in their stressing, each from his own point of view, the crucial importance of false expectations as a psychological background for urban crowding. This seems, as is so frequently the case in this field, to put the burden on education.

In the discussion under this section the old problem of family planning versus other remedies turned up. To this I would only like to say that we are a family planning organization and, consequently, it seems perfectly legitimate for us to speak quite a lot about family planning. This does not mean that we dispute the justification or even necessity of other remedies to an overall critical situation. But many of us hold that family planning should be given a high rate of priority. It was said in the discussion that family planning is a means to an end, namely to curb over-population. Family planners may agree to an extent, but with the clear reservation that no ends must ever be allowed to justify the means. The abortion problem is here a case in point.

2. The papers regarding patterns of family life I shall deal with under "Demography" because in so many respects they can be regarded as a kind of micro-demography contribution. You may envisage the line Population—Family—Individual, and you will realize that demography covers population and part of the family problems whereas medicine covers the individual and a different part of family problems. Thus, Family constitutes a crossing-point for demography and medicine together. This was reflected in several of the papers.

In these papers on family life the role of the nuclear family as a recognized and abiding social unit did not appear to be questioned. I take notice of this because this may not necessarily seem as self-evident in planned parenthood conferences to come as it did in this one. Mrs. Aziza Hussein in her paper hints at the possibility that increasing divorce rates, relinquishing of parental authority, sexual liberalism, contraceptive techniques, employment of women outside the home, etc. might eradicate the nuclear family as the established and universal unit of human society, but she sides with those she calls the optimists who think that this, after all, is not going to happen. Professor Overstreet's remark on Margaret Mead's idea about two kinds of marriage, one for the satisfaction of human needs for contact and intimacy only, and the other one for this and for procreational purposes in addition, seems to point in the same direction. Because one may ask why the former type necessarily has to be labelled marriage and one may ask what influence this kind of so-called marriage may exert on the traditional type of marriage.

Professor Roberts investigates the family in a true demographic way pointing out the difference in family size and structure when moving from a subsistence to an industrial economic system but he, too, leaves the nuclear family intact. Dr. Kessler in an impressive exposition of the "vicious, self-reinforcing pattern of high general infant mortality and poor maternal health" points to the urgent health problems involved in childbirth spacing and the economic wastage resulting from inefficient planning. He spoke against the sinister background of Dr. Williamson's paper and his heart-breaking slides of undernourished children. The concern of these contributors is the kind of family unit, the persistence of which can hardly be disputed by any reasonably realistic future visions, namely that of mother and child. This is comfortably solid, medical ground and I quote Dr. Kessler's concluding remark: "It is in such a context of maternal and child health promotion that family planning and fertility regulation can most safely and effectively be carried out."

3. I want to close the section on demography by jumping to the end of the conference where the effectiveness of family planning programmes was considered. As Dr. Harkavy brilliantly illustrates, the evaluation of our voluntary efforts at changing population structures appears to be one of the hardest nuts for demography to crack. Yet his truly global survey of a specific but crucially important issue gives us some hope, and it also illustrates one of the interesting features of international family planning today, namely that a handful of small countries such as Taiwan, Korea, Singapore and Hong Kong emerge as the most valuable workshops for information for, and guidance towards effective action in our field.

Dr. Notestein in his excellent critical evaluation of family planning programmes stresses the same point. Some of Dr. Notestein's general remarks are in my opinion so pertinent that I should like to see them engraved in the minds of those present. To pick a few of them he states that "the urgent need is for the spread of *voluntary* family planning" and he defines as

the goal for planned parenthood "to ensure individual couples everywhere in the world a free and unrestricted choice in deciding how many children they will have". He speaks about our being "so intrigued with technicalities that we expect it to do all our work for us" and about the ensuing "cycle of high hopes, inept trials and resigned disappointment with one method after another". He deals with the disturbing fact that some people feel they know more than others about what it needed, and that many presumably less-knowing people have suffered by having wisdom forced upon them, by the accusing statement that "we fail to educate acceptors about potential difficulties, fail to provide service for women in trouble, fail to involve and inform the medical profession" and concludes, generally, that "our main failures have been those of education and organization of service". But he also talks, reassuringly, about "a law of lag, which is inferred from experience that has seemed to show a delay of some years before anything of substance is accomplished after a government has come out publicly in favour of family planning". He also stresses the indispensability of devoted local workers in any family planning project and ends up his paper by asserting the importance of voluntary organizations, even where governments more or less have taken over.

BIO-MEDICAL SCIENCES

The bio-medical sciences, as I called the second horse of our four-in-hand, was put in comparatively late in the history of our movement. At an international conference in Zürich in 1930 the role and responsibility of medicine for planned parenthood was for the first time officially and explicitly stated. Considerably later came the contributions from what in the conference programme is referred to as basic sciences, the crucial importance of which is recognized all over the world today. It is significant and hardly coincidental that just about half of all papers presented at this conference fall under the heading of bio-medical sciences. They can be summarized under the sub-titles of "Chemo-physiology of reproduction", "Experimental immunology", "Subfertility", "Contraception", "Side-effects of contraceptive methods" and "Abortion".

The highly technical nature of the majority of these contributions defeats my capacity for comprehensive recapitulation, so from this large section I shall be able to pick only a few highlights, which to my own entirely subjective evaluation seem particularly interesting.

1. Basic studies of reproduction have the advantage of being impartial and equally useful for solving problems of both subfertility and contraception. A most instructive example of this dual illumination of fertility problems is Dr. Rümke's paper on auto-antibodies to sperm as a cause of infertility in the human male. This dual aspect of basic science is important for the aims of planned parenthood as just quoted by Dr. Notestein. These aims include also the problem of subfertility, which so easily seems to be forgotten or neglected. As an excellent exposition of our present knowledge as well as some important points where this knowledge is still deficient about the physiology of mammalian reproduction, I want to mention Dr. Chang's paper on fertilization and transportation of mammalian eggs. From this we learn that the morphology of mammalian reproduction is reasonably well known by now, whereas its physiology and biochemistry has to be further investigated. He draws the interesting conclusion that the mechanism of hormonal contraceptive action in post-mating administration is on egg transportation rather than implantation. This is of considerable importance for the ethical acceptability of the so called day-after-pills, now increasingly coming to our attention. A speeding-up of egg transportation through the tubes was also, hitherto, thought to be the most probable contraceptive mechanism of action of the IUDs. However, from Drs. Eckstein and Kar we now learn that this theory no more seems tenable and that, to quote Dr. Kar "the IUDs prevent pregnancy by acting simultaneously and synchronously on several vulnerable points in the reproductive mechanisms".

2. For half a century by now, theoretical considerations have opened promising views for the possibility that the ideal contraceptive method is going to be found within the realm of immunology. A standard question to representatives for basic sciences at our last few conferences has been, how far has immunology proceeded today. Five papers on this subject have been presented. Although, or perhaps because, they reveal so many new and interesting facts to us, their practical application for human contraception seems to be a thornier task

than we thought some years ago. So the field can not yet claim to have passed the stage of animal experimentation, as was also pointed out in Professor Parkes' summary.

3. Notable in the field of contraceptives I found Dr. Manatou's report on so-called low-dose orals for uninterrupted administration with no inhibition of ovulation, high effectiveness and a low rate of side effects. The most interesting contributions to new trends of contraception seem to me to be those dealing with compounds of the day-after type, i.e. drugs to be taken after a conception possibly but not necessarily has taken place. It goes without saying that a harmless and effective remedy of this kind would come as close as imaginable to the ideal contraceptive in practice. Although it cannot be labelled a contraceptive in the strict sense of that word, I should like to make the point in this connexion that the legally and ethically accepted definitions for the beginning of life, whether they are located at the moment of fertilization or that of implantation, are rather theoretical, and lack a proper anchorage in the subjective experience of the woman. It seems clear that the psychological and experiential impact of using a reliable day-after pill, even if it would exert its action some time after implantation, would be much closer to that of already accepted contraceptives than to an abortifacient in the usual sense of that word, and that fact should be seriously taken into account when evaluating these new remedies. Considering their unprecedented potential advantages from a practical point of view they should not be easily dismissed on ethical grounds. Most of these studies are still at the stage of animal experiments as was demonstrated in Dr. Prasad's paper, but the most interesting report by Drs. McLean Morris and Wagenen shows us that their clinical application is within definite reach.

4. Fortunately, the conference has brought no alarming reports on side-effects of contraceptives now in general use. The important issue of the effect of orals on lactation has been clarified in Dr. Chinnatamby's study and those of you who remember the vivid discussion in Singapore four years ago about the IUDs and intra-uterine infection will have found Professor Mishell's careful study of this subject both interesting and reassuring.

5. Alarming are, however, as was to be expected, the reports of the world-wide problem of abortion. For many years now, world opinion regarding abortion has been divided into the essentially condemning western view and the more liberal eastern one. This situation seems to persist even if differences of opinion appear to show a tendency to level out from both sides.

It is surprising to learn from Dr. Nozue's paper that the Japanese Ministry of Welfare still prohibits the use of orals and IUDs. Encouraging in the light of my just expressed opinion about the questionable current definitions of the beginning of life, is Dr. Nazer's information about the Grand Mufti's concept of the "unformed state" of the foetus, covering as much as the first 120 days after conception.

Convincing figures showing the impact of energetic contraceptive propaganda on the incidence of induced abortions still seem to be lacking. The western standpoint in this matter, strongly supported by Dr. Armijo's major emphasis of the health aspects of the problem may be summarized by quoting Professor Novak: "The laws could give a strong support in order to develop the necessary capacities for contraception which should become everywhere not only free, but even compulsorily stimulated." I may add here that in Sweden the whole abortion problem, although comparatively small in a numerical sense, is considered a very serious problem, and a great many people there hold that even legal abortions are indicative of a deplorable failure of social functions.

TECHNOLOGY

The problem of contraception versus abortion has a bearing on the more general one of the appropriate time for administering either information or tools in order to accomplish optimal contraceptive use effectiveness. And that, in turn, takes me over to technology, for as such I have defined the application and manipulation of the various tools and equipment already provided by science. For our purposes, then, technology divides into two sections, firstly *contraceptive technology* including choice of method and ways of individual application and, secondly, *distribution technology* including such items as administration, mobilization of professional assistance and technical aids for education.

1. Regarding choice of method I only want to remind you of Dr. Wright's statement that "no one method, nor even one principle of method will ever be found which will prove universally acceptable" and also of her extremely comprehensive lists of applicability for each method now in use. A new technical feature at this conference was the interesting problem of the optimal application time for IUDs to which several papers were devoted. It seems to be of great importance for our efforts at counteracting unwanted pregnancies by contraception rather than by abortion. It also seems to be a part answer to the question of how best to reach people in terms of giving us an opportunity to introduce contraception at a moment when the individual can be expected to be particularly motivated for such measures.

2. A most promising initiative in mobilizing professional skills was presented in Dr. Cummins' and Mrs. Phillips-Gay's papers about the usefulness of the nurse/midwife for contraceptive services. It seems to be a general trend in many parts of the world that doctors have to delegate some activities traditionally considered as theirs to other people. It is in complete agreement with my own experience from other fields of medicine that this is not only possible but even desirable to an extent that many doctors do not like to admit.

To finish with the most complicated and difficult aspects of what I have here called technology, I want to express our appreciation of the impressive reports on the national family planning programmes in India and Pakistan. They both give a clear picture of what a formidable task these countries are facing and I am glad to say that we who have been following their efforts for many years can share their confidence in having found a line that holds the promise of success.

EDUCATION

The last but not the least of our main tools is education. We always arrive at a point, sooner or later, where the importance of education for successful parenthood becomes very obvious. Many of us even feel that without appropriate education as a basis the other tools are more or less inapplicable.

In view of this the conference programme may be said to have been a bit lopsided in the balance between science and education.

When child psychiatry was a young discipline the optimistic view was held that teaching the children would mean curbing the so-called infantile neuroses at their formation, thus eliminating the very nucleus of mental disharmonies at a later age. However, it was soon discovered that a few hours treatment a week for the child was of little avail as long as the patient had to spend the rest of his life in a grossly pathogenic home environment. The result was that modern child psychiatry more and more became family treatment, which means that this line of education to be effective has to be given both to the child, or what is now called the defined patient, as well as to other family members at the same time.

The education situation in family planning is very similar to this, the child here being represented by those in direct need and the family by the rest of mankind. Experience has shown that the educational merits of the so-called clinical approach in family planning are very slight indeed as long as the patients have to return to an environment with an insufficient understanding and feeling for what it is all about. The target groups for educational endeavours in family planning have proved to be much larger than those categories of a population mostly in need.

We now realize that educational efforts have to be exercised on all strata of any society. Roughly, we can speak of education, including sex education at school, *aiming at a whole population* on the one hand and, on the other, education *aiming at particular groups*, professional or others, which for various reasons have a key position for our purposes. Four papers were dealing with population education in this sense, whereas two were dealing with specific groups. I also consider Dr. Guttmacher's paper as belonging to this section in so far as it was pointing to the obstacles met in the education of physicians.

Ladies and Gentlemen, I have already taken up a considerable time. I am painfully aware of the inadequacy of this summary. My obvious excuse is the impossibility in a short presentation to do justice to the enormous quantity of material displayed at a conference like this.

As a concluding remark I will return to my metaphor of the chariot and the four horses. It is obvious that any of them may run wild and pull in a different direction from the others.

It is equally obvious that it is the responsibility of every individual, organization or government participating in this tricky situation to see that this does not happen. Because this would not only mean that we are slowing down but that we are exposed to imminent danger for the future life of humanity. It is of the utmost importance that we steer our horses scrupulously and skilfully to concerted action. I am glad to say that behind the open stage of this conference more attention than at any previous occasion of this kind has been paid to the problem of how best to coordinate the efforts of the many organizations and professions that are active in this field today.

92. THE FUTURE ROLE OF THE IPPF

Sir Colville Deverell

Secretary General, IPPF

To be intelligible about the future role of the IPPF it is necessary to say something about its present role and its broad objectives.

The Federation has evolved, since it was formed by a resolution of the 3rd International Conference which met in Bombay in 1952, as a union of autonomous family planning associations, all of which have as their primary objective the promotion of the idea—implicit in the theme of this conference—that any comprehensive catalogue of parental responsibilities *ought* to include an obligation to attempt to plan the size and spacing of our families; and that access to knowledge, and to the means to achieve this objective, as each thinks proper, is indeed a contemporary human right.

The members of our Federation also believe that we ought also to do everything in our power to persuade governments to take steps, when this has not already been done, to acquire the basic demographic, sociological and economic data needed to enable them to consider objectively whether or not there is a need to formulate a national population policy, either, perhaps, for public health and sociological reasons, or, perhaps, because of a patent state of population surplus, or because the rate of the country's population growth is seen to be proving inimicable to the attainment of a rate of economic expansion consonant with the attainment of social justice, and the legitimate aspirations of the common man.

We do not, of course, believe that family planning is a panacea which of itself will solve the problems confronting development. But we do believe that no combination of other measures will be likely to succeed unless accompanied by a vigorous family planning element.

Broadly, then, the objectives of the IPPF are to convert people everywhere to adopt a mode of life consistent with a philosophy which includes family planning as an important element of responsible parenthood; to encourage the provision of indigenously controlled services facilitating the practice of family planning; and to assist in the creation of a public awareness of all the demographic and other relevant aspects such as will eventually enable, or indeed impel governments to play a fully responsible role in this whole field of policy.

Springing from its fundamental concern for the rights and needs of the individual and the family, the IPPF believes that family planning ought to be an important element in any adequate national maternal and child health service, and that logically, where the provision of such services is the responsibility of the state or local authorities, these authorities ought also to provide the family planning element. For this reason, and because we see clearly that a reasonably low rate of infantile mortality is a prerequisite to the creation of a climate of opinion which will lead to the acceptance of the logic of fertility restraint, we strongly support all proposals designed to improve maternal and child health services. It is, however, unfortunately, the very inadequacy of these services generally in developing countries, and particularly outside the towns, which presently so much frustrates all our efforts to promote effective family planning programmes.

The manner in which the IPPF endeavours to pursue the broad policy I have outlined can perhaps be gathered from the following list of objectives. These are:

(a) To stimulate the formation of national family planning associations throughout the world,

(b) To provide an international presence to give expression to the aims and activities of its associations, and to co-operate with the UN and other international and government agencies,

(c) To provide information, technical advice, training facilities, and financial assistance at least until such time as associations can become viable,

(d) To make regional administrative arrangements when these will facilitate the development of the associations,

(e) To ensure adequate representation at international and regional levels, and with the UN agencies,

(f) To seek either directly, or through the associations, to persuade governments, and community leaders, of the urgent need to provide family planning facilities,

(g) To endeavour through its medical, basic science and other committees to enlist the active support of the medical profession and the intelligentsia generally,

(h) To stimulate public awareness, all over the world, through press contacts, international and regional meetings, private discussions, the employment of mass media and visual aids, and the publication of journals, handbooks, pamphlets, both centrally and locally,

(i) To encourage practical experiments with new contraceptive and organizational techniques and to make a proper evaluation of such research,

(j) To enlist financial support both for the Federation and its constituent associations on conditions strictly ensuring the complete autonomy of the Federation.

Some of you may feel that in speaking about the role of the IPPF I have dwelt unduly on the present. But though I fervently look forward to the day when the philosophy of rational family limitation is as universally accepted as, say, the desirability of preventative medicine; and to the time when all governments will have accepted the responsibility of incorporating family planning in their maternal and child health services, and have provided these effectively throughout their countries, I do not foresee that this happy state of enlightenment and practice will be realized soon.

For instance, even where large national programmes are in full operation, the majority of the fertile groups have still no access to regular services, and there may be as many as half a billion people living in countries where little or no steps have been taken. The size of the task remaining is therefore enormous, and the need to tackle it with the utmost urgency is totally compelling.

I believe, therefore, that both the present proselytizing and promotional roles of the IPPF, which I have attempted to outline, will be needed, and increasingly needed, in the foreseeable future. As, however, governments increasingly accept a responsibility for family planning services, so will it be necessary for the national associations to adjust their activities as to enable them to make the maximum possible complementary contribution to the national objectives.

Present experiences suggest that even when governments have made the decision to adopt a positive family planning policy, it by no means always follows that they will wish to assume total responsibility for providing the service. Where they do not, the role of the IPPF is simply to offer the maximum support on terms to be mutually agreed; and in such a case, the sort of activities I have tried to describe will continue to be appropriate with various adaptations to conform with the degree of physical and personnel support obtainable from government resources.

When, however, governments do decide that they themselves will assume responsibility for executing the programme and providing the clinic services, the question does arise as to what the role of the local voluntary association should be.

This aspect was briefly referred to in the "Report on the Family Planning Programme in India" prepared by the UN Advisory Mission and published last year. The advice of the Mission was given in the context of the Government of India's decision to mount a national programme using all the machinery of the government, while giving generous financial support to voluntary organizations operating within the framework of the national plan. In these circumstances, the Mission recommended that voluntary organizations could best contribute to the programme in the following ways:

(a) By providing an informed pressure group to stimulate and influence government policy, and to keep the programme under continuous review,

(b) By seeking out and exploiting every possible means of educating the public to accept and effectively practise family planning, and by making use of the press, radio, television and public debates to this end,

- (c) By providing training for all kinds of voluntary and part-time, or full-time paid workers,
- (d) By persuading and training persons in various kinds of social units such as factories, estates and government departments to accept responsibility for organizing self-perpetuating family planning services,
- (e) By participating, in urban areas, in the establishment of reporting systems to ensure that women who are not attending postnatal clinics, can be identified after delivery, be given timely advice, and put in touch with services of the kind they prefer,
- (f) By establishing model clinics in which new methods of contraception, training, organization and motivation can be tested.

Since this report was written experience in several other countries has, I believe, added emphasis to the need for governments to have available the support of independent, experienced and dedicated voluntary groups which can assist to humanize mass programmes and report public reactions to the day-to-day implementations of the programmes, so that difficulties and administrative mistakes which are bound to occur in any programme, can be adjusted before they become public reproaches. I believe that this role, which Dr. Notestein has referred to as of "a friend, critic, advocate and educator" is one of great importance, which all governments with national programmes would be wise to encourage. It is, I suggest, preferable for governments to learn of any shortcomings from dedicated, experienced workers than to learn about them from possibly hostile and irresponsible sources.

The extent to which the IPPF will in the next decade be able to undertake the formidable task of promoting and nurturing family planning associations in the vast areas of South and Central America, Africa and South East Asia, and of discharging its share of public education all over the world, will obviously depend on the measure of financial support it obtains from private and governmental sources.

It is, I believe, recognized that because of its truly international, and genuine democratic nature, the IPPF can operate in areas where the provision of other forms of external help can prove difficult. But if the Federation is to expand its activities, and make a contribution more adequate to the vast needs, it can only do so efficiently if it can be assured of a reasonable minimum recurrent support for its own general programme. While grants for capital projects and for large specific projects will always be received with the warmest gratitude and relief, most of the Federation's total expenditure is required to cover the recurrent cost of numerous relatively modest services. It is administratively impossible to operate an organization of this kind without some reasonable guarantee of annual income over a reasonable period of years, which will be available to cover the cost of the Federation's own programme.

I believe that governments, foundations and individual private supporters increasingly accept that assistance for family planning programmes is something which can often most appropriately be given through international agencies. The measure of the role which the IPPF can play in the future, along the lines I have suggested, will largely depend on the financial backing these agencies are prepared to give to this principle.

During the course of this conference, as in others, there have been some who have drawn attention to a distinction between family planning and population control, and some have appeared to imply that the former is in some way in a different, and indeed higher, category of ethical values.

My personal view is that both represent an equally legitimate response to our deepest capacity for human compassion. The compassion which demands that we should exert ourselves to protect the rights of mothers and children; the compassion which demands that we should do everything in our power to lighten the present intolerable burden of poverty bearing down upon so much of mankind; the compassion which demands that we must act now, no matter how much our actions may be misunderstood, or misrepresented, to help to lessen the shameful and unacceptable discrepancy between rich and poor countries; the compassion which makes us long to substitute quality for quantity; self-respect for humiliation and despair; food for famine.

I believe that in this conference there has been a universal acceptance that all parents have the right to plan the size and spacing of their families, utilizing the methods of their choice.

There has too, I believe, been an almost universal acceptance of the need for some countries

to curb their national fertility because their existing populations are too large for present or foreseeable resources.

And there has, I believe, been a large majority consensus that in most developing countries, prudence dictates a considerable slowing down of population growth for reasons cogently and explicitly developed in a number of our sessions. But in many developing countries there are vast areas where these propositions have never yet been heard, let alone accepted; and these areas are likely still to be virtually without maternal and child health services.

The situation calls for a grand concerted effort by all national and international agencies concerned with health and development.

The IPPF's role should be complementary to these efforts, and in addition to providing pioneer services through its indigenous associations it should encourage these to bring the wider aspects of fertility limitation to public notice, so that, as soon as possible, a sufficiently congenial climate will exist to induce appropriate government action.

Though the size and complexity of the problem posed by these still virtually untouched developing areas in Africa, parts of Latin America, and South East Asia is certainly daunting, there are significant encouraging aspects.

For instance, we now believe that most women everywhere do not wish to indulge in anything approaching maximum fertility, and yearn for effective help. We know that very few governments indeed are actively opposed to family planning, and that religious opposition, where it exists, is seldom a decisive factor. We know that effective and relatively cheap and acceptable methods can now be deployed, and that a new expertise in the whole field of family planning—a new profession—has arisen. Then, the dramatic growth of world-wide awareness of the importance of the whole matter has encouraged the richer governments to offer technical aid in this new field on the same basis as other aid. The UN agencies, though not yet perhaps quite unfettered, are now able and anxious to give advice and assistance when requested. All these I suggest give us much good ground for hope.

I believe that in this context the IPPF has a great opportunity to perform a perhaps unique role in this, I hope, transitional stage preceding governments' adoption of a positive policy. In this stage it is difficult or impossible for the governments of the developed countries to give government-to-government assistance; and so it remains for voluntary and non-governmental agencies to fill the gap.

We are proud to have this opportunity and I assure you will do all in our power to fill the gap till heavier reinforcements can arrive.

In his speech at the opening of this conference, Lord Caradon eloquently urged that when the Economic and Social Council of the United Nations meets in Geneva next year—in the summer of Human Rights Year, there should be a concentration on action on population matters, and that all the UN agencies should then consider what steps should be taken to accelerate the pace of action in this field.

Believing, as I so strongly do, in the need for immediate action in all countries on humane and health grounds; and on the need for action, too, in most developing countries for social and economic reasons, I personally very much welcome this suggestion, and hope that the distinguished UN representatives who have honoured us with their presence, will on their return to their headquarters feel able to give Lord Caradon's proposal their strong support.

I would not like to end this cursory look into the future without paying a respectful tribute to the work of countless volunteers who, in the face of much derision, and indeed persecution, have in the past laid the foundation of this whole movement. Their reward lies in the fact that almost all governments which now have adopted positive policies in this field have done so only after voluntary associations have created a sufficiently congenial climate to enable them to act.

I close with the hope that those of us who have joined together in this conference will display an equal dedication and persistence, so that soon throughout the world it will be universally accepted and proclaimed that indeed "planned parenthood is a duty and a human right".

93. CLOSING ADDRESS

F. Mardones Restat

Director General, National Health Service, Chile

Mr. President, Minister of Public Health, Committee Members of the International Planned Parenthood Federation—dear friends: First of all I should like to ask your indulgence. Rather than reading the prepared speech which I brought, I want to risk speaking very briefly, but looking into your eyes, to have the privilege of seeing in them the whole world, and of seeing there the expression of each spirit in its search for true human communication.

In this way I should like to strengthen the inner security of each of us so that there should be no obstacle in the world, neither distance nor prejudice, that can hinder men from joining their hearts and minds when their purpose is the most noble—to guarantee the full realization of the human being. Mankind, has existed only for a moment in the life-history of the world, yet has developed an extraordinary biology and a brain whose most important anatomic and functional characteristic is that it permits unlimited ways of communication, and has become the home of the spirit which allows it to be conscious and to be aware of its consciousness.

But first I must thank you. Thank you in the name of the Chilean people and the Government of President Frei, whose Minister of Public Health, Mr. Ramon Valdivieso, has kindly chosen me as his representative. Thank you because the Chilean people expect much from this great international meeting. They expect it for themselves, for their well-being, and for the development of their families and they are sure that this betterment will be linked to that of the whole world; your invitation to the people of Chile is an historic event.

Thank you in the name of a people who expect much and yet know how to wait. For as each day breaks and they work the land of our narrow valleys in the effort to grow food, to sow, to wait for the plant to grow and the rain to fall when it is needed; to wait for the harvest; or when they set out into an ocean which is rarely pacific, to bring back food for their children and wealth and progress for their families and their towns, they know that not every night will be good fishing; and when they cross the desert and the rugged hills seeking mineral wealth, they know that there will be many unfruitful days before the mountain yields its lode; and they wait, not because their patience is infinite but because they know and trust in their democratic tradition. They also have faith in their university which has been able to guide so many governments and so many graduates—they have met them throughout the country, ready to hand on this means for the conquest of true liberty, the use of the scientific method to discover day by day and at every moment, more of the truth.

Our people, and especially the women of Chile, feel that your decision is a homage to them, for if Chile has done anything in family planning and can speak of what it has achieved, it is because the women, generous in fulfilling their tasks as wives—heroines sometimes, who must be not only mother but also father—made their pains known, their problems, their desires, and looked towards a future with well and healthy children, children intellectually prepared to make our country great.

For centuries they accepted all the children heaven sent, but one day circumstances changed. Heavy migration from the countryside to the city meant for them such an accumulated burden that they realized that the victims of the situation, if they went on having children, would be the children themselves.

Like Gabriela Mistral, they say that the needs of the child cannot wait. The child is, at this moment, forming his bones, building his blood, testing his senses, and we cannot say to him, tomorrow. The child calls out now, and in this awareness of urgency and of his responsibility, he asks with authority for the aid of Chile's medical profession in solving his problems. The doctors, together with the talents of the various universities and the generous aid of

international organizations, made it possible for the government to bring together one day all those who worked in this field, ask them their advice and arrange meetings which were memorable in the history of Chilean public health. People of differing political positions and doctrines agreed to the signing of a document in which there was not one objection to a phrase or to a comma. The possibility of a dialogue transcending any faction had been found. The fundamental proposition was the life of the Chilean woman, the future of our country, and for this sake, all divisions were put aside.

The government supported the extension of a programme which had proved to be so efficient—the education of married couples to the responsibility of deciding the size of their family, and to the fulfilment of their tasks as citizens.

This policy decision took the form of planning for health and development, aware that in the latter, economic and social development are inseparable, and that health is not just the absence of sickness or death but, as WHO has defined it, the full enjoyment of well-being, physical, mental and social.

The decision to incorporate family planning in the health programme, especially in those activities concerning the protection of mother and child, meant, therefore, concrete purposes and goals; to eliminate that cruel waste of unborn human lives, the abortion, and also that cruel waste of the lives of women who are clever, capable and have the right, as the Bible says, “to see the children of their children unto the fourth generation”, and see in their future, their responsible actions as members of a family in the process of formation and education, signifying their faith in a country and the desire for the demographic and economic investment that can make a nation great.

Not only are the lives of mothers wasted; a series of studies still in progress shows that in urban families where women have not yet taken to abortion as a means of birth control, the infant mortality rate is extraordinarily high, significantly higher than in families which have resorted to abortion for this purpose. Our shameful infant mortality rate is maintained by a real and sincere inability of the family to provide all the care—physical, emotional and intellectual—that the child needs for its proper development.

The goals to be reached can be measured in such health aspects, but there are other goals which can only be met in answering the long-delayed hopes of our people, so that discontent and discouragement shall not burden their spirits. For the response of technicians, of universities, or of governments could be cowardly in defining and assuming the responsibilities in this field—cowardly in simply being the prophets of all the risk and danger to which the population is exposed at a given time and so become spectators of such a possible future; or cowardly in not listening to the painful pleas of the Chilean woman to face and solve her problem scientifically, the problem of her children, the problem of her family.

But neither professionals nor governments have adopted this easy position of cowardice, but have clearly and courageously set up and incorporated procedures guaranteeing the Chilean mother and her family all the privileges that the progress of science and technology, including the discoveries which you have discussed this week, can add to the improvement of our activities. As His Excellency the President at the end of his address to the inaugural session said, “We have no prejudices, we are ready to listen to all that can benefit our people”.

I should like to express again our gratitude to you for your kindness in having made known to us so much of science, so much of experience; in having shared our doubts, having reassured us about some of them and having agreed to study others to help us in the further improvement of our programmes. But we must also thank you because your proceedings have gone beyond the four walls of this theatre. The press, and the kindness of many of you in having reached various circles, your invitation to Chilean youth to a dialogue on fundamental matters guarantee the spread of your concern, of your goodwill, which will make this an unforgettable event in our history. For this week has been of the greatest importance in world history, especially in the Americas. While 87 countries were represented at this meeting, 18 American governments promised, after severe self-criticism, to adopt measures which would guarantee the most rapid possible development of Latin America.

I am sure from the friendship that has been born here, that we will go on being friends, that the emotion that I feel, is also in your hearts, that it will prove strong enough so that you will be able to bring changes to the programmes in your own countries, improving them so that

they adopt continually more effective methods for the well-being of the family of man.

Lastly, I should like to thank the Committee of the IPPF for having given me the honour and responsibility of bidding you an affectionate farewell!, a farewell which nevertheless firmly cements our friendship and strengthens our commitment to go on working together. Because what we have accomplished is a fundamental step towards peace in the world, and all of us are called upon to build for the common good, in every region and every country. In this we can distinguish at least three levels: material wealth differing from each continent, each area, to the next; the wealth of culture, which although also sometimes rich, raises barriers to communication intrinsic to each culture as the entirety of sacrifices and contributions made by each of its members; but especially it is for us to build and perfect together the riches of the spirit—truth, fruit of intelligence, so well developed that mankind can in a second, by pressing a button, or two buttons, destroy itself, perhaps totally.

Such are the achievements of the human intelligence, dwelling within this marvellous organ, the brain. The danger of imbalance is evident if we are only capable of manipulating our truths and do not want at the same time to develop our will towards peace. And this demands from each of us that we begin by conquering peace in our own spirits, in our families, our neighbourhoods, where we work, and in our community. Nowhere can there be progress in hate. No government can carry out its tasks if there is hatred between different sections. Only if each member of this world puts his will to the service of peace can we build the common good to which we are called. Thank you.

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