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International Centre for Diarrhoeal
Disease Research, Bangladesh



The **INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH (ICDDR,B)** is an autonomous, non-profit making organisation for research, education, training and clinical service. It was established in December 1978 as the successor to the Cholera Research Laboratory, which had been established in Bangladesh in 1960.

The mandate of the ICDDR,B is to undertake and promote research on diarrhoeal diseases and the related subjects of acute respiratory infections, nutrition and fertility, with the aim of preventing and controlling diarrhoeal diseases and improving health care. The ICDDR,B has also been given the mandate to disseminate knowledge in these fields of research, to provide training to people of all nationalities, and to collaborate with other institutions in its fields of research.

The Centre, as it is known, has its headquarters in Dhaka, the capital of Bangladesh, and operates a field station in Matlab Upazila of Chandpur District. The Centre is organised into four scientific divisions: Population Science and Extension, Clinical Sciences, Community Health, and Laboratory Sciences. At the head of each Division is an Associate Director; the Associate Directors are responsible to the Director who in turn answers to an international Board of Trustees consisting of eminent scientists and physicians and representatives of the Government of Bangladesh.

The Centre is funded by organisations and nations which share its concern for the health problems of developing countries. At present the major donors to the Centre include: the aid agencies of the governments of Australia, Bangladesh, Belgium, Canada, Denmark, France, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, the United States; international organisations including the United Nations Capital Development Fund, the United Nations Development Programme, the United Nations Children's Fund, and the World Health Organization; and private foundations including the Ford Foundation. ■



Annual Report 1990



International Centre for Diarrhoeal
Disease Research, Bangladesh

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The ICDDR publishes a journal, a newsletter, scientific reports, monographs, annotated bibliographies and many other items in the field of diarrhoeal diseases and on related subjects. Details of some of these publications may be found at the end of this report.

PREFACE

This is the twelfth Annual Report of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B).

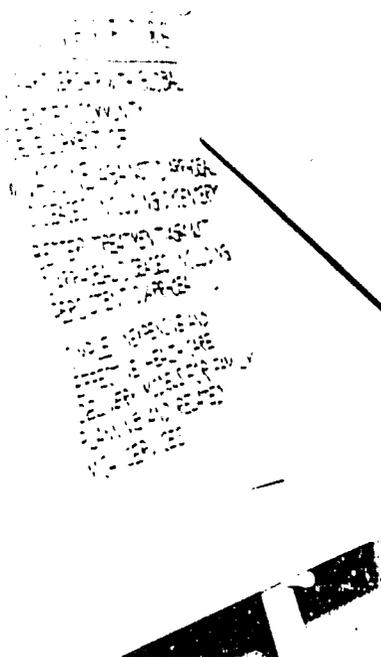
This report describes many aspects of the work of the ICDDR,B staff during 1990, including research, support for research, and health services. Scientific papers, letters, abstracts, and editorials published by the Centre's current or former staff and by visiting scientists are also listed here. Many of these describe research actually done in previous years and reported in earlier annual reports.

If you have any comments on this report or would like more information about the ICDDR,B or the work described here, then please write to the Director at the address given opposite. ■

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**DIRECTOR'S REPORT
ORGANISATION
ORGANOGRAM**



Asim Anwar

Among the director's many responsibilities is the relating of the achievements, objectives, and goals of the ICDDR,B to individuals and groups who visit the Centre.

DIRECTOR'S REPORT

The Centre's triple tasks of research, training and service were overshadowed by a continuing preoccupation in addressing the related issues of a large number of staff and an impending budgetary deficit. Although the Centre had already initiated steps to address these problems, the report of the Donors' External Review (April 1990) further brought them into stark focus. The Review concluded that "Despite its past accomplishments, the Centre cannot remain viable with the continuing serious impairment of its productivity and potential by overstaffing and failure to recruit creative senior scientific staff." The Review further called on donors to provide "support" for actions to be taken to make the Centre "more cost effective and scientifically sound."

Measures undertaken during 1990 resulted in substantial reduction of redundant staff. This has brought considerable savings which was further enhanced by a firm cost-containment policy and prudent financial management. The process of rationalisation of the staffing pattern of the Centre will continue through 1991 and beyond. The Centre has also been able to fill some of the key positions that have been vacant for some time, particularly in the Community Health Division, by internationally renowned and competent scientists. We expect this to have a snowball effect with many more talented scientists being attracted to the Centre from all over the world. The many recommendations of the External Review are being implemented and will contribute to the viability of this unique health research institution as a centre of excellence.

Research output as measured by the number of publications has been maintained at a similar level as in the past few years. Some major initiatives in research and service delivery include the finalisation and introduction in Matlab of an innovative microcomputer-based health and family planning management information and research system for women and children under 5 years of age in the intervention area, establishment of the

state-of-the-art diagnostic laboratory techniques in identification of enteropathogens, development of a multipronged strategy in case management of persistent and other types of diarrhoeas that include improved ORS formulations, innovative diet (energy dense infant diet-based on amylase-enriched cereal flour), micronutrients (zinc, selenium, vitamin A) and new drugs, and the reorganisation of the Urban Volunteer Program as groundwork to embark on an urban health research agenda.

A new initiative that is likely to have a positive impact on research activities at the Centre is the formation of a Scientific Advisory Council composed of prominent scientists from around the globe, active in research areas within the Centre's mandate. The Council's role is to advise scientists of the Centre on current gaps in knowledge and the research needs to address these, and determine the research topics to be undertaken based on the Centre's resources and comparative advantages. The Council which has two sections -- social sciences and health -- will meet regularly. The social science section met in June/July 1990 and the health science section will be meeting in 1991.

The construction of the Matlab Health and Research Centre was completed in February 1990 and became fully operational thereafter.

Training activities have continued and a programme for fellows in health research training has been finalised. However, the goal of developing training capability in clinical management in national institutions has remained elusive.

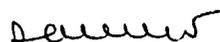
The Centre's finances have performed fairly well, demonstrated by the avoidance of a potentially large deficit. This has been the result of favourable currency fluctuations, strict austerity in expenditure and reduction in the number of staff.

The deliberate policy of making the Centre's

operations transparent, including meetings of the Board of Trustees and administrative matters has created a credible atmosphere and improved relations with donors, the Government of Bangladesh and others interested in the Centre. Indeed the Government of Bangladesh has demonstrated concretely that it is a willing partner, supporting the Centre by submitting requests for financial assistance to the donor community.

Within the Centre, efforts to widely disseminate policy decisions and to involve staff in the decision-making process have continued. The Consultative Management Committee, which includes elected representatives of staff, has been holding regular meetings, and divisional meetings to discuss science and management have become a regular practice.

Political developments in Bangladesh and the Gulf crisis slowed activities in the Centre during the last quarter of the year as indeed it must have done in many other institutions in the country. But the staff members of ICDDR,B deserve full credit for continuing to work hard in the face of mounting obstacles. They succeeded in maintaining the research, training, and service activities of the Centre at the same level of excellence.



Demissie Habte, MD
Director

ORGANISATION

The ICDDR,B is a complex network of activity, its definite pattern of organisation barely discernible in day to day activities. Yet, as a body depends on its skeleton, so does the Centre need a framework to maintain action and growth. The organogram in Fig. 1 illustrates this basic structure. The Associate Directors named are those who head the Divisions at the time this annual report goes to press; in 1990 the Community Health Division was without an Associate Director.

Although each division is administratively responsible for specific areas of the Centre's functions, in practice the objectives of research, training, and health care are integrated activities, each division dependent upon the other. Thus the various accounts of the efforts and achievements of 1990 are necessarily organised in this report by subject rather than by area of divisional activity.

In brief, the four scientific divisions have the following subdivisions:

** Clinical Sciences Division: The Clinical Research Centre with the Clinical Services Department, the Child Health Programme,

and the Matlab Treatment Centre (until 1991); and the Clinical Research Department.

** Laboratory Sciences Division: The Department of Diagnostics Services with the Reference Laboratory and the Clinical Laboratory; the Department of Research and Development with its specialised laboratories; the Biomedical Engineering Cell; and the Medical Illustration Cell.

** Population Science and Extension Division: The Demographic Surveillance System; the MCH-FP Extension Project; the Computer Information Services; and the Data Archiving Unit.

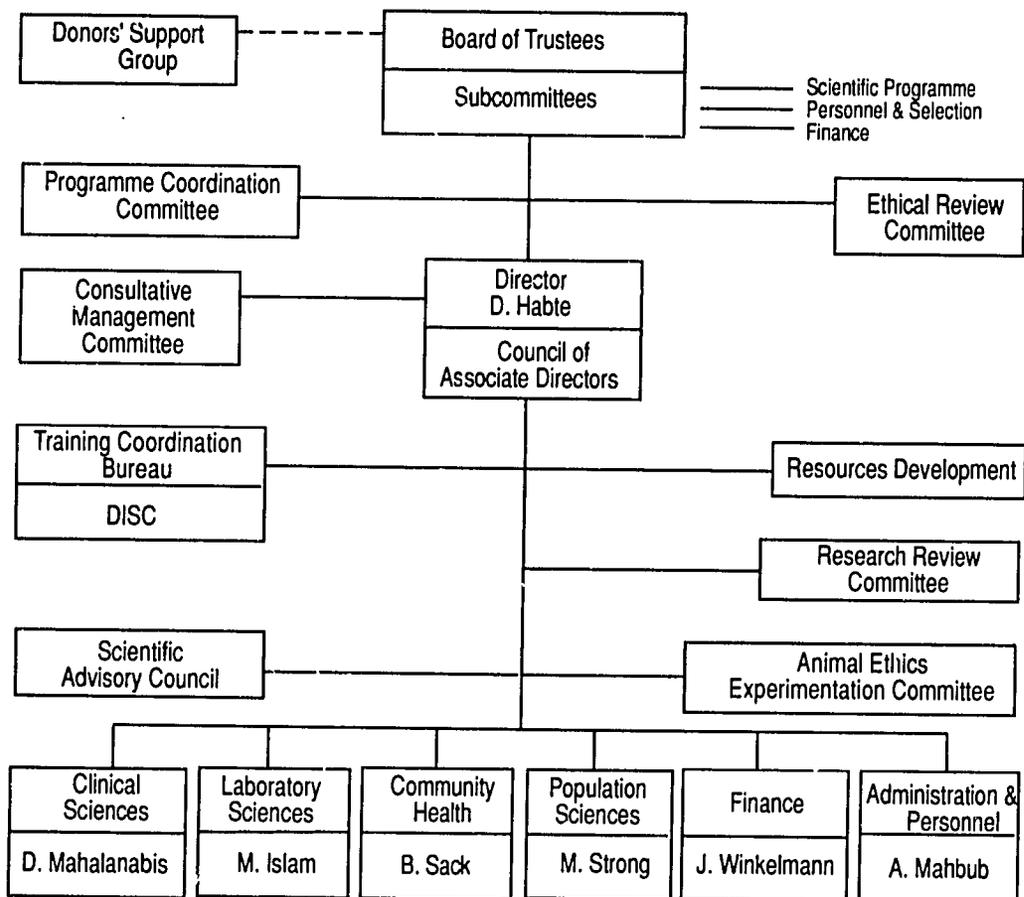
** Community Health Division: Urban studies with the Urban Volunteer Program; Rural Studies with the Matlab Diarrhoea Treatment Centre (with CSD until 1991), the Matlab Health and Research Centre, and the MCH-FP; Epidemiology Department (until 1991); and Social Sciences and Environmental Health Scientific Interest Groups (new in 1991). ■



Asem Ansari

The Associate Directors pose with the Director. Left to right they are: Mr. John Winkelmann, Finance Division; Dr. Moyenu Islam, Laboratory Sciences Division (Acting); Dr. Dilip Mahalanabi, Clinical Sciences Division; Prof. Demissie Habte, Director; Mr. M.A. Mahbub, Administration and Personnel Division; C. Michael Strong, Population Science and Extension Division; Prof. R. Bradley Sack, Community Health Division. (Photo taken in May 1991).

ORGANOGRAM





A mother spoon-feeding oral rehydration solution (ORS) to her baby. At the Centre's health care facilities a locally-prepared rice-ORS is routinely used.

WATERY DIARRHOEA

- ORS containing L-alanine
- Rice-ORS
- Bicarbonate and citrate-ORS
- Risk of death in epidemics
- Saccolene in cholera
- Pancreatic exocrine function
- Treating diabetics
- Neonatal rotavirus infection
- Rotavirus strains identified
- Novel rotavirus strains
- Oligonucleotide probes
- Hafnia alvei*: probable pathogen
- Diarrhoea from *E. coli*
- Non-traditional *E. coli* strains
- Detecting *E. coli* serogroups
- DNA probes for *E. coli*
- The role of enteric adenovirus
- New cholera toxin
- Analysis of diarrhoea in Matlab

DYSENTERY

- Treating with bovine colostrum
- Protein loss
- High nutrient feeding
- Post-*Shigella* nutrition
- Pivmecillinam and gentamicin
- Ciprofloxacin as treatment
- Detecting *Shigella*
- Role of cytokines
- Immune response
- RNA fingerprinting
- Haemagglutination of *S. flexneri*
- Plasmid-associated resistance
- Enzymes produced by *Shigella*
- Outbreak of keratoconjunctivitis
- Leukaemoid reactions
- E. coli* infections in children
- Contact haemolysin production
- Oral vaccine against shigellosis
- E. histolytica* and zymodemes
- C. difficile* in neonates
- Reducing deaths from dysentery

PERSISTENT DIARRHOEA

- Epidemiology of diarrhoea
- Risk factors - an analysis
- Risk factors - a clinical study
- Albendazole and *G. intestinalis*
- Zinc supplementation
- Coconut oil - a metabolic study
- Trimethoprim - sulphamethoxazole

WATERY DIARRHOEA

The category of acute watery diarrhoea includes mild diarrhoeae as well as the most serious. Treatment may require quick action since if the organism is *Vibrio cholerae*, for example, dehydration can cause death within a matter of hours. Even seemingly milder cases may be fatal, however, especially if the patient is a child and the child is undernourished.

In the Centre's laboratories, researchers concerned with this kind of diarrhoea are developing new and innovative, more reliable, quicker, less expensive ways of detecting the causal organisms and identifying their various strains. The studies in which they were engaged in 1990 also included the discovery of "new" organisms which cause these symptoms; details are described below. Their successes enable the clinical researchers to find ways to better prevent and treat patients with watery diarrhoea.

In 1990 the quest of the clinical investigator continued for more effective, more acceptable oral rehydration solutions (ORS). These simple solutions of salts and sugar are very practical means of replacing fluid loss and thereby correcting and preventing serious dehydration. The most serious cases require fluid replacement given intravenously. This, of course, requires hospitalisation or at least expert medical attention, whereas ORS can be given by mothers at home. Gaining wide-spread usage throughout the developing world, ORS is still rejected by some patients who need it most because it does not "cure" the disease, that is, the stool output continues to run its course. The improved solutions, it is expected, will shorten the course of illness and satisfy this need.

The following studies describe these efforts, and many others, to improve the prognosis of those who suffer from acute watery diarrhoea.

Comparison of two L-alanine-glucose-based oral rehydration solutions with the standard WHO-ORS formula in adults and children with acute watery diarrhoea

Principal Investigator: F.C. Patra
Funded by: WHO

The main thrust of clinical research on ORS now is to develop a solution that will appreciably reduce the stool output in patients suffering from acute watery diarrhoea. A recent clinical trial conducted at the ICDDR,B using a combination of 90 mmol of L-alanine and 90 mmol of glucose as substrates in the ORS has shown a substantial reduction (40%) of stool output in severely dehydrated adults and older children suffering from acute diarrhoea.

Since L-alanine is quite expensive, another three-cell study was initiated to see if a similar reduction in the stool output of patients suffering from acute and severe watery diarrhoea could be achieved by lowering the L-alanine concentration in the ORS by almost

50%, i.e., by using 50 mmol of L-alanine in place of 90 mmol. This study is double-blind and randomised. The control group is receiving WHO-recommended ORS, and the study groups are receiving an ORS containing either 50 mmol or 90 mmol of L-alanine along with glucose. The electrolyte composition of the study solutions is similar to that of WHO-recommended ORS. All the patients are being initially rehydrated with intravenous (i.v.) acetate solution followed by administration of the assigned ORS. Patient enrolment (200) has been completed, and the data analysis is now in progress. ■

Evaluation of precooked ready-to-use rice-ORS in reducing duration of diarrhoea and in improving weight gain in infants and young children with mild diarrhoea

Principal Investigators: D. Mahalanabis and A.S.G. Faruque
Funded by: SDC/WHO

This ongoing study aims to determine if the use of rice-ORS, comparing it with glucose

ORS, leads to a reduction in the duration of stool output in infants and young children with mild diarrhoea who visit the Centre's Outpatients Department, and if its use leads to better nutritional weight gain over a short period of follow-up. This is a randomised controlled study with children aged 3-35 months with acute watery diarrhoea enrolled. Patients randomly receive either precooked rice-ORS or glucose-ORS. A physical examination including a nutrition anthropometry is performed, followed by a clinical evaluation every 8 hours for the first 24 hours. Patients, before discharge, are supplied with ORS packets to be used at home until diarrhoea stops, and are home visited after 24 hours of discharge. Information collection at the household level is reinforced by using a picture calendar. Children then visit the hospital after 48 hours and again on day 16 for another physical examination and anthropometric measurement. Findings of the study may help in designing a future action programme for control of diarrhoeal diseases. About 150 children have been included in the study. ■

Comparison of efficacy of bicarbonate or citrate-based glucose-ORS in acute diarrhoea

Principal Investigator: Ramendra N. Mazumder
Funded by: WHO

Since citrate-based ORS has been shown to be more stable under high humidity and temperature conditions, this study was done to compare the effectiveness of citrate-ORS with the bicarbonate solution. In this double-blind study, 180 males aged 8 years and older with acute diarrhoea for less than 48 hours and severe dehydration were randomly assigned to two groups. After initial i.v. rehydration with acetate (within 4 hours), one group received bicarbonate-ORS, the other citrate-ORS, and after 28 hours both groups received oral tetracycline; food was withheld for 28 hours. Patients were studied until the diarrhoea stopped. Both the volume of ORS consumed and stools produced were recorded, and the cause of diarrhoea was determined by microbiological culture. When completed 160 patients had been studied, and the findings showed that the citrate ORS reduced fluid loss and oral fluid requirements and was as effective as bicarbonate ORS in treating acidosis due to diarrhoea. ■

Evaluation of risk factors of deaths from acute watery diarrhoea in the context of epidemics

Principal Investigator: A.K. Siddique
Funded by: UNICEF, Bangladesh

ORS is now viewed as the most practical and effective therapy for preventing severe dehydration, and death, from cholera and related diarrhoeas. Nevertheless, in Bangladesh each year a large number of patients die from acute watery diarrhoea, particularly during epidemics. Difficulty reaching the health facilities is one of the major problems for patients with severe dehydration requiring medical care. This is often complicated further by lack of qualified medical consultation, particularly in the rural areas. In principle, the impact of these constraints can be reduced by the early use of ORS at home.

The objective of this study is to identify the risk and prognostic factors of deaths from acute watery diarrhoea in the context of epidemics in rural Bangladesh. Data were made available through the Centre's Epidemic Control Preparedness Programme (ECP). The ECP was involved in the investigation and intervention of epidemics of diarrhoea in 24 rural districts in which the government epidemic surveillance system reported 1,086 deaths. Verbal autopsies on 615 of the reported deaths were conducted by ECP. At the same time, 702 persons, who survived attacks of the disease, from households where no deaths were reported, were interviewed. This was done to identify the factors associated with diarrhoeal deaths and survival, particularly in epidemics in rural areas, where the affected family, under stress, tended to apply the available means to save the patient. Analysis of this data, which is in progress, should provide new insights into health care providing a pattern for rural dwellers during acute diarrhoeal episodes. ■

Sacolene in cholera

Principal Investigator: F.C. Patra
Funded by: Core Funds

To evaluate the antisecretory effect of *Sacolene* (a methylated casein preparation) in adult patients suffering from bacteriologically proven cholera, a double-blind randomised trial is underway. *Sacolene* contains methylated casein and sucrose and is commercially distributed as an oral antidiarrhoeal medication

in many countries. In this trial, 50 patients were treated with *Sacolene* (16 g/day X 2 days) and 50 patients received a placebo. All patients entered the study after initial rehydration with i.v. acetate solution. Neither group received any antibiotic until the course was completed, following which they received tetracycline in the usual dose regimen. Response variables are being assessed by comparing the stool output and the duration of diarrhoea between the study and control groups. The patient enrolment is complete and the data are being analysed. ■

Pancreatic exocrine function in acute diarrhoea

Principal Investigator: P.K. Bardhan
Funded by: SDC and USAID

Transient nutrient malabsorption has been documented during acute intestinal infections, although the mechanisms have not been understood. The aim of this study was to assess the pancreatic exocrine function in acute infectious diarrhoea. The pancreatic enzyme and bicarbonate output were quantitatively assessed after direct stimulation of the pancreas with secretin-caerulein and after indirect stimulation by a standard liquid meal. The release into the blood circulation of the two hormones secretin and CCK was monitored during administration of the test meal to adult patients suffering from acute infectious diarrhoea and healthy volunteers used as controls. The patient and volunteer studies have been completed and the results show that pancreatic enzyme outputs, after both direct and indirect stimulation in patients, are comparable to those of the healthy controls. Analyses of serum samples for determining hormone levels are ongoing. ■

Management of acute diarrhoea in diabetic patients

Principal Investigators: R. Haider and A.K. Azad Khan
Funded by: USAID

Most people with diabetes are reluctant to take ORC and wonder if it is safe for diabetics with acute diarrhoea. To answer this question, a collaborative study was initiated between ICDDR,B and the Bangladesh Institute for Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders. Diabetics with an acute onset of diarrhoea aged 15

years and above, receiving insulin, oral hypoglycaemics, or on diet control, are being studied in a randomised controlled trial with three different rehydration solutions. The study aims to evaluate the fluctuations in the blood sugar level after administration of rice-ORS or glycine-ORS, as compared to the standard WHO formula for ORS, as well as to assess the efficacy of these rehydration solutions in reducing the duration of diarrhoea in diabetics. Since diabetics with systemic complications cannot be recruited, the progress is slow, but steady. Thirty-five patients so far have been studied. ■

Studies on neonatal rotavirus infection

Principal Investigator: Nigar S. Shahid
Funded by: ICDDR,B Core Funds

There is evidence that babies infected with "nursery strains" of rotavirus develop milder disease during subsequent encounters with rotavirus in the post-neonatal period as compared to their counterparts who do not have neonatal infection. Two such strains have been identified from two neonatal wards: Dhaka Shishu Hospital and Holy Family Hospital, Dhaka. Rotavirus strains from within each hospital appeared to be identical but between hospitals were distinct in both the serotype and RNA pattern. Analysis has shown that the two different serotypes are serotype 1 and 4. When compared to strains of the same serotypes from the "community", obtained during the same period, the "nursery" strains showed marked dissimilarity in the migration pattern of RNA segments. Gene and amino acid sequences are required to fully characterise these strains. Studies to examine the possible endemic patterns and genetic changes of these strains are currently underway. ■

Group A rotavirus strains from Dhaka, Matlab and Teknaf

Principal Investigator: Leanne Unicomb
Funded by: Core Funds

In this study stool samples were collected from diarrhoeal patients in Dhaka, Matlab, and Teknaf and tested for rotavirus by enzyme-linked immunosorbent assay (ELISA) and, in turn, the positive samples were tested for serotype. Rotavirus was present in 17.7%, 23.7%, and 25.3% of specimens from Dhaka, Matlab and Teknaf respectively. Rotavirus

caused an epidemic in Teknaf during the winter months and a single strain was implicated. Serotypes 1-4 were found cocirculating in both Dhaka and Matlab where serotypes 4 and 1 were predominant respectively. ■

Investigation of novel serotype 2 group A rotaviruses

Principal Investigator: Fu Bingnan

Funded by: Core Funds

Three rotavirus strains from a total of 898 rotavirus-positive specimens from children were found to possess properties not normally associated with serotype 2 rotaviruses. The strains were found to be subgroup II and possess long RNA patterns, whereas human serotype 2 strains are almost always subgroup I, short pattern viruses. Two of three strains were adapted to growth in a cell culture for further studies. The serotype, subgroup, and RNA pattern of the strains remained stable and verification of the serotype of the adapted strains by the standard method was carried out. ■

Determination of sensitivity and specificity of oligonucleotide probes

Principal Investigators: Fu Bingnan and Ayub Ali

Funded by: Core Funds

This is a continuing study in which oligonucleotide probes for serotyping group A rotavirus were further characterised to determine optimal conditions for their use in the serotyping test using both rotavirus from stool samples and standard rotavirus strains. At the hybridisation temperature of 50°C, probes to serotypes 1,2,3,4 and 8 showed good sensitivity, minimal cross-reactivity among serotypes and no cross-reactivity with stool extracts of other enteropathogens. Probes were found to hybridise with rotavirus RNA bands 7,8 or 9 - the RNA segments responsible for encoding the serotype specific protein. ■

***Hafnia alvei*: probable diarrhoeal pathogen of humans**

Principal Investigator: M.J. Albert

Funded by: Core Funds

Hafnia alvei, a member of the family *Enterobacteriaceae*, was the only bacteria cultured

from the stool of a nine-month old child who was admitted with a 3-day history of watery diarrhoea. The isolated strain failed to produce heat-labile or heat-stable enterotoxins, Shiga-like toxin I or II and did not invade HeLa cells, nor did it cause keratoconjunctivitis (Sereny test) in the guinea pig's eye. The strain, however, induced diarrhoea in 8 of 12 adult rabbits with removable intestinal ties (RITARD assay), and in one of 2 orally fed animals. Microscopic examination and electron microscopy findings led to the conclusion that at least some strains of *H. alvei* have the potential to cause diarrhoea, and that "attachment-effacement" is a virulence characteristic shared by bacteria other than *Escherichia coli*. ■

Diarrhoea due to *Escherichia coli* in Bangladesh

Investigators: M.J. Albert and K. Haider

Funded by: Core funds

At least 5 categories of *E. coli* are known to cause diarrhoea, and they are: enterotoxigenic *E. coli* (ETEC), enteropathogenic *E. coli* (EPEC), enteroinvasive *E. coli* (EIEC), enterohaemorrhagic *E. coli* (EHEC) and enteroaggregative *E. coli* (EAggEC). The investigators of this study are screening *E. coli* isolated from 3 sources for their diarrhoeagenic properties: children with persistent diarrhoea, Dhaka Hospital Surveillance patients, and individuals who participated in the oral cholera vaccine trial in Matlab. Over 2000 isolates have been screened so far and the results obtained to-date suggest that all categories of diarrhoeagenic *E. coli* are present in Bangladesh, but their prevalence varies. The contribution of EHEC to disease in Bangladesh may prove to be negligible. ■

Diarrhoeagenic property of non-enteropathogenic serotypes of *E. coli*

Principal Investigator: M.J. Albert

Funded by: Core funds

There are approximately 10 serotypes of *E. coli* that are causative agents of childhood diarrhoea throughout the world. These are called enteropathogenic *E. coli* (EPEC) serotypes. EPEC serotypes produce plasmid-mediated localised adherence (LA) in culture HeLa and HEp-2 cells. In addition, EPEC serotypes produce a characteristic "attaching-effacing" lesion in the intestinal mucosa of

humans and animals. This ability to produce attaching-effacing lesions is considered to be a distinctive characterisation of EPEC serotype induced diarrhoea.

In this study 3 LA-positive non-traditional EPEC serotypes isolated from the diarrhoeal stools of 3 infants were tested for their ability to cause attaching-effacing lesions in the ligated ileal loop of rabbits, and all 3 strains produced the lesion. It was therefore concluded that there are LA-positive *E. coli* strains outside the traditional EPEC serotypes that are capable of causing attaching-effacing lesions of the intestinal mucosa, and that they should be considered as potential diarrhoeal pathogens. ■

An enzyme-linked immunosorbent assay (ELISA) for the detection of locally-adherent EPEC

Principal Investigator: M.J. Albert
Funded by: Core funds.

EPEC serotypes cause LA to cultured HeLa or HEp-2 cells. They can be identified by serotype, LA to tissue culture cells, or DNA probe for recognition of LA. Since a serological test like ELISA is relatively simple for large-scale screening of isolates, the aim of this study was to develop an ELISA for the detection of EPEC. The ELISA detected EPEC positive for LA by HeLa cell assay and DNA probe assay. A specific antiserum was raised with an LA-positive EPEC strain by immunising rabbits and then absorbing the antiserum with its LA-negative derivative. The absorbed antiserum reacted specifically with all 78 strains of *E. coli* belonging to 7 different EPEC serogroups that were positive for LA by a DNA probe assay and HeLa cell assay. All strains of *E. coli* and EPEC serogroups that were negative for LA, by either DNA probe assay or HeLa cell assay or both, were negative by ELISA. Thus the ELISA is 100% sensitive and specific in detecting localised adherent classical EPEC serogroups. ■

Identification of enteric pathogens using specific DNA probes

Principal Investigator: S.M. Faruque
Funded by: USAID

The aim of this study is to assess the prevalence of different pathogenic groups of *E. coli* using specific DNA probes. Isolates of *E.*

coli are obtained for analysis from the Centre's surveillance system and from stored isolates obtained during the cholera vaccine trial. More than 4,000 isolates of *E. coli* have so far been screened for the presence of genes coding for heat-labile and heat-stable toxins, Shiga-like toxins, and adhesive or enteroinvasive factors. In a study carried out in collaboration with the Centers for Disease Control in the USA, 18% of 396 children up to 20 months of age with diarrhoea were shown to be infected with EPEC adherence factor-positive *E. coli*. Twenty-three per cent were infected with enterotoxigenic *E. coli* (ETEC), 9% were infected with Shiga-like toxin-positive *E. coli*, and 13% were positive with diffuse adhesiveness positive *E. coli*. Ten per cent of patients were colonised with more than one type of potential diarrhoeagenic *E. coli*. A comparative study of DNA probes with bioassays to identify diarrhoeagenic *E. coli* showed a general agreement between the two assay methods. New DNA probes are also being introduced and tested for their sensitivity and specificity in identifying enteric pathogens.

Study of the role of enteric adenovirus in diarrhoeal disease

Principal Investigators: Kerstin Jarecki-Khan and Leanne Unicomb
Funded by: Deutscher Akademischer Austauschdienst and Core Funds

An ELISA test, developed in the Centre's laboratory, has been used to test 4,409 stool specimens for the presence of adenovirus. Enteric adenovirus-specific monoclonal antibodies, in an ELISA Test, identified 222 (5.0%) specimens containing enteric serotypes. Next all monoclonal ELISA enteric adenoviruses will be confirmed, using serotype specific DNA probes and polyacrylamide gel electrophoresis. A case-control study will be undertaken during 1991 to confirm the role of enteric adenoviruses as the cause of diarrhoea. ■

Studies on the new cholera toxin

Principal Investigator: Setarunnahar Saha
Funded by: AIDAB

The objective of this study was to purify a newly identified cholera toxin and to characterise its physico-chemical and immunobiological properties. In this study the toxin has been purified from cholera toxin gene-negative *Vibrio cholerae* 01 strain, and it

was demonstrated to be a heat-labile, pH-sensitive protein with a molecular weight of approximately 61,000. A zone of protease activity of the toxin was found in milk agar plates which suggests that the toxin might be a protease of *V. cholerae*. This result is to be confirmed by further experiments.

The cytotoxic nature of this toxin was found in HeLa cells like that of Shiga-toxins, and the activity could be neutralised by its homologous antitoxin but not by anti-Shiga toxin which indicates the antigenic dissimilarity of the toxins. Its cytotoxic activity to Y_1 -mouse adrenal cells, unlike that of cholera toxin, indicates the difference of the toxins in their mode of action. For immunobiological detection directly on the culture plate, an *in vitro* test was introduced following the principle of the Biken test. Another *in vitro* test, ELISA, showed that it attached to the walls of the plastic microtitre plate enough to be used as antigen in the test. Both the *in vitro* tests need the use of monoclonal antibody against new cholera toxin for further confirmation.

As the toxin was found to be antigenic, the next aim is to see the role it plays in antitoxic immunity in protecting against the new cholera toxin-induced diarrhoea. ■

The following study relates to both watery diarrhoea and dysentery (the next category to be reported). ORS is a useful treatment for the dehydration resulting from diarrhoea of all kinds. However, as this investigation points out, there is a need for more and better education of the community in its use.

Socioeconomic, demographic and cultural factors related to patients with diarrhoea at Matlab: an epidemiologic and ethnomedical analysis

Principal Investigators: K.M.A. Aziz, Abbas Bhuiya, M. Yunus and M. Strong
Funded by: Core Funds

The aim of this study was to investigate the factors associated with the overall diarrhoeal mortality trend among very young children in Matlab in relation to knowledge and availability

of ORS in the community and access to free treatment at Matlab Diarrhoea Treatment Centre (MDTC). From the patients admitted to the MDTC during June-December 1990, 315 children under 5 years of age were selected as index cases for this study. Of these, 231 had watery diarrhoea and 84 had dysentery. For each index case, two comparable cases (within two weeks of occurrence) were selected through house to house search in the same neighbourhoods. Each care-giver of the hospitalised children was asked about her hygiene practices, perceptions and home management of diarrhoea, and the decision-making process that brought the child to the treatment centre. Similar interviews were carried out in the homes of the controls and in the homes of the hospitalised children.

Information on economic condition of households, education of parents, proximity to the MDTC, sex and birth order of the child was also collected. In addition to the interview, care-givers of the controls were observed for four hours regarding diarrhoea management and hygiene practices. Similarly, when the hospitalised children returned home, behaviour of the care-givers there was also observed. Field data collection was completed in December 1990.

Preliminary tabulation based on 45 community cases showed that about two-thirds of the care-givers did not provide ORS to the diarrhoea-affected children. The common reasons they gave were that ORS packets were unavailable, the baby did not like taking it, they did not consider the episode serious enough, and they did not view ORS as helpful. The reasons for giving ORS, they said, were to stop diarrhoea and/or vomiting. They presumed probable causes of diarrhoea to be: eating hot and stale foods, taking food at an unscheduled time, eating another meal at a short interval, and the mother's non-observance of restricted timings in movements. When completed, this study will provide insight into the community's perception of diarrhoea and its management and assist in the development of programmes aimed at improving diarrhoeal management practices at home. ■

DYSENTERY

Patients with dysentery, an inflammatory disease of the large intestine, have frequent loose stools containing blood and mucus. Organisms isolated from these stools may be species of *Shigella*, invasive strains of *E. coli*, *Campylobacter jejuni*, or a protozoan parasite called *Entamoeba histolytica*, the cause of amoebic dysentery. This type of diarrhoea, like the more acute kind, may also be fatal, though not as dramatically as cholera. Children, especially those with malnutrition, are very often its victims; the disease, in turn, intensifies the malnutrition.

As is evident in the majority of protocols that follow, shigellosis is the form of dysentery causing the most concern in Bangladesh because it is the most common and a very severe, debilitating illness. Further, more and more of the species are becoming resistant to the usually prescribed antibiotics, keeping investigators busy developing new treatment regimens. Many aspects of the disease and its treatment are being investigated by ICDDR,B in the community, the hospitals and the laboratories.

Evaluation of hyperimmune bovine colostrum in the treatment of: A) rotavirus diarrhoea in infants, and B) *Shigella*-associated disease in children

Principal Investigators: D. Mahalanabis, S. Tzipori, R. Eeckels, A.K. Mitra and S.M. Akramuzzaman

Funded by: Australia

Recent reports suggest that hyperimmune bovine colostrum (HBC) can be successfully used to treat intractable diarrhoea due to *Cryptosporidium* and that it plays a protective role in preventing human rotavirus infections. Bovine colostrum, which is prepared by vaccinating pregnant cows with antigens from enteric pathogens including rotavirus and *Shigella dysenteriae* type 1, is a highly nutritious food product without any side-effects. Moreover, the organisms are not likely to develop resistance against HBC.

These findings led to the current study which is evaluating the clinical efficacy of HBC as an immunological approach to treating enteric infections with rotavirus and *Shigella*-associated dysentery. In the rotavirus group, only boys of 6 to 24 months of age with a history of acute watery diarrhoea of 72 hours or less, having mild to moderate dehydration and a positive stool test for rotavirus antigen are included. In the shigellosis group, both boys and girls aged 1 to 12 years with a

history of bloody diarrhoea of 72 hours or less, not receiving any antimicrobials for the current episode, having a positive stool test for *S. dysenteriae* type 1 are included. After enrolment, patients are randomly assigned to receive either HBC or colostrum from non-immunised cows in a double-blind treatment schedule. HBC is given orally at a dose of 100 ml three times a day for three consecutive days. Patients are rehydrated with ORS and breast-feeding is continued. An isocaloric milk diet (supplying 67 kcal/l) is allowed for the infants and children who are non-breast-fed. The patients with shigellosis are given suitable antibiotics. On admission and after 48 hours, blood and stool samples are examined and a stool culture is repeated daily for the patients with shigellosis. Patients are weighed and clinically evaluated daily, and daily progress notes and the point of clinical improvement are recorded by the physicians. At discharge, patients are advised to return every 15 days for evaluation. If there is diarrhoea, a stool sample is sent for culture. The plan is to include 100 patients with rotavirus-associated diarrhoea and another 100 patients with *S. dysenteriae* type 1. So far, 75 patients with rotavirus and 51 with shigellosis are enrolled. All patients have tolerated HBC well, and no untoward effects were noted. The study continues. ■

Enteric protein loss in childhood shigellosis

Principal Investigator: A.N. Alam
Funded by: USAID

Abnormal transmucosal protein loss has been observed in various gastrointestinal disorders. Diarrhoeal diseases of different aetiologies may have a similar effect which may contribute and lead to malnutrition. In this study, faecal clearance of alpha-1-antitrypsin is measured to assess the enteric protein loss in children with diarrhoea with or without malnutrition. Intestinal permeability is also measured from the ratio of the dual carbohydrate markers lactulose and mannitol in urine of patients receiving foods containing both markers. Attempts were made to determine the nitrogen losses in urine and faeces and to assess the effects of chemotherapy and zinc supplementation on such loss and alteration in gut permeability. Thirty-two patients with acute shigellosis have been studied so far, and the data are being analysed. ■

High nutrient feeding of undernourished children with shigellosis during the acute stage

Principal Investigator: Ramendra N. Mazumder
Funded by: USAID

Shigellosis is a major cause of morbidity and mortality in developing countries like Bangladesh. It leads to malnutrition, marasmus, kwashiorkor, growth faltering, and recurrent infection which increases the mortality of the affected population, particularly children. So nutritional intervention at the start of the disease process may alter the outcome by reducing morbidity and mortality.

In this study, patients of both sexes of 1-4 years of age with acute shigellosis for less than 72 hours are randomly assigned to two groups. Patients with a complicating illness are excluded from the study. On admission prior to treatment and nutritional intervention, two stool cultures, a urinalysis, blood culture, chest X-ray if required, a complete blood count, and blood chemistry are completed on all patients. They are hospitalised for a study period of 10 days, and the necessary tests are repeated on days 5 and 10. The study group is offered a diet of nutrients yielding ≥ 150 kcal/kg/day, and the control group receives the usual hospital diet with 75 kcal/kg/day. Patients are followed for a period of one month fortnightly after discharge. The outcome is judged by

clinical and nutritional improvement. So far, 80 patients have been enrolled, and the data are in the process of being analysed. ■

Nutritional management of post-Shigella growth faltering in children with a high-protein diet

Principal Investigator: Iqbal Kabir
Funded by: USAID

In this study, a diet high in protein given during the convalescence from *Shigella*-associated dysentery in children was evaluated to see if it would allow catch-up growth and faster restoration of serum protein than the usual hospital diet of the same energy content. Sixty-nine children 2-5 years old with stool culture positive shigellosis were treated with antibiotics for 5 days. At the end of the treatment, children were randomly assigned to receive dietary intervention for 21 days in the hospital with one of two diets: a high-protein diet containing 150 kcal/kg/day with 15% of the total calories as protein or a standard control diet of the same caloric content with added protein to provide 7.5% of the total calories as protein. Anthropometric measurements and serum proteins were done before and at the end of 21 days. A preliminary analysis has shown that children fed the high-protein diet had a significantly greater increase in height and body weight than did the children fed the standard diet. Concentrations of serum proteins also increased more in the children fed the high-protein diet, and when bio-impedance assays were done, the children who were fed a high-protein diet showed a significantly greater increase in fat-free mass than those in the control group. These results indicate that dietary management of dysentery during convalescence should include diets plentiful in protein. The work is continuing with follow-up observations during the 6-month period after discharge to observe the lasting benefits in regard to growth patterns and morbidity. ■

Comparative efficacy of pivmecillinam and oral gentamicin with nalidixic acid in the treatment of acute shigellosis in children

Principal Investigators: M.R. Islam
and A.N. Alam
Funded by: USAID

A double-blind randomised clinical trial has been carried out to evaluate the efficacy and

safety of pivmecillinam, a penicillanic acid derivative, in a dose of 50 mg/kg/d and gentamicin, an aminoglycoside, in a dose of 30 mg/kg/d; both were given orally in 4 equal divided doses in the treatment of acute shigellosis. Children of both sexes having no history of taking any known effective drug within this period were recruited for the study. The effectiveness was compared with that of nalidixic acid used as the control drug in a dose of 60 mg/kg/d. Patients remained in the hospital for 6 days, during which time, regular physical findings, frequencies and character of stools were evaluated every 8 hours. Rectal swabs and stool cultures were done daily for *Shigella* spp. Patients were considered clinically cured if they were afebrile, passing soft stools without any mucous or blood on day 5 or earlier, and bacteriologically cured if *Shigella* spp. could not be isolated on day 3 or beyond. Of the 120 patients successfully studied, 59 returned to the hospital after one week for clinical and bacteriological re-evaluation. No untoward side-effects have been observed. The study is in the data analysis phase. ■

Short-course ciprofloxacin in the treatment of shigellosis

Principal Investigators: M.A. Salam
and Michael L. Bennish
Funded by: Core Funds

The objective of this double-blind, randomised study is to compare the effectiveness of the conventional regimen of treatment using ciprofloxacin given as two daily doses of 500 mg for 5 days to either a single dose of 1 g, or two doses of 1 g given 24 hours apart. The bacteriologic and clinical cure rates will be compared between the groups. If a single dose, or even two doses of ciprofloxacin gives cure rates comparable with that conventional 5-day therapy, treatment will be much simplified in terms of cost and patient compliance. By the end of the year, all 162 of the required patients had been enrolled in the study. Of the total, 118 patients were found to be suitable for analysis, i.e. they completed at least five days in the hospital and had *Shigella* spp. isolated from their faecal samples, which were free of other enteric co-pathogens. Of these, 40 were infected with *S. dysenteriae* type 1, 59 with *S. flexneri*, 4 with *S. dysenteriae* types 2-10, 4 with *S. sonnei*, and

11 with *S. boydii*. In 8 patients, the therapy was considered to have failed. The protocol is now in the analysis phase. ■

Development of an immunodiagnostic assay for the detection of *Shigella*

Principal Investigator: Dilara Islam
Funded by: SAREC

The aim of this study is to develop an immunodiagnostic assay using species/serotype-specific monoclonal antibodies for the detection of *Shigella* antigen directly from stool, blood, and possibly urine. The assay will use monoclonal antibody-coated immunomagnetic particles and will be compared with the latex agglutination assay, direct immunofluorescence assay, and conventional bacterial culture for speed, cost, sensitivity, and specificity. At the initial stage of the study, *Shigella* antigen in blood and urine was not detected by the above-mentioned methods, therefore only multiple stool samples have been collected. Until now, samples from 19 of the necessary 30 *Shigella* stool samples from patients have been collected, which will be compared to those from 30 diarrhoeal control subjects. The study is expected to be completed in 1991. ■

The role of cytokines in the pathogenesis of shigellosis

Principal Investigators: Michael L Bennish
and M.A. Salam
Funded by: USAID

The objective of this three-year study is to investigate the relationship between the production and action of cytokines and life-threatening events in shigellosis. Specifically, the study's aim is to measure in patients with shigellosis the production of the cytokines interleukin 1-alpha, interleukin 1-beta, cachectin (tumour necrosis factor), and granulocyte and granulocyte-macrophage colony-stimulating factors, as well as certain acute phase proteins, endotoxin, and Shiga toxin. The study will attempt to determine whether a correlation exists between the production of cytokines and the severity of colitis, fever, leukocytosis, weight loss, or the development of specific complications. If correlations are found, patients at risk may be more easily identified and provided with better treatment.

By the end of December 1990, 208 cases had been enrolled in the study. Of these, *S. dysenteriae* type 1 was isolated from 109, *S. dysenteriae* type 2 from 2, *S. flexneri* from 23, *S. boydii* from 3, and *S. sonnei* from another 3 patients. Twenty of these cases had both leukaemoid reaction and haemolytic-uraemic syndrome, both serious blood-related complications, and 30 patients had only leukaemoid reaction. It is estimated that 10 more patients will be required for the study. Thirty-three patients have been enrolled as controls. ■

Local and systemic immune response to Shigellosis in adult humans.

Principal Investigator: Rubhana Raqib

Funded by: SAREC

This study, done in collaboration with Karolinska Institute, Sweden, intends to investigate the immune responses in the cells and the blood of 30 adults with shigellosis, both systemically and locally and to assess the relative protective roles of these immune mechanisms, comparing them with responses of 30 healthy volunteers. Thus, the study will provide base-line information on the local population. So far 17 patients and 17 volunteers have been enrolled. Rectal biopsy specimens having been obtained by proctoscopy, blood and stool samples are now being collected from patients on 4 different days up to 11 days of infection. From the volunteers, blood, stool, and biopsy samples are collected only once. The project is expected to be completed in 1991. ■

Ribosomal RNA fingerprinting of diarrhoeagenic bacteria

Principal Investigator: S.M. Faruque.

Funded by: USAID

The aim of this study is to differentiate between different strains of bacteria that cause diarrhoea based on their ribosomal RNA gene restriction patterns. A cloned *E. coli* ribosomal RNA operon is used as a probe to identify restriction fragment length polymorphisms in ribosomal RNA genes. Studies in 36 *Shigella* strains so far, using three restriction enzymes, showed a species-specific restriction pattern of the ribosomal RNA genes in *Shigella*. ■

Haemagglutination ability and adhesiveness of *Shigella* species (Part 2)

Principal Investigators: Firdausi Qadri, Tasnim

Azim, Gabriel Mondol and Dilara Islam
Consultant: M. Sayeedul Islam, University of Dhaka

Funded by: USAID

Earlier research has shown that strains of *S. dysenteriae* type 1 show a sialic acid-sensitive haemagglutinating activity. The adhesin in these strains is the lipopolysaccharide. Now in this study the tested strains of *S. flexneri* belonging to different serotypes have similarly shown a sialic acid-sensitive haemagglutinating activity. The haemagglutinin in strains of *S. flexneri* 1a, 1b, 2a, 2b, 3a was also found to be the lipopolysaccharide. Mannose-sensitive haemagglutination has not been detected in any of the strains of *S. flexneri* studied so far. Further studies will characterise outer-membrane components and the haemagglutination of *Shigellae* using monoclonal antibodies. Hybridoma technology has been set up with the hope of using specific monoclonal antibodies both for the characterisation of the adhesion process and for use in rapid immunodiagnostic assays. ■

Plasmid-associated resistance to pivmecillinam in *S. flexneri* and *S. boydii*

Principal Investigator: Khaleda Halder

Funded by: Core Funds

In Bangladesh, where shigellosis is endemic, virtually all *Shigella* strains are resistant to the previously used drugs of streptomycin, tetracycline, chloramphenicol, co-trimoxazole, and ampicillin. This initially resulted in the introduction of a quinolone, such as nalidixic acid, for the treatment against which resistance started appearing in the mid-1980s. At the present time, nalidixic acid-resistant *Shigella* strains are treated in ICDDR,B with pivmecillinam and ciprofloxacin, and now pivmecillinam-resistant strains are beginning to emerge.

In this study, two strains of *S. flexneri* and one of *S. boydii* that were resistant to pivmecillinam were tested to describe the mode of transfer of resistance against this drug. The findings suggest that pivmecillinam resistance in strains of *Shigella* is associated with a self or a non-self conjugative plasmid of varied molecular sizes. Results of conjugation studies also suggest that perhaps resistance to both ampicillin and pivmecillinam,

penicillanic acid derivatives, is associated with a single plasmid. This has grave implications, since plasmid-borne resistance could spread rapidly among *Shigellae* in the community. ■

Production of mucinase, neuraminidase, and proteinase by *Shigella* species

Investigator: Khaleda Haider

Funded by: USAID

In this study, the production of mucinase, neuraminidase, and proteinase by *Shigella* spp. and their ability to bind to mucin were investigated. All four species of *Shigella* produced these enzymes, whereas avirulent strains of *Shigella* species studied did not show any proteinase activity. The production of mucinase and neuraminidase was, however, not significantly different between virulent and avirulent pairs of strains. Virulent strains of *S. dysenteriae* type 1, *S. flexneri* and *S. boydii* bound significantly more amounts of mucin than their avirulent mutants. These results indicate that, as in other enteric bacteria, these hydrolytic enzymes may have a role to play in pathogenesis of shigellosis. This may contribute to known virulence factors, such as lipopolysaccharides, toxin and outer-membrane proteins. ■

An outbreak of keratoconjunctivitis due to *Salmonella weltevreden* in a guinea pig colony.

Principal Investigator: M.J. Albert

Funded by: Core Funds

Although *Salmonella* and *Shigella* are invasive enteric pathogens, unlike *Shigella*, *Salmonella* do not induce keratoconjunctivitis in guinea pigs (Sereny test). Yet an outbreak of keratoconjunctivitis due to *S. weltevreden* occurred in the guinea pig colony of the Centre's animal house and the animals carried the organism in their intestinal tracts. The same serotype of *Salmonella* that caused an epidemic of diarrhoea in humans and a routine laboratory isolate also possessed the ability to induce keratoconjunctivitis. Though other properties of the serotype were shown to differ from *Shigella*, it was finally concluded that, contrary to previous observations, the ability to produce keratoconjunctivitis is a property found in certain serotype(s) of *Salmonella*. ■

A study of the immune response to *S. dysenteriae* type 1 to identify abnormalities leading to the development of leukaemoid reactions

Principal Investigators: Tasnim Azim, Firdausi Qadri, Jena Hamadani, M. Abdus Salam and M.A. Wahed

Consultant: Laila Noor Islam, Dhaka University
Funded by: USAID

Leukaemoid reaction (blood findings that resemble leukaemia) and haemolytic-uraemic syndrome (a serious blood disorder) often complicate dysentery from *S. dysenteriae* type 1, particularly in children. It is unknown why some children develop these complications which are often fatal. As host immunity plays a major role in defense against any infection, any alteration in the immune status during shigellosis, either due to the organism itself or secondary to other causes, may precipitate complications.

This study aims to assess the immune status of children aged 1-5 years suffering from dysentery due to *S. dysenteriae* type 1, and to correlate any possible changes in immunity with the development of leukaemoid reaction. A variety of tests are being done on the blood, stools, and saliva, as well as skin tests on children on admission, 3-5 days after admission, and 14 days after discharge. At the end of 1990, 17 children had been enrolled in the study. ■

Clinical and microbiological features of entero-aggregative *E. coli* infections in children

Principal Investigator: Khaleda Haider

Funded by: Core Funds

When *E. coli*, isolated from a total of 389 children under 1 year of age with diarrhoea, were analysed for the presence of entero-aggregative *E. coli* (EAggEC) by their pattern of adherence to HeLa cells, EAggEC were isolated from 58 (14.8%) children either as a sole pathogen or in combination with other enteric pathogens. In 60% of the children, EAggEC infection occurred in the second-half of infancy (7-12 months). Thirty-eight of 47 children having EAggEC as the sole pathogen had watery diarrhoea along with vomiting (87%) and dehydration (74%) and were successfully rehydrated with ORS alone. In contrast, the other 9 had bloody mucoid diarrhoea with infrequent vomiting, dehydration, and frequent abdominal pain. Children who were breast-fed (94%) and were well-nourished (68%) had shorter durations of diarrhoea (<7 days). EAggEC strains were

resistant to more than 3 antibiotics (71%). It was evident by phage pattern that various EAggEC strains were present in the population. Infection due to this group of *E. coli* appeared to be an important cause of endemic diarrhoea among children under 1 year old in Bangladesh. ■

Contact haemolysin production by enteroinvasive *E. coli* and *Shigellae*

Principal Investigator: Khaleda Haider

Funded by: Core Funds

Shigella spp. and enteroinvasive *E. coli* (EIEC) were investigated for production of contact haemolysin by growing the bacteria in different growth conditions and using erythrocytes from the mouse, rat, guinea pig, rabbit, sheep, and monkey models and from humans. The best medium for demonstrating haemolysin activity in *Shigella* spp. and EIEC was Trypticase Soy Broth and Casamino acid yeast extract broth, each supplemented with 1 mM CaCl₂. Among the various erythrocytes used, the guinea pig erythrocytes were lysed with higher efficiency by all bacterial species tested. The production of haemolysin by all species except *S. boydii* was highest at near optimal growth pH. Isolated cell surface components, i.e., lipopolysaccharide and outer-membrane proteins, were nonfunctional. Haemolysin production by both *Shigellae* and EIEC was strongly dependent on the presence of a large 140-megadalton (MDa) plasmid. Further studies suggested that haemolysin might be a protein molecule, and that its receptor may be a chitotriose-like moiety. Erythrocytes incubated with bacterial cells at 4°C or heat-killed cells at 37°C were not lysed which indicates that metabolically active cells are required for haemolysin activity. It may be concluded that EIEC and *S. boydii* also produce haemolysin which is in agreement with the common mechanism of virulence in strains of *Shigella* and EIEC. ■

Development of a live oral vaccine against shigellosis

Principal Investigator: Zia U. Ahmed

Funded by: USAID

Studies continued in 1990 with the attenuated vaccine candidate *S. flexneri* Y strain TSF21. The studies involved an assessment of safety, immune response, and protective potential. In a total of 23 monkeys, each of which had

received live cells of the vaccine in excess of 1×10^{11} cfu, no clinical disease was observed and, of 3 monkeys examined, none had any signs of mucosal abnormalities. These observations provide further attestation to the safety and non-pathogenicity of the mutant. Consistent protection after immunisation with two oral doses each consisting of 10^{11} cells was demonstrated against homologous challenge of the wild-type *S. flexneri* Y strain SH4. Protection against *S. flexneri* serotypes 3a and 2a has been strongly indicated by the results of a limited study carried out recently. Partial protection against an *S. dysenteriae* challenge after immunisation with this vaccine was also evident in a recent experiment. ■

Differentiation of pathogenic and non-pathogenic *Entamoeba histolytica* isolates

Principal Investigators: Rashidul Haque and

Andrew Hall

Funded by: USAID

Recent studies have demonstrated that *E. histolytica* isolates from patients with amoebic dysentery show isoenzymatic patterns, or zymodemes, that differ from those isolated from asymptomatic carriers. This distinction has been the basis for the designation of pathogenic and non-pathogenic strains (zymodemes). In Bangladesh pathogenic zymodemes II and XIV are associated with dysentery and non-pathogenic zymodeme I is widely prevalent in the asymptomatic carriers.

In the present study two monoclonal antibodies (MAbs) were used to distinguish pathogenic from non-pathogenic zymodemes of *E. histolytica* by the Immuno Fluorescent Antibody Test (IFAT). Both monoclonals reacted with all 20 isolates showing pathogenic zymodeme patterns (zymodeme II and XIV). In contrast, the monoclonal antibodies failed to react with 14 isolates of *E. histolytica* having non-pathogenic zymodeme I. This study demonstrates that the discrimination of pathogenic from non-pathogenic zymodemes, based on the reactivity of monoclonals, is entirely in accord with that by isoenzyme analysis. This fact indicates that MAbs could be a useful means of distinguishing between zymodemes. ■

Isolation of *Clostridium difficile* from neonates and hospital environment

Student thesis supervised by: S.Q. Akhtar

Rectal swabs from 62% of 135 neonates who had received antibiotics in an Intensive Care Unit and 28% from 75 non-antibiotic-associated neonates yielded *Clostridium difficile* on culture in selective plates and enrichment broths. Of 90 swabs collected from the environment of the Unit, 4% were positive for *C. difficile*. The study revealed that *C. difficile* is present in high percentage in neonates who were treated with antibiotics. The study also indicated that environmental contamination is implicated in the spread of *C. difficile*. ■

Intervention to reduce deaths from dysentery in the Matlab MCH-FP area

Principal Investigators: Jacques Myaux, Md.
Yunus and Vincent Fauveau
Funded by: NORAD, WUSC/CIDA and BADC

This study, launched in 1989, assessed the effects of antibiotic treatment on children under 5 years of age with dysentery due to *Shigella*. Community Health Workers (CHWs) of the MCH-FP area in Matlab were trained to diagnose cases of dysentery based on the

history and presence of blood in the stool. CHWs of two study blocks were supplied with nalidixic acid and asked to treat children 3-59 months of age with dysentery. CHWs of the other 2 blocks were asked to refer children with dysentery to the sub-centres for treatment. At the same time a random sample of the population was surveyed to detect cases of dysentery and to collect rectal swabs for culture. *Shigella* spp. and antibiotic sensitivity were tested. Preliminary analysis revealed that the mother's report of blood in the stool did not very accurately predict the presence of *Shigella*.

During 1990, 407 dysentery cases were reported; 109 stool cultures (26.8%) grew *Shigella*. The proportion of *Shigella* isolation varied from month to month and seemed related to the incidence of dysentery. High isolation rates were seen during the monsoon and the preceding winter. A comprehensive analysis of the study will be completed during 1991. ■



Asim Anam

Patients with diarrhoea are transported to the Matlab hospital in various types of vehicles. Here is a sick child brought for treatment in the Centre's motor boat.

PERSISTENT DIARRHOEA

In 1986 the Programme Coordination Committee of the Centre selected "chronic diarrhoea and malnutrition syndrome" as a new research priority for the ICDDR,B because of the high incidence of this condition and its serious consequences. Since then, it has more often been called "persistent diarrhoea". It is defined as episodes which last for 14 days or longer. The World Health Organization has estimated that in developing countries up to 20% of acute episodes in children become persistent. Especially common among infants and young children, it often leads to severe malnutrition and death. Yet investigators are still grappling with the reasons why some acute cases respond to treatment and others do not.

The studies that follow range from attempts to determine the factors which prolong the episodes of diarrhoea to trials of various treatments to bring about a more rapid recovery.

Epidemiology of persistent diarrhoea in Bangladeshi children

Principal Investigator: Abdullah H. Baqui
Funded by: WHO

To determine the magnitude of the problem of persistent diarrhoea and to identify its potentially important risk factors, a community-based study was carried out in Matlab. The study, following 705 children under 5 years of age for 1 year, involved the collection of socioeconomic and demographic information along with gathering of disease information every fourth day. The identified aetiologic agents of each child's acute and persistent diarrhoeal episodes were then compared to the findings from stool samples of a group of healthy control children age-matched with the persistent cases. In addition, a monthly anthropometry, and an assessment of the cell-mediated immune status were done every three months, a monthly survey of types of food and food preparations taken by the child was made, and information on dietary and other management of diarrhoeal episodes was recorded.

The overall diarrhoeal incidence in the study children was 4.5 episodes per child per year; the age-specific rates were highest in the first two years of life. The proportion of all diarrhoeal episodes that became persistent (8.0%) was also highest in the first year of life. Though there were wide disparities in socioeconomic status, these variables were not

strong predictors of diarrhoea or persistent diarrhoea. *Shigella* spp. and rotavirus were significantly associated with the occurrence of acute diarrhoea. *Shigella* spp. was also associated with persistent diarrhoea, but the odds of isolating it were the same from acute and persistent episodes. When compared with the acute diarrhoeal controls, diffuse adherent *E. coli* and *Cryptosporidium* were the only enteropathogens that were significantly associated with persistent diarrhoea.

Undernutrition was widespread and there was a modest association between undernutrition and the incidence of all diarrhoeas. About 10 to 20% of the study children did not respond to any of the skin test antigens. These children experienced a 50% increased incidence of all diarrhoeas and a 100% increased risk of persistent diarrhoea, compared to their immunocompetent counterparts. Routine feeding patterns did not influence the occurrence of diarrhoea; however, reduction in breast-feeding, consumption of cows milk, withdrawal of any food or introduction of any new food, during an episode were associated with the persistence of diarrhoea.

The study concluded that improved nutrition and appropriate care of the high risk episodes could be expected to have a positive impact on the incidence of persistent diarrhoea. Cell-mediated immune deficiency deserves further, more specific investigation. ■

Prognostic indicators and risk factors for increased duration of acute diarrhoea and for persistent diarrhoea in children: a multivariate analysis of hospital surveillance data

Principal Investigators: D. Mahalanabis and A.N. Alam

Funded by: Japan and USAID

This study's aim was to identify the factors which determine the increased duration of acute diarrhoea and lead to persistent diarrhoea in children under 3 years of age. A systematic sample (3,690) of patients attending the treatment centre over a 3-year period was analysed, using multiple regression, logistic regression, and stratified analysis. The study found that the significant factors for the increase in duration of acute diarrhoea included bloody or mucoid diarrhoea, concomitant signs of chest infection, signs of the presence of vitamin A deficiency, decreased weight-for-age, the routine use of contaminated surface water, lack of breast-feeding, and increasing age. The presence of rotavirus or ETEC or *V. cholerae* 01 in the stools had a negative association. In logistic regression and stratified analysis, these factors, except for lack of breast-feeding and age, were also found to be the factors that predict the prognosis of persistent diarrhoea. Possible programmes to reduce these risks, these findings imply, should include control and/or treatment of dysentery, vitamin A deficiency, acute respiratory tract infection, and malnutrition, and the provision of clean water for all day to day needs. ■

Prognostic and risk factors for prolongation of acute diarrhoea: a clinic-based cohort study

Principal Investigators: D. Mahalanabis and A.S.G. Faruque

Funded by: SDC

This ongoing study aims to identify the factors that determine the prognosis of an acute diarrhoeal episode that is likely to become persistent. It also seeks to use these factors as indicators of the need for early and appropriate treatment. The risk factors that influence the duration of diarrhoeal episodes or determine nutritional impact from persistent diarrhoea are of particular interest. This is a randomised controlled study in which children aged 3-35 months with acute watery diarrhoea are given either rice-ORS or glucose-ORS. After a skin test for evaluation

of cell-mediated immunity is performed, the children spend the night in the hospital. They are home visited after 24 hours of discharge and return to the hospital 48 hours later, and on days 16, 32, and 48, for a physical examination and anthropometric measurements. The results may help in designing future intervention strategies against persistent diarrhoea. By the end of the year more than 300 children had been enrolled. ■

Albendazole as a treatment for infections with *Giardia intestinalis*

Principal Investigator: Andrew Hall

Funded by: Core Funds

Albendazole is currently used to treat a wide range of intestinal nematodes. The aim of this study is to examine its efficacy as a treatment for infections with *G. intestinalis*, a protozoan parasite of the small intestine which is associated with persistent diarrhoea. The study involves about 500 children aged between 5 and 10 years living in an urban slum. Children found to be infected with *Giardia* were assigned randomly to receive either a single dose of 600 mg of albendazole, or three daily doses of 400 mg, or a five-day course of metronidazole, the usual treatment for this infection. Three stools were collected from each child during a 10-day period after treatment to check that the infection had been treated. A stool sample was also frozen for eventual testing by an ELISA. Subject to the results of the ELISA, the study indicated that the single dose of albendazole apparently treated about 60% of the infections; the three daily doses, about 80%; and metronidazole treated 97%. Albendazole appears then to treat infections with *Giardia*, but the doses given in this study were not as effective as metronidazole. The study is being continued using larger dosages of albendazole. ■

A study of the impact of zinc supplementation on mucosal permeability and clinical response in acute and persistent diarrhoea in Bangladeshi children

Principal Investigators: S.K. Roy, R. Halder, A.M. Tomkins, Ron Behrens and S.M. Akramuzzaman.

Funded by: The Wellcome Trust, UK.

To test the hypothesis that zinc supplementation can reduce the magnitude of diarrhoea by improving mucosal permeability and water and

electrolyte transport, a double blind randomised trial was undertaken in children with both acute and persistent diarrhoea. The effect of supplementation was further studied by measuring growth and monitoring health weekly for 3 months after discharge. Since March 1987, a total of 192 patients aged 3–24 months were recruited with persistent diarrhoea and 208 patients were recruited with acute diarrhoea. Either zinc acetate or a placebo was given for a 14-day period. Intestinal permeability was estimated by feeding them a lactulose and mannitol solution (5:1 ratio), and then calculating the percentage of sugars in the urine collected over a 5-hour period. In patients with persistent diarrhoea, the effect of zinc supplementation on reducing the duration of diarrhoea was marked, and the intestinal mucosal permeability was significantly improved after only one week. Zinc therapy led to a 30% reduction in the recovery period of the lighter, thinner, and male children with persistent diarrhoea. In patients with acute diarrhoea, reduction in stool volume was evident in children who were males, shorter, lighter, or had low serum zinc on admission. Duration of diarrhoea was also significantly shorter among children having low serum zinc. At discharge the control children had a significant drop in body weight whereas those in the supplemented group maintained their initial weight. In the follow-up study, there were also findings that suggest the significant clinical and nutritional benefits of giving a zinc supplement to children with diarrhoea. The study led to a Ph.D. in Nutrition for the Principal Investigator (SKR). ■

Trial of coconut oil-based comminuted chicken meat diet in persistent diarrhoea in children – a metabolic balance study
Principal Investigator: P.K. Bardhan
Funded by: WHO

Persistent diarrhoea is increasingly being recognised as a difficult clinical problem both from a pathophysiological and a management point of view. Malabsorption of nutrients causing severe nutritional deficiencies seen in persistent diarrhoea is mostly related to functional derangements of the gastrointestinal tract. The most important aspect of clinical

management in persistent diarrhoea is dietary manipulation.

In this metabolic balance study, a diet based on coconut oil, which is a rich source of medium-chain triglycerides, is being compared with a diet of equal caloric content based on soybean oil. Children aged 3–12 months, suffering from diarrhoea for more than 2 weeks, are randomly assigned to the two dietary groups. Clinical response and coefficients of nutrient absorption are recorded and related to the functional derangements identified by various laboratory investigations, and then compared between the two dietary groups. Subjects are followed for 2 months to monitor the results and to ensure appropriate dietary management at home. Data generated are expected to be useful towards identification of more appropriate and alternative diets, as well as to provide insights into the pathophysiological mechanism. Sixty-four patients so far have been studied. ■

Evaluation of trimethoprim-sulphamethoxazole in the treatment of infants and children with persistent diarrhoea

Principal Investigator: N.H. Alam
Funded by: USAID

One of the postulated mechanisms involved in the pathophysiology of persistent diarrhoea is small bowel bacterial overgrowth. In this double blind randomised controlled clinical trial, 52 patients of either sex, aged 3 to 24 months, with a history of diarrhoea for 14 days or more, will be studied in two groups. All the patients will be given a modified diet (rice, egg albumin and soy oil mixture) and a vitamin mineral mixture. Only one group will receive trimethoprim-sulphamethoxazole in addition to a vitamin mineral mixture. The clinical responses of the two groups will be compared. For meaningful interpretation of the results of this study, microbial flora of upper small bowel and faeces will be evaluated for type, quantity and antibiotic sensitivity. After recovery, the patients will be seen every two weeks as outpatients for a period of 4 weeks, or until they resume their normal diets. By 31 December 1990, 33 patients had been enrolled in the study and no adverse effects had yet been noted. ■

URBAN STUDIES

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- Urban Surveillance System
- An evaluation of the services
- Rice-ORS vs glucose-ORS
- Polio vaccine with gastroenteritis
- Life choices and slum women
- Diarrhoea Surveillance Programme
- Breast-feeding and vitamin A
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POPULATION STUDIES

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- MCH-FP Extension Project
- Matlab
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- Sample Registration System
- Technical assistance



Asam Antari

An Urban Volunteer measures the height of a child from an urban-slum area.

URBAN STUDIES

Over the past two decades, Bangladesh has been among those countries experiencing severe problems related to urban growth. Its urban growth rate is among the highest in Asia. In 1981, the urban population was 13.5 million. In 1990, it was almost 23 million people, of which 11.5 million were estimated to live below the poverty line (a minimum monthly income of 2,600 taka for a family of six). The current urban poor population of Bangladesh, thus, approaches the country's total urban population of 1981.

The largest city in Bangladesh is Dhaka with an estimated population of 7 million, of which some 3.5 million are slum-dwellers. By the year 2000, Dhaka is projected to have a total population of over 10 million. Authorities familiar with urban poor communities agree that environmental and health conditions for slum residents in Dhaka are deplorable. Population densities of 600 people per square acre are common in some Dhaka slums and squatter settlements. Almost 90% of slum-dwellers lack private latrine facilities and regular garbage disposal services. Only 6% of slum and squatter settlements have primary education facilities and only 3% have primary health care facilities. Given such conditions, it is not surprising that both disease and death are common in slum communities, especially for the vulnerable groups of children under 5 years of age and women of child-bearing age.

The leading causes of childhood death in urban slum areas are diarrhoeal diseases, acute respiratory infections, and tetanus. Their prevalence can be dramatically reduced by delivering affordable and sustainable health care services that are simple and effective. This reduction may be achieved by providing ORS and antibiotics for diarrhoeal diseases, antibiotics for acute respiratory infections, and immunisations for tetanus, polio, and measles. It may also be achieved by educating mothers about disease symptoms, basic hygienic and nutritional practices, and informing them about clinic locations and services. Until now, however, these public health measures have generally not been designed, managed, and delivered in ways most beneficial to urban slum populations.

Not only do urban slum-dwellers in Bangladesh suffer from a disproportionately high level of disease and death, they are underserved by the public health service system. Although there is a health and family planning services outreach system at the public sector level for the rural population, no such system exists for the urban poor. Concern for these alarming conditions brought about the Urban Volunteer Program at ICDDR,B in 1981. Since then it has grown in effort, size, and scope.

Urban Volunteer Program

Project Director: Ngudup Paljor
Funded by: USAID, BADC and Ford
Foundation

The Urban Volunteer Program (UVP) was conceived as an operations research and service delivery pilot project to test the possibility and impact of using women, most of them illiterate, from slum communities to furnish preventive health care and referral information to slum residents. Special attention

was paid to the health needs of women and children under 5 years of age. The Program's original focus was on diarrhoea prevention and treatment through education and distribution of ORS, but over time it expanded to nutrition, immunisation, and family planning. The Program also conducted research designed to assess the effectiveness of the volunteer model, and to test the outcome of the health care provided.

During 1990 over 550 trained volunteers

provided extensive services in diarrhoea prevention and treatment, and nutrition, immunisation, and family planning promotion and referrals. They also collected data, using an especially designed symbol calendar. The volunteers' activities were monitored and supervised by field supervisors and community health coordinators. The following is a summary of services provided by UVP in 1990 (see details in Table 1).

- ** 586,694 ORS packets were distributed; 193,799 persons were provided health education on the prevention of diarrhoea; 1,499 diarrhoea cases were referred to the ICDDR,B Treatment Centre.
- ** 322 children were given vitamin A capsules; 300 families received vegetable seeds; 96 neem soaps were distributed to early scabies cases.
- ** 36,310 mothers received nutrition education; 535 malnourished children were treated at UVP's three Nutrition Rehabilitation Centres (NRU) and referrals were made to the Child Nutrition Units (CNU) of the Save the Children Fund (UK), and NRU of ICDDR,B.
- ** 12,245 children were referred for immunisation to the Dhaka Municipal Corporation's EPI centres; 36,525 received health education on immunisation.
- ** 4,832 women were referred to family planning clinics; 25,354 received health education on family planning methods.
- ** 178,242 persons were taught ORS preparation; 55,315 received health education on personal hygiene; 16,854 received health education in basic child health care.
- ** 3,248 cases (other than diarrhoea and malnutrition) were referred to hospitals and other health facilities.

During its initial years, UVP recruited and trained volunteers and monitored their achievements through periodic surveys and special studies. The preliminary findings show that local women could indeed be recruited and trained as volunteers, that they could transmit basic health messages to slum

residents and refer them to clinics, and that the behaviour of slum residents would change as a result of these activities. The UVP experience also showed that a successful project requires consistent recruitment procedures, standardised training, well-defined areas of operation, and routine performance evaluations. Thus, a major task in 1990 has been the restructuring of the project to provide effective and efficient service delivery in urban slum areas and also to develop a sustainable public health research capacity at the ICDDR,B. To aid in these objectives the UVP initiated or continued the following data collection research proposals. ■

Urban Surveillance System

Principal Investigators: Abdullah H. Baqui, S. Mizan Siddiqi, Charles Lerman, F.A. Ara, S. Nurani, K.L.B. Banu, R.A. Jahan, N.M. Jahangir, Md. Ali, *et al.*
Funded by: USAID

An Urban Surveillance System (USS) was developed in 1989 and 1990 for evaluating volunteer effectiveness and impact. It provides the means for gathering statistical information for conducting research in urban slums.

The USS surveys, which track demographic and health events in both treatment and comparison areas, cover mothers with children under 5 years of age and women of child-bearing age. They were designed to assess knowledge and practice for diarrhoeal disease prevention and treatment, nutrition, immunisation and family planning. These surveys also provided valuable information about the status of diarrhoea and scabies prevalence, ORS use, immunisation coverage, and contraceptive use and choice.

The USS has four data collection mechanisms:

- ** A questionnaire to track births, deaths, migration, and marriages within the field area.
- ** Quarterly modules to track nutrition, family planning, immunisation, diarrhoea, and causes of death.
- ** An initial survey, and a follow-up to collect data on education, occupation, marital status, and household composition.

Table 1
URBAN VOLUNTEER PROGRAM, ICDDR,B
 Summary of Service Statistics, Jan-Dec, 1990

Month	Health Commodities Distributed				Health Education							Referral to Static Health Facilities				
	ORS	Vit. A	Veg. seed	Neem soap	Diar. prev. msg.	ORS prep.	Nutr. educ	Hygn. educ	Immun	Fam. plan	Child health	ICDDR	Nutr. centr	Immun centr	Fam. plan	Others
JAN	72692	75	30	2	25073	22408	3564	5136	4364	2934	2469	229	52	2109	741	499
FEB	58600	70	205	35	19912	17953	3357	4492	4178	2882	2278	179	70	1786	574	438
MAR	51414	12	4	38	17680	15684	3078	3691	3757	2621	1941	186	62	1144	563	384
APR	74498	64	5	1	24361	22223	4279	6827	4729	3779	2297	203	87	1450	627	422
MAY	60385	29	4	7	19973	18242	3630	6071	3786	2820	1814	162	43	1152	480	398
JUN	62313	4	33	8	20395	18912	4018	6320	4060	2782	1782	161	75	1081	527	309
JUL	50945	25	1	1	18398	16725	2909	5097	3003	2050	1257	122	33	1072	444	290
AUG	57220	39	18	4	16055	16877	3034	4841	2743	1885	1219	118	38	893	368	18
SEP	39002	4	0	0	12596	12050	3376	4597	2328	1554	810	56	42	530	226	113
OCT	16336	0	0	0	5620	5562	2003	3031	1234	843	420	19	14	341	87	65
NOV	15348	0	0	0	5272	5216	1494	2557	1050	536	342	34	11	267	65	55
DEC	19041	0	0	0	6464	6390	1568	2655	1293	668	235	30	8	380	130	87
TOTAL	586694	322	300	96	193799	178242	36310	55315	36525	25354	16854	1499	535	12245	4832	3248

- ** Special surveys to identify the effects of primary health care in selected field and comparison areas.

The USS has been revised to make its data collection and management system compatible with that of the Sample Registration System (SRS) of the MCH-FP Extension Project. Researchers who wish to use both SRS and USS can, thus, do so with ease. Common systems are also being developed with the Matlab Project and the MCH-FP Extension Project for the purpose of comparing rural and urban poor populations. ■

An evaluation of urban health services delivery system

Principal Investigators: Abdullah Baqui, Mizan Siddiqi and Charles Lerman
Funded by: USAID and BADC

One purpose of this study is to determine the ongoing effectiveness of the urban volunteers, specifically their ability to deliver health services in the areas of diarrhoea, nutrition, immunisation, and family planning. This evaluation of the urban slum health delivery model is being done in the UVP's USS research clusters. Half of the clusters have been assigned for intervention and the other half for comparison. Volunteers have been recruited and trained, and quarterly surveys will be conducted.

Another purpose of this study is to evaluate the past effectiveness of the urban volunteers. Results from three surveys are being used to compare across areas, both with and without volunteers, mothers' knowledge about diarrhoea prevention and treatment, immunisation, nutrition, and family planning, and also to compare selected health status indications, such as diarrhoea prevalence, ORS utilisation rates, and contraceptive prevalence rates. ■

A comparative study of the correct use of packet rice-ORS vs standard glucose-ORS

Principal Investigators: S.M. Siddiqi, Abdullah H. Baqui
Funded by: USAID and BADC

The purpose of this study is to compare the acceptability and usage of prepackaged rice-ORS with that of glucose-ORS in an urban slum population. The superiority of rice-based ORS has been proven in clinical trials,

but no information is available on its use at the community level in urban areas. The study area will be the research clusters of the USS, and the data will be collected through interviews with the mothers, on-site observations, and focus groups. ■

The effectiveness of trivalent oral polio vaccine in children with gastroenteritis

Principal Investigators: Jacques Myaux, Amatul Uzma, Abdullah H. Baqui, Mathuram Santosham, Richard Besser, Diana Silimperi
Funded by: USAID and BADC

The purpose of this study is to evaluate the effect of acute watery diarrhoea on the effectiveness of trivalent oral polio vaccine (TOPV) by administering the vaccine to a cohort of children during an episode of diarrhoea and measuring sero-conversion rates to the 3 poliovirus serotypes after the 1st and 3rd doses. Given the high risk of both diarrhoea and poliomyelitis in children in developing countries, it is important to determine whether or not TOPV administered during an acute diarrhoeal episode will give the child adequate protection. The international Expanded Program of Immunization (EPI) standards recommend that oral polio vaccine should be given even during an acute diarrhoeal episode. However, in such instances, it is stated that an "extra" dose of TOPV should be given at a later time. Despite EPI guidelines, many children with diarrhoea are refused immunisation because of their illness, and even those who have been vaccinated rarely receive the "extra" dose of TOPV recommended. Hence, the issue of whether or not TOPV can be effectively administered during an acute episode of gastroenteritis needs to be determined.

The study population will be comprised of infants residing in, or adjacent to, slum communities that are included in the UVP research clusters. These clusters are scattered urban areas which include 3,000 families whose vital statistics are being obtained on a quarterly basis. A cohort study design is being used, selecting one infant aged 4 weeks to 4 months with acute diarrhoea for every two healthy infants from the same environment, and then comparing their antibody levels after the administration of TOPV. ■

The impact of enhancement of life choices among slum women

Principal Investigators: Naeema Chaudhury and Shahnaz Ahmed
Funded by: Ford Foundation

The Women's Empowerment Pilot Project (WEPP) was launched in June 1990 to study the impact of enhancement of life choices by way of literacy, legal awareness, income generating, credit access, and reproductive health training among the target population of

the UVP. Over the years informal and formal discussions with volunteers have revealed that slum women suffer from two basic problems: lack of money and social harassment. This project works to change individual and social attitudes by forming groups and by organising the women to play a stronger participatory role in order to enhance their personal and interpersonal development. ■

The ICDDR,B has since its beginning provided free treatment for diarrhoeal diseases to many people each year who visit its Clinical Research Centre (CRC) (see p. 42). They are probably the poorest and sickest people in the community, yet studying these patients can often reveal helpful information for improving health services and sharing with other treatment institutions.

ICDDR,B Surveillance Programme, Dhaka CRC
Principal Investigator: A.N. Alam
Funded by: UNDP/WHO

this study maintains a surveillance system in which data are collected from a 4% systematic sample of patients attending the Centre.

The number of patients being treated at ICDDR,B CRC is very large. About 150-300 patients attend the research centre every day, yearly attendance being about 60,000-70,000. Since it is not feasible to study each patient routinely in depth nor to collect clinical and microbiological data on each of these patients,

During 1990, 2,390 patients were enrolled in this programme. Selected patients receiving routine medical care were interviewed by a staff member of the surveillance team and given a thorough physical examination, including anthropological measurements by a physician. In addition, a stool specimen was

Table 2

The major bacterial pathogens isolated each month during 1990 as the part of the surveillance of 4% of patients attending the CRC

Months	No. of samples	<i>Salmonellae</i>	<i>Shigellae</i>	<i>Vibrio cholerae</i> O1	Other vibrios tested	Rotavirus	
						Sample	+ve
January	168	6	22	3	15	156	36
February	165	3	17	4	36	147	11
March	196	1	22	3	50	189	19
April	250	6	34	9	39	235	21
May	240	4	37	14	41	221	13
June	190	6	23	4	37	182	14
July	184	7	13	3	38	176	31
August	200	9	23	4	42	189	34
September	199	8	22	5	49	194	36
October	187	9	29	19	28	182	35
November	197	5	28	35	39	193	24
December	209	4	29	38	32	209	49
Total	2385	68	299	141	446	2273	323
%	(100)	(2.9)	(12.5)	(5.9)	(18.7)	(100)	(14.2)

obtained from each one for culture and microscopic examination, except from those who absconded or refused. The major bacterial pathogens isolated each month during 1990 at the CRC are shown in Table 2. This ongoing surveillance programme allows the investigators to describe epidemiological trends of diseases and to define the causative organisms with their antibiotic sensitivity. Based on this system, the ICDDR,B sends a weekly report to the Ministry of Health, Government of Bangladesh. In addition, the surveillance data are used by all investigators to initiate clinical and follow-up studies and test different hypotheses. ■

Breast-feeding and the risk of vitamin A deficiency in children in Bangladesh attending a Diarrhoea Treatment Centre: a case-control study of hospital surveillance data

Principal Investigator: D. Mahalanabis
Funded by: SDC and USAID

The association between breast-feeding and the risk of vitamin A deficiency was examined in a case-control study of 6 to 35-month old children attending the diarrhoea treatment centre. Using multivariate analysis, 66 children with nightblindness, Bitot's spots, corneal lesions, or any combination of these were compared with 2,621 controls. The odds ratio relating breast-feeding to vitamin A deficiency after adjustment for confounders reflected a 74% reduction in the risk of vitamin A deficiency among breast-fed children. The estimated reduction of risk did not decline with age and as high as 49% of children aged 24-35 months were still being breast-fed. These results indicate that breast-feeding was associated with a substantial reduction of the risk of vitamin A deficiency. Results support the recommendation that mothers in developing countries like Bangladesh should be advised to breast-feed as long as possible. ■

Concentration of vitamin A in breast-milk after supplementation of vitamin A at delivery

Principal Investigators: S.K. Roy, A. Islam, A. Molla and S.M. Akramuzzaman
Funded by: UNDP

This study was designed to determine the effect of vitamin A on the health of breast-fed infants. (It is known that most of the vitamin A supply of newborns and infants comes from breast milk.) In a periurban village of Dhaka,

a single dose of vitamin A (200,000 I.U.) or placebo was given at delivery to 50 randomly selected mothers aged 16-35 years. The concentration of vitamin A and retinol-binding protein was estimated in blood and breast-milk before supplementation, at delivery, and at 3, 6, and 9 months after delivery. The mother's and infant's weights and status of health were recorded for one year. The results showed a high fluctuation of dietary vitamin intake. The serum vitamin A level rose significantly after supplementation and remained high for one month. Only the malnourished mothers maintained significantly higher levels of vitamin A in breast-milk and serum for 3 months. There was a significant reduction of respiratory tract infection, diarrhoea, and fever in the infants of supplemented mothers and no significant difference in the incidence of disease between the mothers. This completed study suggests a positive impact of vitamin A supplementation on malnourished women and breast-fed children. ■

Zinc and iron supplementation on growth and morbidity of underprivileged children in Bangladesh: a community-based study

Principal Investigators: S.M. Akramuzzaman and A. K. Mitra
Funded by: UNICEF/SDC

Zinc is emerging as an important nutrient and its deficiency is felt to be widespread. When it is deficient in the diet, the immediate impact is the failure of the child to grow. Zinc supplementation has also been shown to be beneficial during attacks of acute and chronic diarrhoea. Like iodine, it is eminently suitable for implementation on a large scale through regular intake in physiological doses, e.g., added to salts. It is therefore important that the benefits of zinc supplementation are first studied at the community level under optimum conditions to establish its effectiveness.

In this study, zinc supplementation is combined with physiological doses of iron, because in Bangladesh bioavailability of iron is low due to the high cereal content of the diet. Furthermore recent findings from an ICDDR,B handpump project in Mirzapur, located about 60 km from the capital city, showed that children using water from handpumps with high iron concentration had a much better growth rate than those using water from pumps with a low concentration. Other

studies have also shown that iron has a beneficial effect on the child's growth and in acute diarrhoea. The objective of this study is to evaluate the role of zinc and iron supplementation in reducing morbidity and improving the growth rate of children aged two months to four years in a poor peri-urban community. Such supplementation, if successful, may identify a simple and cost-effective public health intervention with far-reaching implications for child survival efforts. The initial phase of the study, which includes census household mapping, identification of eligible children in each family unit, training and standardisation of procedures for collection of data by field workers, development and pretesting of data forms, and collection of base-line information, has been completed. The next phase includes supplementation, monitoring and data collection. A total of 450 children from 290 families have been enrolled, and a mid-term analysis of the data is underway. ■

Multi-resistant *Salmonella typhi* in Bangladesh
Investigators: M.J. Albert and K. Haider

Funded by: Core funds.

Enteric fever caused by *Salmonella typhi* is normally treated by drugs, such as chloramphenicol, ampicillin, and co-trimoxazole. However, 16 strains of *S. typhi*, resistant to all the above drugs and tetracycline, have been isolated at the Centre's laboratories between September 1989 and August 1990. This study examined the mode of transfer of resistance in these bacteria and found that they all possessed a single plasmid of approximately 110 MDa. This plasmid could be transferred to a recipient *E. coli* in conjugation studies and, on transfer of the plasmid, the *E. coli* also acquired resistance to all 4 drugs. This suggested that drug resistance is associated with the plasmid and that this resistance could spread rapidly among strains in the community. There are reports of outbreaks of infection due to multi-resistant *S. typhi* from other parts of the Indian subcontinent, which may point to a subcontinent-wide outbreak and a need to find alternative drugs to treat enteric fever caused by multi-resistant *S. typhi*. ■

POPULATION STUDIES

An interest in population studies arose originally from the need to provide demographic information about the large numbers of people in the field areas where cholera vaccine trials were conducted. In recent years population studies have grown in importance at the Centre because of the recognition that ill-health is not a simple matter of cause and effect. In reality, the occurrence and prevalence of disease is strongly associated with the broader social and cultural circumstances in which people live. The information which has been collected by population scientists at the ICDDR,B during the last quarter century is unique in the developing world and provides unparalleled opportunities for research on the relationships between the health of the population and its social profile.

As the Centre began to increase its emphasis on social science research it was realised that outside assistance in setting priorities in this area was needed. With excellent donor support, the Centre's first scientific advisory council was formed.

Social Science Advisory Council

Chairperson: Jane Menken

Funded by: Ford Foundation

A major achievement of 1990 was the hosting of the first annual meeting of the Social Science Advisory Council (SSAC). The SSAC, consisting of Jane Menken (chair), Mushtaque Chowdhury, John Cleland, Andrew Foster, and James Ross, met in Dhaka in June. The long-term mandate of the Council is to help identify the research needs now existing in the social sciences, inventory the resources available at the ICDDR,B, decide which research topics are appropriate to undertake here and elsewhere, establish priorities, and determine resource needs. At its first meeting all of these issues were discussed with scientists throughout the ICDDR,B. The Council report detailed a number of general and specific recommendations in the areas of: structural issues; social science training; data access and collaborative studies; and research priorities. ■

Demographic Surveillance System

Project Director: Michael A. Strong

Funded by: The Netherlands Government and CIDA

The Demographic Surveillance System (DSS) collects the data which makes population research possible. It addresses the Centre's research needs in two ways. First, by

maintaining long-term records on people living in a rural area, the DSS provides a structure which allows a variety of community-based studies to be undertaken by the Centre scientists. The DSS records, for example, made possible the recent oral cholera vaccine trial (1985-1988). Second, the DSS scientists themselves conduct valuable research on the links between demographic, socio-economic, epidemiological, and biological factors at work within a poor rural community in Bangladesh. This research, based on communities and populations, provides useful information for comparison with other areas of Bangladesh and with other countries in the developing world.

Matlab: The DSS has been an important component of the health research at the Centre's field station in Matlab Upazila, a rural area southeast of Dhaka (see map in Appendix). Beginning with a census in 1966, increasingly detailed information about demographic events has been recorded, including deaths, pregnancy outcomes, migrations, and changes in marital status. In 1977 the area under surveillance was divided into two parts: in one, usually called the "Treatment area", an MCH-FP programme is operating (see page 33); in the other part, usually called the "Comparison area", only the normal government family planning and health services are available, although people there also have access to the Centre's hospital in

the town of Matlab Bazaar (see page 44). At the beginning of 1990 the two areas contained a little over 200,000 people living in 142 villages.

Data collection and personal computer-based data entry continued in Matlab. There were no natural disasters in 1990, and the political upheaval which took place at the end of the year was primarily an urban phenomena, so the field work took place without problems. The data collection forms, revised at the end of 1989, and the corresponding data entry programme worked well. Database work continued roughly on schedule, although funding uncertainty required an increased degree of frugality with respect to computer use.

As the database approaches real time, field errors discovered during loading, such as incorrect identification numbers, are more meaningful to the field staff when returned to them for correction. It is now possible to use these error lists to identify staff who need additional training and supervision.

Teknaf: During 1974-1989, the Centre operated a field station in Teknaf, an area close to the Burmese border, where the DSS also collected vital information useful as comparisons with research in Matlab. Since health research activities in Teknaf had been completed and no new ones were anticipated, the Board of Trustees decided, in 1989, to close the field station. Because the Teknaf diarrhoea treatment centre had four to five thousand patients each year, there was concern by the Centre and the local community that health services be maintained. Discussions with the British Overseas Development Administration to establish a health care NGO based on the Centre's existing facilities and staff were begun in 1989. Due to various delays, the NGO has not yet been established; contact is maintained with the nucleus of staff which will start the NGO. (Details of the 3 areas are shown in Table 3).

Research

Research projects conducted and published by DSS staff during 1990 reflect the breadth both of their interests and of the studies made possible from the Matlab data; data from a population large enough to permit even the

analysis of relatively infrequent events, such as adult mortality and twin births. Several of these studies began to apply the tools and perspectives of demography to child survival issues.

Education and child mortality

A study of maternal education and its influence on child survival repeated the finding that the risk of death is greater for girls aged 6 to 35 months, and that children whose mothers have more education have a lower risk of dying. It also found, however, that increasing the education of the mother reduced male mortality much more (42% vs 5% for no schooling to 1-5 years). One possible explanation is that mothers with more education are better at recognising illnesses and convincing family members to use family resources to treat the illness, but that all mothers still put greater emphasis on male survival. These findings illustrate the complex ways in which social systems operate, as well as showing again the need for overall improvement in the status of women and for more research into the mechanisms by which factors such as education influence health.

Famine studies

The 1974 famine in Bangladesh was one of the most severe in modern times. The DSS data allow a detailed look at several aspects of this famine, especially its impact on both mortality and out-migration from Matlab. When migration is not considered a possible demographic response to famine, the estimated covariates of mortality, such as education, wealth, and religion, can be quite biased. In Matlab, for example, it was found that children in families who owned more household items had lower mortality than children in families with fewer items. The difference, however, is generally not significant and is much less than when migration is not taken into account, since poorer families were more likely to out-migrate.

Marriage

In Bangladesh there is a much higher proportion of widows than widowers at all ages. One study showed that mortality differentials alone do not explain this difference. Instead, the greater probability that

a woman will outlive her husband is due to the difference in their ages at marriage. The greater probability of a widower remarrying further reduces the number of widowers in the population, so that by age 60 about 6% of males are widowers while over 60% of females are widows.

Twin studies

Twins are often used in studies where their similarities can be used to control factors which are otherwise difficult to measure. One such study using Matlab data made use of the fact that twins have identical gestational ages. Looking at the 204 twin births taking place between 1977 and 1985 where the children were of opposite sexes, no evidence of a sex differential in neonatal mortality was found. Therefore, since male birth weight is known to be greater than female at a given gestational age, comparison of birth weight-specific male and female neonatal survival has been biased in favour of females because of their greater average gestational age.

Collaboration with Bureau of Statistics

Matlab is one of the few places in the developing world where demographic estimates based on new techniques can be compared to known population parameters. In January 1990 the DSS and the Census Division of the Bangladesh Bureau of Statistics (BBS) pre-tested the census form being drafted for the 1991 national census in two villages in Matlab. The importance of accurate mapping of villages and training of enumerators in order to locate all households again emerged as an important consideration. In addition, the tendency of people in this test to understate their age and overstate educational attainment showed the importance of careful field work and the possible need for careful post-enumeration adjustments. Based on the results of this study the forms and field procedures used by BBS may be improved.

Throughout the year the Centre staff assisted in the planning of a national health survey to be conducted by BBS and scheduled to begin in 1991. Discussions also took place on the possibility of pre-testing this survey in Matlab as well, where the DSS population framework and the ICDDR,B hospital facilities could

greatly assist the Government efforts.

Interval between age at menarche and age at first delivery

Principal Investigator: Ann Riley
Funded by: Ford Foundation

This study is examining the effects of a woman's age at menarche, age at marriage, and age at first pregnancy on her adult nutritional status and pregnancy outcomes. The sample consists of 1,618 women who participated in a 1976-1977 study, when they were 10 to 20 years old. These women have been regularly interviewed by the DSS since then: their current residence, date of marriage, and pregnancy information are known, and they could be easily located and interviewed. Preliminary findings provide little evidence to support the hypothesis that biological immaturity plays an important role in the higher risks associated with early child bearing in Matlab. Likewise, early pregnancy does not appear to interfere with the completion of adolescent growth in height or weight. These data do suggest, however, that young age at first pregnancy and short intervals between menarche and first pregnancy are associated with an increased likelihood of foetal loss or stillbirth. Multivariate analysis of these data is currently underway. This study also illustrates the research potential of a system where people in the past can be easily relocated.

Determinants of contraceptive use dynamics in rural Bangladesh

Principal Investigator: Radheshyam Balragi
Funded by: WHO

This study (combining data from DSS and the MCH-FP Project), started at the end of the year, will make more reliable and accurate estimates of contraceptive continuation and failure rates in rural Bangladesh. In addition, the study will result in a better understanding of the role of client characteristics and the attitudes of family members, the role of the service delivery programme, and the interactions between the programme, the individual, and the family in determining contraceptive use dynamics. This has important policy implications, especially in areas where high contraceptive use has not yet resulted in the expected decline in fertility.

Table 3
Population dynamics in the Matlab Treatment Area, in the Matlab Comparison Area and in Teknaf, from 1978-1989. The Matlab Treatment Area is served by the Centre's MCH-FP Programme while the Comparison Area is served by the government health services alone.

Vital rates (per 1000 people)		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ALL DEATHS	Treatment Area	12.5	12.1	11.3	11.9	12.5	12.1	13.4	10.1	9.9	9.4	8.7	8.1
	Comparison Area	13.8	15.6	14.8	14.4	15.9	18.0	17.3	14.2	12.1	11.1	11.1	9.4
	Teknaf	14.7	15.9	12.8	14.2	13.3	14.7	17.1	12.8	13.4	17.0	-	-
NEONATAL DEATHS ^a	Treatment Area	69.0	70.9	59.3	66.4	58.1	56.4	57.9	51.8	49.6	43.5	43.0	47.0
	Comparison Area	78.7	74.6	72.7	69.5	68.1	70.3	71.4	69.5	51.8	55.2	57.2	51.5
	Teknaf	78.8	85.6	75.0	88.2	72.8	88.4	96.0	77.5	81.0	83.8	-	-
POST- NEONATAL DEATHS ^a	Treatment Area	45.5	43.5	32.6	36.1	47.5	41.8	56.9	34.2	37.5	34.9	38.9	28.7
	Comparison Area	47.0	43.3	41.3	45.0	50.2	42.2	55.7	49.0	37.7	39.2	39.8	38.2
	Teknaf	54.3	57.1	46.8	51.2	46.1	65.4	56.4	45.9	46.2	57.3	-	-
CHILD (1-4 YRS) DEATHS	Treatment Area	22.5	17.1	18.6	19.1	18.8	21.9	23.1	16.0	13.1	9.8	7.4	6.4
	Comparison Area	22.1	26.2	25.4	24.8	27.4	35.3	39.2	24.6	20.1	14.9	14.3	11.3
	Teknaf	16.8	16.9	13.7	14.9	10.5	12.3	22.1	11.9	12.5	21.6	-	-
BIRTHS	Treatment Area	32.1	34.9	37.1	35.3	36.9	33.8	30.7	34.4	33.3	33.5	30.9	28.5
	Comparison Area	37.7	47.0	45.5	43.8	44.7	42.4	37.3	42.6	40.0	39.1	40.5	36.5
	Teknaf	45.1	55.6	52.4	51.5	53.2	53.4	54.8	54.4	55.5	57.5	-	-
TOTAL FERTILITY RATE ^b	Treatment Area	4.5	4.9	5.1	4.8	5.0	4.5	4.0	4.5	4.3	4.1	3.7	3.7
	Comparison Area	5.5	6.9	6.7	6.3	6.3	6.1	5.1	6.0	5.5	5.2	5.4	5.2
	Teknaf	6.7	8.1	8.1	7.7	7.9	7.5	7.8	8.1	8.1	8.6	-	-
NATURAL INCREASE	Treatment Area	19.6	22.9	25.8	23.4	24.3	22.3	17.3	24.3	23.4	24.1	22.2	20.4
	Comparison Area	23.9	31.4	30.6	29.4	28.8	25.8	20.0	28.4	27.9	28.0	28.0	27.1
	Teknaf	30.4	39.7	39.6	37.3	39.9	38.7	37.7	41.8	42.1	40.5	-	-

^aPer 1000 births^bPer woman

- = Figures not available

ENVIRONMENTAL STUDIES

Many of the research projects made possible by the surveillance system in Matlab involve diarrhoeal disease studies. However, diagnosis and treatment are not enough if illness and death rates from diarrhoea are to be effectively reduced. Therefore, in 1990, the Centre's Community Health Division began environmental studies to determine the ways in which diarrhoea pathogens are transmitted, and to develop methods for preventing their transmission. The following studies illustrate this effort.

Development of an appropriate hand washing technique for rural Bangladesh

Principal Investigator: Bilqis Amin Hoque
Funded by: WHO

The potential importance of hand washing as a public health intervention is suggested in recent studies. Improved hygiene with hand washing can reduce diarrhoeal disease rates by 14-40%.

The aim of this study is to develop an appropriate hand washing technique for rural women. The first phase of data collection was completed around August of 1989. Ninety rural mothers were asked about their hand washing practices before and after different activities. Their socioeconomic characteristics were noted, as well as their post-defaecation hand washing acts and the conditions and locations of their outside latrines. Swab samples from their washed hands were then taken for faecal coliform counts. Preliminary findings indicated that 100% of the women washed their hands with water, but only 68.7% of them used a cleaning agent. Mud was the single highest (38%) agent used, and it was being collected from a variety of places; soap

was used by 19%. Faecal coliform counts showed that the right and left hands were equally contaminated. The second phase of the study, which consists of experimental trials on different types of hand washing techniques and bacteriological testing of hands, is in progress. ■

The environment and child survival

Principal Investigator: Bilqis Amin Hoque
Funded by: IDRC

This case-control study is being done to determine the association between existing environmental, behavioural, and sociocultural factors and mortality from infectious diseases among children aged 1 to 59 months. Mothers or caretakers of about 700 children who died and the same number of controls (sex and age-matched live children) will be interviewed and observed for specific risk factors. In addition, some quality parameters of the water from the primary and secondary sources, used for domestic purposes by the families of the cases and controls, will be tested. The study is expected to continue through 1992. ■

FAMILY PLANNING AND MATERNAL AND CHILD HEALTH STUDIES

Design, implementation and monitoring of MCH-FP services and record-keeping system in Matlab

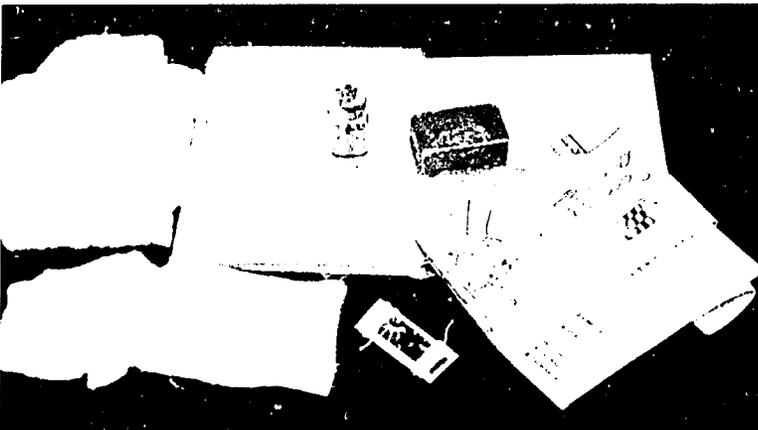
Principal Investigators: Vincent Fauveau, Kate Stewart and Andrés de Francisco
Funded by: NORAD and WUSC/CIDA

The Family Planning and Health Services Project started in 1977 with the objective of reducing fertility and subsequently improving child survival. The Project expanded in 1986 to include broader services and data collection on child health and became known as the Matlab Maternal and Child Health and Family Planning Project (MCH-FP). Health care activities are delivered by 80 Community Health Workers (CHWs), who provide counselling on family planning, a variety of contraceptive methods, immunisation, vitamin A supplementation, and safe delivery kits (see photo below). They treat mothers and children under 5 years of age with infectious diseases and refer malnourished children to the treatment centres for treatment and nutritional education. In addition, the CHWs collect data on morbidity, reproductive and service-related information, and work with the DSS (see page 28) recording births, deaths, migrations, and changes in marital status.

While the MCH-FP project activities are concentrated in the treatment area population of 100,000, demographic data are also collected for a further 100,000 people who receive the normal government services. This infrastructure allows the comparison of vital events in the "treatment" and the "comparison" areas and provides a unique setting for evaluating health and family planning interventions.

As a result of the programme in 1985, the total fertility rate was significantly lower in the MCH-FP area than that in the neighbouring comparison area (4.5 vs 6.0), yet not as low as expected considering the 45% contraceptive use. Infant and child mortality rates were at the same time lower by 28% and 37% respectively. In order to decrease fertility and mortality further, it was decided to emphasise maternal and child health interventions. So in 1986 the WHO's comprehensive EPI was implemented in the four service blocks of the MCH-FP area, and a Nutrition Rehabilitation Unit was set up at the Matlab Central Clinic.

Based on the findings of the cause-of-death analysis comparing the MCH-FP and comparison areas, in 1987 the focus of



The contents of a safe delivery kit: sterilised cotton, gauze, string and blade, soap, disinfecting solution, plastic sheet, and instructions. These kits are distributed to pregnant women to insure a hygienic delivery and thus reduce maternal and infant infection and mortality.

attention shifted towards maternal care and the treatment of acute respiratory infections (ARI) in children under age 5. New services to decrease the incidence of ARI and resulting deaths were initiated in 1988 (see report below). Also during 1988 an emphasis was placed on the quality of care and data collection. Regular every three-months monitoring of the mid-upper arm circumference (MUAC) was introduced as part of a nation-wide nutritional surveillance system. The blockwise results showed a general decline in severe malnutrition throughout the area. This monitoring continues to contribute information as part of the system funded by the Helen Keller International. Training of staff was carried out during 1990, and measurements of nutritional status will be taken four times in 1991.

In 1989 microcomputers were introduced in Matlab to facilitate the data entry and processing and to enable a rapid performance feedback to field workers and their supervisors. Then in 1990 the Project achieved a computerised record-keeping system which provides feedback to the field workers within one month of data collection for improved service delivery and supervision. Thus, mothers and children at risk are targeted more efficiently by the CHWs and considerable reductions in maternal and child mortality are documented.

Programme service statistics indicate that in 1990, 1,994 pregnant women received antenatal care and 623 received post-natal care. There was a sharp increase when the maternity care services were extended to the whole of the treatment area. In 350 cases the mother called the midwife to attend the delivery, and during the year 205 deliveries were attended by either the government's Lady Family Planning Visitors or midwives. To insure a hygienic attendance of the delivery, 3,583 safe delivery kits were produced and distributed to pregnant women.

The Matlab treatment area achieved a 59.3% contraceptive users prevalence (CUP) figure, higher than that in previous years. Of 10,177 users, 49% received injectable contraceptives and 25% oral contraceptives. There were 1,457 new users throughout the year. Surgical sterilisation services are now offered at the Matlab MCH-FP inpatient facility, and 29 tubectomies

were performed in 1990.

At the outpatient department of the sub-centres and at the Matlab clinic 4,757 women were treated for a variety of illnesses, 9,573 attended for family planning consultations, and 8,556 children (27% infants) were treated during the year. The Matlab hospital admitted 1,388 women and children: 161 to the maternity ward, 775 to the ARI ward and the rest to the general medical ward. Admissions to the Nutritional Rehabilitation Unit at Matlab tallied 72 cases, and 183 to the Nutritional Rehabilitation Centres at the sub-centres; 61% were children with a MUAC below 110 mm.

There were 16,304 women, 95% of the eligible mothers, who achieved full immunisation with tetanus toxoid vaccine; a total of 4,294 doses were given. At the end of 1990, 93.1% of the children had been immunised against tuberculosis (BCG), and 77% under 5 years of age had received three doses of DPT and polio. Measles immunisations were given to 92.6%. Over 30,000 capsules of vitamin A were distributed during the year in the appropriate dosage every six months.

Four hundred and eighty-three patients were treated for dysentery at the sub-centres and 244 were admitted to the Matlab hospital. Over 150,000 ORS packets were produced and distributed. Of the 2,271 cases of acute respiratory infections detected in the community during the year, 62% were treated by CHWs at home and 32% were referred to the Matlab Treatment Centre. ■

An approach to the management of acute respiratory infections in children in rural Bangladesh

Principal Investigators: Kate Stewart, Vincent Fauveau and Andrés de Francisco
Funded by: The Netherlands

Analysis of the causes of death of children under the age of five years in Matlab revealed that ARI accounted for a large proportion of those deaths. In 1988 an ARI Project was launched with the goal of decreasing illness and death from pneumonia. In half of the MCH-FP area CHWs provided home treatment to children with mild and moderate disease with procaine penicillin injections and referred the severe cases to the sub-centre clinics or Matlab hospital. CHWs in the remaining half

of the area referred all cases. An impact evaluation of the project after two years of operation showed reduction of the incidence of severe pneumonia in the home treatment area and some reduction of total ARI-related deaths when compared to the comparison area.

In 1989, the National ARI Programme Plan set guidelines to use oral co-trimoxazole (trimethoprim/sulphamethoxazole) for home based treatment of pneumonia. Because of the need to standardise management nationally and in an effort to study the effectiveness of these recommendations, in January 1990 the Matlab ARI project extended its services to include as well the blocks serving as the referral area in the first phase. Data to evaluate these activities will be analysed in early 1991.

In addition to the extension of home-based treatment, a more structured follow-up scheme has been introduced to improve services provided. This scheme is carried out by medical assistants who provide supervision by visiting the children in the field. CHWs record initial and follow-up findings in their Service Record Books and these are then matched with the findings of the medical assistant. Almost 10% of the 1,200 cases in a two-block area were followed by the medical assistants in 1990. ■

Community perceptions and behaviour regarding ARIs in children

Principal Investigators: Kate Stewart and Barbara Parker

Funded by: Dutch Government

A qualitative study was conducted in Matlab to describe the communities' perceptions of the signs and symptoms of ARIs, case management behaviour, and the willingness to seek help. The investigators found that pneumonia was a recognised disease thought to be caused by 'exposure to cold'; that mothers identified laboured breathing, chest retractions, lethargy and inability to feed as signs of severe disease needing treatment outside the home; and that they did not recognise signs of moderate disease. At the same time, similar illnesses were sometimes believed to be due to attacks by evil influences. In these cases, spiritual healers were sought for management and medical treatment was delayed. The mother's

observance of 'purdah' and restricted mobility were reported to play a role in the prevention of death from disease. Local terminology for signs and symptoms of ARI and a series of informative health messages were described as the result of this study, and will be used in health interventions during 1991. ■

An approach to improving maternity care

Principal Investigators: Vincent Fauveau, Shameem Akhter Khan and Andres de Francisco

Funded by: Ford Foundation

The Maternity Care Programme was implemented in 1987 within the MCH-FP structure to decrease maternal mortality. Four professional midwives were posted in half of the treatment area to provide antenatal and postnatal care, to attend deliveries, and to train the traditional birth attendants in the use of hygienic practices. A chain of referral was established including Matlab hospital. Yet in spite of the availability of midwives to provide obstetric care in the field, their services did not provide enough scope to prevent deaths of women during pregnancy and delivery. Thus, to identify factors associated with the use of midwifery services, a case-control study was conducted in 1988 which showed that women who lived closer to the sub-centre where the midwife was posted and those with a history of antenatal care were significantly more likely to call the midwife for delivery. Furthermore, the project midwives reported that most families were not willing to let pregnant women travel to neighbouring bars for antenatal care when they were not perceived to have any problems. A recent analysis revealed that 44% of pregnant women were home-visited at least once during the pregnancy and that 10% were visited within 2 days of birth. In an effort to improve the locating of those most in need of antenatal care, a high-risk screening form to be completed by CHWs for all pregnant women was implemented in May 1989. The usefulness of this tool in identifying women likely to experience complications of pregnancy is currently being evaluated.

In February 1989, the Bangladesh National Maternal Health Care Workshop held in Dhaka stressed the need of using FWVs at the union level. To test the feasibility of these recommendations, maternity care by FWVs

was extended to the other half of the treatment area. In early 1990, one nurse midwife was posted in each of the 4 treatment sub-centres to supplement the training of the FWVs who formerly provided limited maternity care. Training was also provided by MCH-FP medical officers both in Matlab and at the sub-centre clinics. The midwives and FWVs were then instructed to train the CHWs to perform antenatal and postnatal care; they are currently being trained in a phased manner and it is expected that their involvement will result in increased coverage. Other indicators to be evaluated in 1991 are changes in the call to midwives to attend deliveries, the timeliness of referral for complications, and maternal mortality. ■

Pilot study on the prevalence of anaemia in mothers in Matlab

Principal Investigators: Churamonie Jagdeo and Kate Stewart
 Funded by: NORAD and WUSC/CIDA

The aim of this clinically-based study was to evaluate haemoglobin levels in a group of mothers who attended the health facilities,

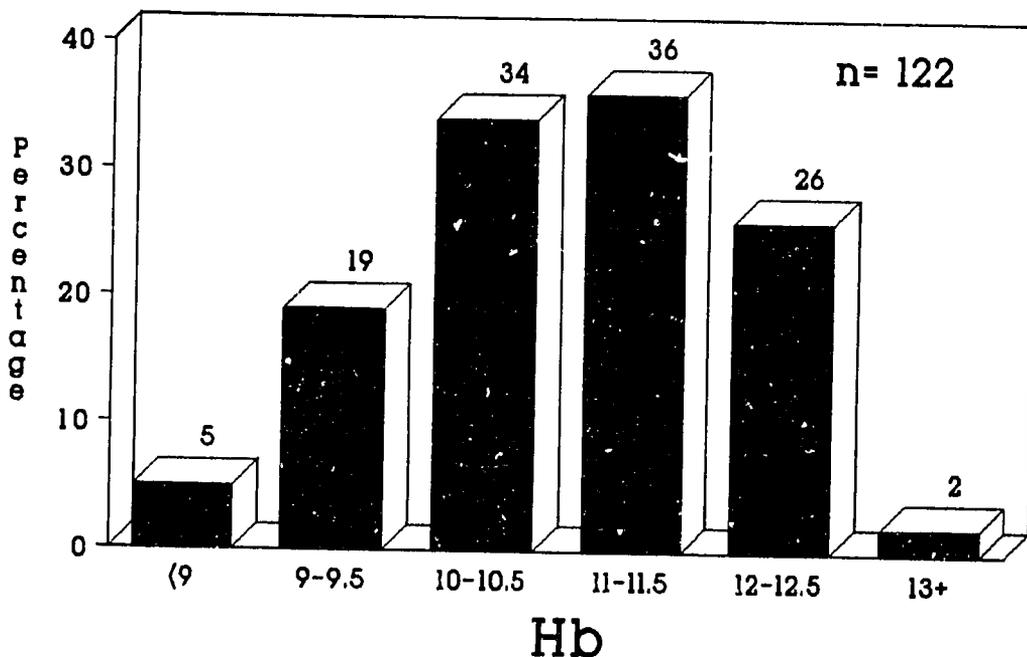
either on their own or due to the child's illness. A paramedic assessed them clinically for anaemia at the same time as their blood samples were taken. Of the 129 samples evaluated, 48% had haemoglobin level below 11 grams. The analysis also revealed that a diagnosis of anaemia based upon observations of the mucosa of the eye lids and the mouth had a high sensitivity (89%) but a low specificity (43%). The predictive value was 29%. A higher specificity was achieved by diagnosing the degree of anaemia (non, mild, moderate or severe) (87%). Values for non-pregnant women are represented in Fig. 1. ■

Measles surveillance system

Principal Investigators: Vincent Fauveau, Mike Strong, Mike Koenig and Andrés de Francisco
 Funded by: UNICEF

A surveillance system detecting cases of measles in the 'comparison area' of Matlab, where governmental immunisation services are provided to the community, is currently underway. During 1990, 2,232 cases of measles were diagnosed by the community health workers in children under 5 years of age; 49%

Fig. 1 - Hb levels - non-pregnant women
 OPD - Matlab sub-centres



were males. Of these, 307 (14%) were confirmed by a doctor or a medical assistant. Twenty percent of the confirmed cases occurred to children under 9 months of age. A report on the data will be produced in 1991. ■

Reproductive tract infections and client satisfaction

Principal Investigators: Kate Stewart and J. Chakraborty
Funded by: NORAD and WUSC/CIDA

A base-line follow-up survey of 120 women treated for reproductive tract infections has been conducted to evaluate the effectiveness of the current system of diagnosis and treatment. Preliminary findings indicated that 87% of the women treated during the survey period reported finishing the treatment regime as recommended, while only 71% reported improvement or cure of their symptoms. Further analysis will shed light on how the women's satisfaction with treatment might vary according to their physical traits and the type of infection, and by the reported level of their husband's compliance with treatment. ■

Study of injectable contraceptive users

Principal Investigators: Maxine Whittaker, Ann Riley and Kate Stewart
Funded by: USAID

In this study, 200 women who were using or had used injectable contraceptives in the past were interviewed to learn their perspectives on their experience with the method. Special attention was given to menstrual disturbances. The field work and data entry of this study ended in 1990, and the analysis is expected to yield results in early 1991. ■

Quality of care activities in Matlab

Principal Investigators: Churamoni Jagdeo and Kate Stewart
Funded by: NORAD and WUSC/CIDA

In order to increase the use of health services offered by the Project, base-line studies on quality of care were carried out. A workshop in which specific cases of health workers' performances and counselling were presented was held in August 1990. There was a high degree of participation by health workers in devising methods to improve the quality of services. Concrete recommendations derived from the workshop included the participation of

the members of the community in delivery of health care and an increase in the counselling of side-effects of contraceptive methods. These recommendations are currently being implemented, and their effectiveness will be evaluated in 1991. ■

The MCH-FP Extension Project

Principal Investigator: Michael A. Koenig
Funded by: USAID

The MCH-FP Extension Project was established in 1982 to carry out health and family planning research on the Matlab service programme, and to test the ways in which the successful components of Matlab can be transferred to the Government service programme. In addition to working in Matlab, the Extension Project has field sites in two other upazilas in rural Bangladesh: Sirajgonj in Sirajgonj District and Abhoynagar in Jessore District. Service delivery in these areas remains the responsibility of the government, with the role of Project staff limited to research and counterpart support. During 1990, the Extension Project maintained an active role in carrying out its objectives, with special emphasis on providing direct technical assistance and dissemination at the national level.

Matlab: One important study done by the Project in Matlab was a YAP survey of 7,946 women in the treatment and comparison areas on health and family planning behaviour. The key findings from the survey showed major differences between the two areas in indicators, such as the levels of immunisation coverage and use of contraception for both spacing and limiting births. The treatment and comparison areas were very similar in terms of women's educational levels, ideal family size preferences, and attitudes toward family planning. As Table 4 shows, where the two areas differed markedly was in the intensity, coverage, and perceived quality of services offered by the ICDDR,B programme compared to the government services in the comparison area, and it is these factors which account for its success in the areas of family planning and child survival.

Current research by the Project in Matlab is focusing upon:

** levels and trends over time in contraceptive use-effectiveness

- ** trends over time in the length of post-partum amenorrhoea
- ** further evaluation of the tetanus and measles vaccination programmes
- ** analysis of the impact of the family planning programme upon fertility decline.

Database System: During 1990, the Extension Project introduced an innovative micro-computer-based system in Matlab to process and utilise service-related information. This system, which was introduced in collaboration with the Community Health Division, provides rapid feedback (within two weeks of the end of each monthly cycle of data collection) for

17,300 reproductive-aged women and 14,200 children under 5 years of age on such information as contraceptive use, reproductive and breast-feeding status, maternal and child immunisation, children's nutritional status, and acute respiratory infection and diarrhoeal disease rates. In addition to forming the basis for much current research in the Matlab treatment area, applications of this system are being developed to improve the coverage, quality, and overall effectiveness of service in the field.

Table 4

Findings from a 1990 Survey Conducted in the MCH-FP Extension Areas

	% Treatment area	% Comparison area
Health/Family Planning		
Contraceptive prevalence	57.1	27.2
Immunisation Coverage		
2 TT	73.9	59.0
DPT 3	71.1	30.2
Measles	71.5	26.1
Respondent Characteristics		
% literate	31.8	28.7
Mean ideal family size	3.1	3.2
Approval of family planning	97.3	90.6
Programmatic		
Reported visits by female field workers during last 3 months:		
None	1.6	59.8
4+	85.5	1.5
%		
reporting never having received a visit	1.1	40.0
Last visit was for ≥ 10 minutes	49.9	14.7
%		
reporting field worker was:		
Helpful in solving problems	79.8	30.3
Sympathetic to clients' needs	62.0	16.9
Emphasised more than one FP method	74.9	34.6



A family welfare visitor going to the field with a record-keeping book developed by the MCH-FP Extension Project.

Extension Areas: During its existence, the Extension Project has conducted pilot testing and operations research to improve health and family planning service delivery within the Government programme areas. To date, a number of important Project recommendations have been incorporated into national policy. During 1990, the Extension Project continued an active programme of operations research to identify barriers to effective delivery of services, the field testing of strategies to overcome

these barriers, close collaboration with the Government of Bangladesh and donors to translate promising findings into national policy. Current areas of Project policy recommendations include:

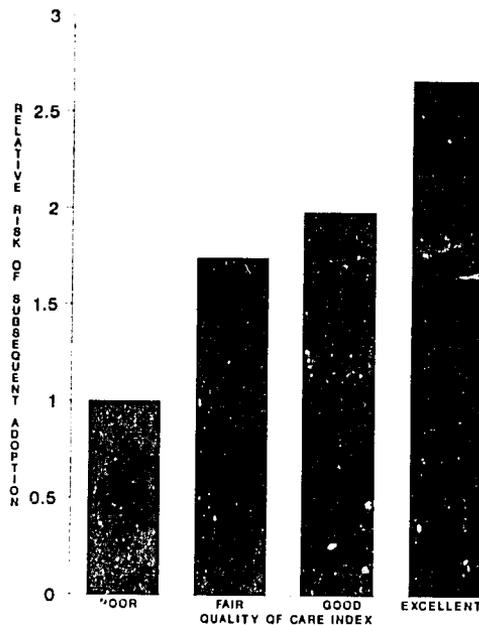
- ** the need to accord higher priority to measles vaccination within the EPI programme
- ** recruitment of female health outreach workers
- ** the phased expansion of the injectable contraceptive outreach programme
- ** the need to improve the range and accessibility of paramedical services offered in the field
- ** strategies to improve coordination between NGO and Government service programmes.

Current operations research priorities include interventions to strengthen programme management and field supervision, and approaches to improve the quality of services provided by field workers and paramedical staff. The importance of the quality of services provided by outreach workers for family planning acceptance is illustrated clearly by current Project research (Fig. 2). This figure shows that among a cohort of 5,224 women non-users of contraception in the Extension areas, those who perceive that the female field worker who visits them provides high quality care, are more than 2.7 times as likely to adopt contraception over the next two years compared to women who perceive such care to be of poor quality.

Some of the other studies underway are evaluating:

- ** the effects of MCH and family planning service provision upon field worker credibility
- ** the effect of quality of care upon contraceptive use-effectiveness
- ** the evaluation of the domiciliary injectable contraceptive programme
- ** the relationship between family planning and child survival and nutritional status.

Fig. 2 - Relative risk of subsequent adoption of modern contraception among baseline non-contracepting women by quality of field worker care: MCH-FP extension areas, April 1989-March 1991



Note: Rates are adjusted for the effects of frequency of field worker visit, time spent during visit, fertility frequencies, household area, maternal age, maternal education, religion and prior use of contraception.

Two approaches are being implemented in the project field sites to improve the capability of the workers and their supervisors to continuously monitor and improve the quality of services. These approaches include: (1) development of supervisory and screening checklists for clinical and domiciliary services, and (2) development of training packages on antenatal care, side-effect management, breast feeding, and the use of supervisory checklists. Both these approaches are expected to improve quality of care in the project upazilas and also produce replicable supervisory tools for the national programme.

The family planning field worker's record-keeping book, designed on the basis of experiences in Matlab and the Extension areas, has been implemented within the government family planning programme. The current operations research on the management

information system focuses on the development of a record-keeping system for higher level paramedics, Family Welfare Visitors, and for male health workers. An activity register for the family planning supervisors is also being field tested to improve accountability and quality of supervision.

The project has so far concentrated its interventions at the field level. It has only recently started developing interventions to improve management capabilities of upazila and district-level programme managers. An experiment to test a performance improvement strategy based on the Management by Objectives (MBO) approach has been recently initiated in one of the field sites. A non-project upazila is also included in this action research to test the feasibility of this approach in a normal government context with minimal inputs from the ICDDR,B.

Sample Registration System: The Sample Registration System (SRS) is a cost-effective, rapid feedback system for the collection of data, which provides the basis for evaluating projects in the field sites. A representative sample of 8,600 households are visited on a quarterly basis to collect data on vital events within the household and health and family planning service operations; this information is available within two weeks of the end of each three-month round. Annual demographic rates for the three surveillance areas through 1990 are shown in Table 5. Currently, the Extension Project is working closely with the Centre's Urban Volunteer Program to adapt the SRS to carry out demographic and health surveillance for an urban slum population; other applications of the SRS are underway in Indonesia and Tanzania.

Technical Assistance: The Extension Project

continued during 1990 to assist the Government of Bangladesh in implementing several of its most important policy recommendations. One is the recruitment and training of additional female field workers. By June 1990, 9,255 field workers were recruited; another 2,300 field workers will be recruited by June 1991. This will bring the total number of female field workers in Bangladesh to 23,500 and reduce the worker:population ratio from about 1:7000 to 1:4000. Currently, discussions are underway with the Government to provide assistance in two other areas: with the national training programme of field workers on the health and family planning record-keeping and reporting system developed by the Project, and on the phased expansion of the household delivery of injectable contraceptives by field workers with support from the Project staff.

Three Project briefing papers were completed during 1990 and distributed to over 1,200 individuals within Bangladesh and internationally. They dealt with the topics of improving coordination between NGOs and the Government in the delivery of family planning services, a cost-effectiveness of approaches to providing transport for satellite clinic paramedical services, and on the impact of measles vaccination upon childhood mortality. During the year, the Extension Project worked closely with review missions from the World Bank, UNFPA, USAID, and the Bangladesh UNICEF office. The areas of assistance included: formulation of country sector programmes within the 4th Five-Year Plan; design of a new concept of the Management Development Unit; and analysis to support high priority to measles in EPI. Field trips to Project sites represented another dissemination approach.

Table 5

Fertility and Mortality Rates from the MCH-FP Extension Project Sample Registration System															
Vital rates (per 1000)	Sirajgonj ¹					Abhhoynagar ¹					Jessore Comparison Area				
	1986	1987	1988	1989 ²	1990 ²	1986	1987	1988	1989 ²	1990 ²	1986	1987	1988	1989	1990
Fertility															
Crude birth rate	40.1	40.6	41.4	32.6	30.5	26.7	29.5	28.6	23.0	23.1	36.5	30.9	31.9	27.6	28.1
General fertility rate(a)	173.7	176.1	181.1	143.1	133.2	110.0	121.6	117.8	93.0	92.2	158.4	133.3	137.8	117.9	118.9
Total fertility rate(b)	5.4	5.3	5.4	4.8	4.0	3.1	3.4	3.2	2.6	2.7	4.8	3.9	4.2	3.5	3.5
Mortality															
Crude death rate	13.9	13.4	14.6	12.9	9.8	10.2	7.8	7.8	8.1	7.5	7.7	6.2	7.5	7.7	7.9
Infant mortality rate(c)	147.7	149.5	165.5	150.3	135.6	136.3	104.0	102.4	112.8	85.4	92.3	91.7	79.2	72.0	98.8
Neonatal death rate(c)	94.3	92.0	100.2	80.5	88.5	88.2	58.4	59.6	64.0	64.1	62.9	56.8	45.8	48.0	68.2
Post-neonatal death rate(c)	53.4	57.5	65.3	69.8	47.1	48.1	45.6	42.8	48.8	21.3	29.5	34.9	33.3	24.0	30.6
Age-specific death rates:															
1-4 years	22.9	18.1	21.4	16.0	13.6	9.1	4.6	8.0	4.4	3.8	6.4	6.7	3.0	5.3	1.2*
5-14 years	2.0	2.6	1.5	2.3	2.2	1.5	0.6	1.4	0.5	0.6	0.5	0.5	2.4	1.2	0.7
15-44 years	2.7	2.0	2.5	2.0	1.9	2.0	2.5	2.6	3.2	3.3	2.2	1.5	2.4	2.1	2.8
45+ years	23.5	24.5	25.5	32.2	17.7	30.6	20.3	17.2	22.9	23.0	17.9	12.9	20.3	26.2	23.5

(1) Includes both treatment and comparison areas.

(2) Four unions in Sirajgonj and two in Abhhoynagar were dropped from the Project in 1989.

(a) Per 1000 women of child-bearing age

(b) Per woman

(c) Per 1000 live births.

* This rate seems to be very low and is under investigation.

Clinical Research Centre
Child Health Programme
Staff Clinic
Matlab Treatment Centre



Faloud

In June 1990, the new Matlab Health and Research Centre was formally inaugurated by the United Nations Development Programme Resident Representative, Charles H. Larsimont.

HEALTH CARE

Free health care is provided by ICDDR,B at two hospitals; one is in Dhaka, the other in the rural area of Matlab. Treatment is offered for all diarrhoeal and diarrhoea-related diseases and conditions, such as respiratory infections and malnutrition. Family planning services, immunisation and health education are also extended to those who visit the hospitals.

Clinical Research Centre (CRC), Dhaka

Principal Investigator: A.N. Alam

Funded by: Core Funds

During 1990, a total of 59,950 patients attended the CRC, a figure very close to the previous year's total of 60,083. The number of patients admitted to the inpatient facilities has decreased by 578, from 6,135 in 1989 to 5,557 in 1990, representing a 9.4% decrease. Admissions, as percentage of total patient attendance, have, however, decreased from 10.2% in 1989 to 9.3% in 1990. A total of 5,097 patients were admitted to the General Ward and Intensive Care Unit, a decrease of 668 (11.6%) patients. The number of patients participating in different research protocols, however, has increased by about 25%, from 370 in 1989 to 460 in 1990. Of the 5,557 patients admitted, 1,910 (34.4%) required care in the Intensive Care Unit. Three hundred forty of these died, and another 32 were dead on arrival to the CRC bringing the total to 372, 0.62% of the total 59,950 patients attending. This is a decrease in deaths by 9% from 0.68% in 1989.

Of the 5,557 admitted cases, 763 (13.7%) had *Shigella* isolated from their stool or rectal swab cultures, 323 fewer than in 1989. Of these 763 cases, 55 died, thus the mortality in *Shigella* cases was 7.2%, a decrease by 17% from the figure of 8.7% in 1989. The proportion of isolation of different *Shigella* spp. has also changed. *S. dysenteriae* 1 comprised 34.5% of all *Shigella* spp., as compared to 31% in 1989; *S. flexneri* comprised 51% as compared to 53%; and other *Shigella* spp. combined together were 14.5% compared to 16%. The number of isolates resistant to ampicillin, sulphamethoxazole + trimethoprim, and nalidixic acid remained about the same as the previous year (see Table 6). The highest number of *Shigella* cases was seen during the month of May. A species of non-typhoidal *Salmonella* was isolated from 118, 2.1% of total admissions. *Salmonella*-associated deaths (12) represent only 3.5% of all deaths. The highest number of deaths (274) occurred among the 4,516 patients who were either not sampled for faecal cultures, or had no bacterial enteric pathogens (ETEC is not routinely looked for). This group represents 81.2% of all admissions and 80.6% of all deaths.

Table 6

Resistance pattern of *Shigella* spp. to ampicillin (AMP), sulphamethoxazole + trimethoprim (SXT), and nalidixic acid (NA).

<i>Shigella</i> spp.	1987			1988			1989			1990		
	AMP	SXT	NA									
<i>S. dysenteriae</i> type 1	91	94	09	95	94	35	99	96	69	99	95	80
<i>S. flexneri</i>	91	94	08	64	38	02	64	47	03	62	48	04
All <i>Shigellae</i>	53	37	02	61	46	08	65	57	21	61	58	25

Note: Figures represent % of isolates resistant to different drugs.

A total of 24,303 litres of i.v. fluids were used, 8.6% less than in 1989. Use of i.v. fluids was 0.41 litre per patient which was 6.8% less per patient than in 1989. A total of 313,975 litres of ORS were used which is 6.7% less than in 1989. However, the average volume used per patient was 5.24 litres, compared to 5.6 litres per patient in 1989.

During 1990, 12 active research protocols were carried out at the Research Units of the CRC. These are summarised elsewhere in this report.

Child Health Programme

Principal Investigator: Shakuntala Thilsted and Aminul Islam

Funded by: DANIDA

The Child Health Programme (CHP) completed its first three-year phase in 1990 and continues its efforts to strengthen and expand the preventive services at the Centre together with the clinical management of diarrhoea. Its main services are providing health education to all patients and attendants, offering immunisation, nutrition rehabilitation, and birth-spacing services, providing treatment for tuberculosis, and training personnel in preventive health care. During 1990, the CHP organised its activities, staff structure and delivery system based on its experiences and on the results obtained through evaluation and surveys.

Health education is given either in groups or individually. The group is comprised of six participants discussing a particular topic for 15-20 minutes. The topics covered are preventing and treating diarrhoea, immunisation, and nutrition. These subjects are emphasised further through bed to bed individual instruction. In addition the attendees are guided to practise personal hygiene, stimulated to breast-feed and practise family planning, and instructed in the use of ORS. Education is intensified by practical demonstrations and audio-visual support. During the year, 17,904 group sessions were conducted, and 39,845 persons watched videos.

Community immunisations are planned and implemented in collaboration with and according to the guidelines of the government EPI in Bangladesh. With the continued effort to immunise children under 2 years of age at discharge from the hospital and their female

attendants of child-bearing age, the CHP kept its vaccinations available throughout the week from 7:00 a.m. to 7:00 p.m. In 1990, 61% of the 24,027 children under 2 years of age who were brought to the CRC were already immunised, an improvement from the previous year. A large percentage (83%) of those who had not been vaccinated then received immunisations. In addition, 1,074 other children were vaccinated and 52% of the female attendants, those of child-bearing age, received tetanus toxoid vaccine. Only 38% of the children and 18% of the women returned for follow-up doses.

Nutritional rehabilitation services are offered by CHP to inpatients, outpatients, and children in their homes. In 1990, 267 patients were treated for severe malnutrition as inpatients; their caretakers were given intensive training on low cost home-based diets and practical demonstrations, and 747 were followed in the outpatient unit. Social counselling and income-generating activities were also provided. Child stimulation and kitchen gardening were demonstrated.

Tuberculosis services are given to patients with underlying disease, free of charge, either as outpatients or in-home visits; full course treatment is offered. During the year 75 patients were treated, of which 49 completed the course and 21 were continuing.

Birth spacing and family planning services, both motivating and counselling, were continued for mothers staying with their children in the hospital. In 1990, 307 new clients received some method of birth control, the injectable contraceptive being the most popular. Distribution of a safe-delivery kit to the pregnant mothers at or after 8 months of pregnancy was started during the year. Fifty-nine mothers received this kit which contains sterilised cotton, gauze, string and blade, soap, disinfectants, and plastic sheeting (see picture, page 33). ■

Staff Clinic, Dhaka

Physician Manager: Meena Choudhury

The staff clinic in Dhaka continued its efforts to provide improved health care facilities to the staff members and their entitled dependents during 1990. Although the physician: patient ratio was unbalanced (1:60), the operation of

the clinic was managed quite professionally. Altogether 22,441 patients were seen in the year for medical, surgical, and gynaecological illness. Obstetric services were also extended and presented the community with 26 new babies. The family planning activities included advice and contraceptives; only one surgical sterilisation was performed. Preventive health measures included vaccination against diphtheria, whooping cough, tetanus, poliomyelitis, measles, and others.

Matlab Diarrhoea Treatment Centre

Principal Investigator: Md. Yunus

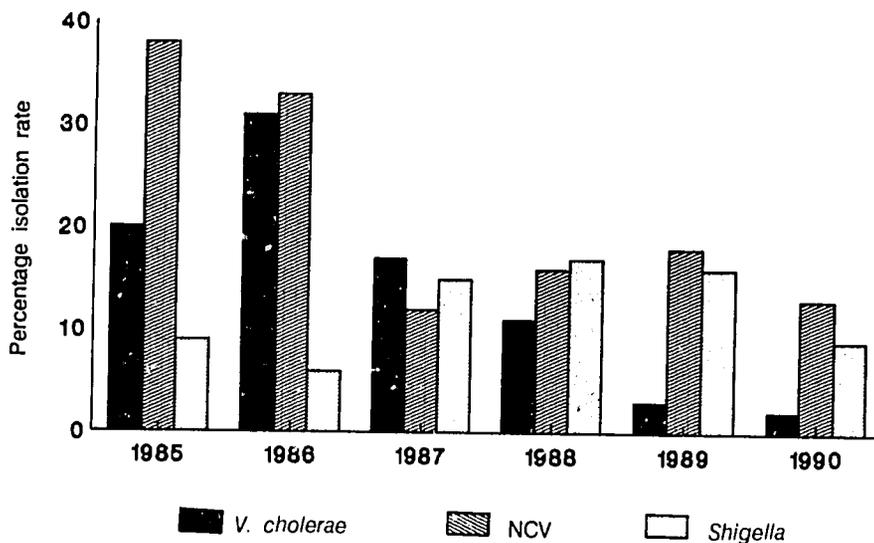
Funded by: WUSC/CIDA

The Matlab Diarrhoea Treatment Centre (MDTC), a field station in a rural area about 60 km southeast of Dhaka, and the three Community-operated Treatment Centres (COTCs) (previously called Community Diarrhoea Treatment Centres) located at Shataki,

Kalirbazar, and Nayergaon provide treatment services to diarrhoeal patients of Matlab and neighbouring upazilas. During 1990, 5,639 patients received free treatment at the Matlab Treatment Centre; 43% came from within the DSS (see page 28) area and 57% from outside. The case fatality rate was 0.9%. Another 1,570 patients with diarrhoea were treated at the three COTCs run by volunteers trained and supported by the ICDDR,B Matlab Health and Research Centre. There were no deaths at these centres.

Stool specimens from 2,425 patients who lived within the DSS area were cultured and yielded two main pathogens: *Shigella* (9%) and non-cholera vibrios (13%). *V. cholerae* O1 were isolated from only 2% of the patients, a sharp decline during 1989-1990 compared with previous years. Fig. 3 illustrates this and the isolation rate of non-cholera vibrios, which has dropped by almost two-thirds since 1985

Fig. 3 - The percentage of stool samples from which the three main causes of diarrhoea were isolated over the last 6 years in Matlab

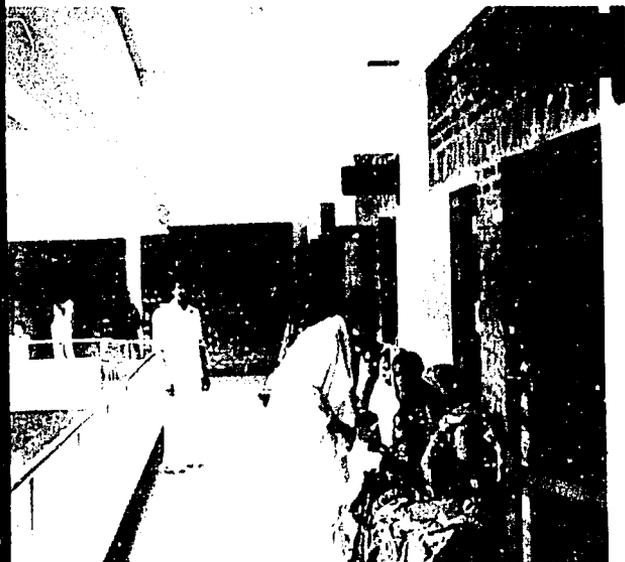
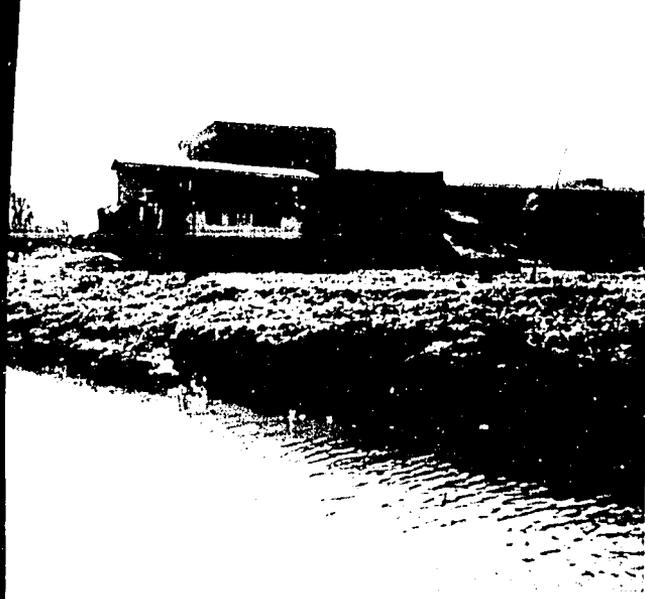


PHOTOGRAPHS OPPOSITE:

Top: views of Matlab Centre from across the bridge and from the lake at the end of the scenic trip to Matlab from Dhaka which requires approximately one hour by land and another hour by motor boat.

Middle: a doctor examines an infant in an examining room, and a group of medical staff members make rounds in the children's ward.

Lower: The Matlab Laboratory and a view of the lower, open-air corridor which surrounds the interior garden and is surrounded by the various clinics and wards.

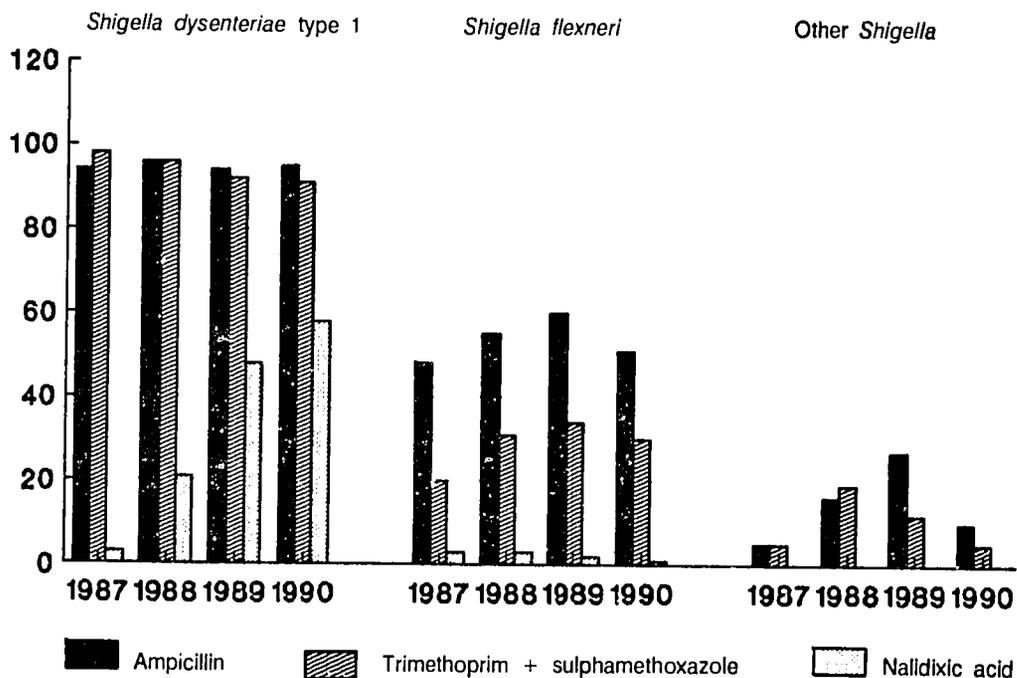


and has appeared to be stable for the last four years. The most common species of *Shigella* isolated during 1990 was *S. flexneri* (62%), followed by *S. dysenteriae* type 1 (19%). Fig. 4 presents the resistance pattern of *Shigella* isolates to common antibiotics over the last four years. As in previous years, most of the isolates of *S. dysenteriae* type 1 tested during 1990 were resistant to ampicillin and co-trimoxazole and nearly 60% of the isolates were resistant to nalidixic acid. *S. flexneri* and other species of *Shigella* were still sensitive to nalidixic acid. *G. intestinalis* and *E. histolytica* were detected in only 5% and 1% respectively of the 2,761 faecal samples

examined microscopically.

The Matlab Health and Research Centre was moved in February 1990 from the Government Upazila Health Complex to the newly constructed two-storied Health Complex building of its own. The financial assistance from the United Nations Capital Development Fund (UNCDF) and support from the Government of the People's Republic of Bangladesh enabled the construction of this complex which has facilities for medical care, training, and research. The new premises were formally inaugurated in June 1990 by the UNCDF Resident Representative. ■

Fig. 4 - The percentage of drug resistant isolates of *Shigella* species over the last four years in Matlab



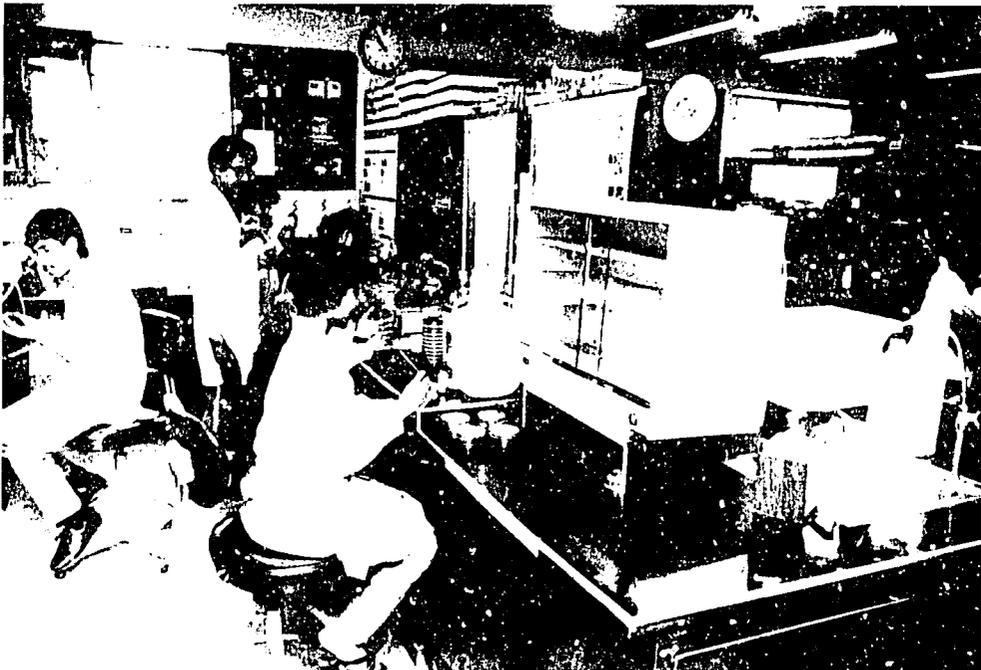
LABORATORIES

Biochemistry and Nutrition
Environmental microbiology
Virology
Biomedical Engineering
Laboratory archives
Animal Resources
Clinical Laboratory
Histopathology
Logistic Support

LIBRARY AND INFORMATION DISSEMINATION

OTHER SERVICES

Medical Illustrations
Computer Information
Data Archiving
Community Studies



Asam Akbari

Dr. S.M. Faruque with technicians in one of the Centre's laboratories.

LABORATORIES

The Centre's laboratories are all the responsibility of the Laboratory Sciences Division and are the focal point of all laboratory-based research activities at the ICDDR,B. They:

- ** conduct research in microbiology, immunology and pathogenesis of diarrhoeal diseases (these studies are related elsewhere in this report)
- ** provide laboratory-based research and logistic support and services to other scientific divisions
- ** provide diagnostic laboratory services to patients of Dhaka Clinical Research Centre and Matlab Diarrhoea Treatment Centre
- ** participate in training programmes for post-graduate students in research methodology and laboratory diagnostic procedures (see Training and Staff Development).

RESEARCH SUPPORT

Research support and services are offered to all investigators of the Centre by the following units: Biochemistry and Nutrition, Environmental Microbiology, Virology, Biomedical Engineering, Laboratory archives, and Animal resources.

BIOCHEMISTRY AND NUTRITION

Head: M.A. Wahed

The Biochemistry and Nutrition Laboratory performs specialised assays for biochemical and nutritional studies: 3,587 assays were performed in 1990. Assays were done to support 18 research protocols and some collaborative research programmes with both national and international institutions. The Unit was also responsible for maintaining and organising codes for various double-blind studies. A new innovation was the local preparation of study syrups (zinc, vitamins and iron) which were previously prepared by pharmaceutical companies, and a new accomplishment was the installation of a pH meter and deionizer plant. In addition, they developed the new method of establishing immunoglobulins (IgA, IgG, IgM) and iron with Cobas-Bio, which makes the tests much less expensive and time-consuming. ■

ENVIRONMENTAL MICROBIOLOGY

Head: Md. Sirajul Islam

The Environmental Microbiology laboratory performs its support by providing interdepartmental services for testing environmental samples supplied by the Clinical Sciences and Community Health Divisions. Samples, e.g., water and food, from various national and international institutions of Bangladesh, are also tested in this laboratory. ■

VIROLOGY

Head: Leanne Unicomb

The Virology laboratory provides diagnostic services for the identification of viral causes of diarrhoea, particularly rotavirus, in research studies. In 1990, group A rotavirus and enteric adenovirus were the organisms of major interest. ■

BIOMEDICAL ENGINEERING

Head: Matloob Sobhani

The Biomedical Engineering Cell provides mechanical and electrical repair for specialised equipment and installs new scientific instruments. In 1990 the staff installed one 300 mA diagnostic X-ray machine at Matlab Health and Research Centre. This was donated by DSM (the Netherlands). One autopourer

machine in the media room, a glass still and a CO₂ incubator in the Microbiology Department, a Humalyzer spectrometer in the Clinical laboratory, a deionizer in the Biochemistry Research laboratory, and two DINAMAP paediatric monitors in the hospital were also installed. It is expected that new wireless sets will arrive by the end of March 1991 and communications with Matlab may be restored by April 1991. ■

LABORATORY ARCHIVES

Head: M.A. Malek

The Laboratory Information and Archive Unit provides support by performing data entry/verification, coding, editing, data cleaning, and data processing for scientists within the Laboratory Sciences Division. They also produce blood culture reports, *Shigella* sensitivity reports, and monthly financial recovery reports for the treatment centres, and laboratories. Specifically, they produce analytical and cross reports from vaccine trial data, and maintain supervision of cold-chain activities. In addition, the staff also store data for future use and produce query reports and data analyses. In 1990 they entered nearly 70,000 records into the computer database for both the Dhaka and Matlab laboratories. ■

ANIMAL RESOURCES

Head: K.A. Al-Mahmud

The Animal Resources Branch (ARB) provides technical support for the scientists doing research requiring animals, in addition to the supply of research animals that are needed by both the investigators of the Centre and other institutions, such as the Institute of Public Health, Dhaka and the Bangladesh Agricultural University. During the year, the ARB provided research support to the scientists of the Centre for about a dozen approved protocols and exploratory studies. These included ileal loop assays, orogastric feedings, RITARD model tests, antisera production, Sereny tests, and *Cryptosporidium* studies. The ARB also produced 630 rabbits, 399 guinea pigs, 686 rats, 7,971 mice, and maintained 15 sheep and 4 chickens for supplying blood for various laboratory tests and for making culture media.

DIAGNOSTIC SUPPORT

Diagnostic services in support of routine patient care are given by the Clinical and

Histopathology Laboratories, and the Logistic Support Branch.

CLINICAL LABORATORY

Head: Md. Anowar Hossain (Acting)

The Clinical Laboratory provides diagnostic support by performing tests on specimens of patients who seek medical care at the Centre's hospital and treatment centres. Its technicians also extend their services to other institutions in Bangladesh and abroad. Tufts University (USA), the Bangladesh Rural Advancement Committee, the Institute of Public Health, and the Dhaka Shishu Hospital were among those who were served during the year. Training in diagnostic procedures is an important part of their work (see Training). Also in 1990, to increase the specimen inflow and to recover the costs, the management decided to extend the services of the Laboratory to the general public. Following the changes, the specimen flow increased substantially, and all operational costs were recovered. One major accomplishment of the year was the purchase of an automatic filter photometer with thermostatic arrangement, needed to meet the increased demand in the Clinical Biochemistry section of the Laboratory.

Over 62,000 specimens were tested by the Pathology, Biochemistry, and Microbiology sections of the Clinical Laboratory during the year; 161,800 tests were performed on these specimens. The majority of samples were blood, stool, and rectal swabs. Species of *Shigella* were isolated from 19.1%, and species of *Aeromonas* from 14.6% of the stool specimens tested. Of the 1,213 samples, 195 (16.1%) were positive for *Campylobacter* spp., and *G. intestinalis* and *E. histolytica* were found in 5.0% and 2.9% respectively of the 15,462 specimens tested. Rotavirus was another agent detected with 532 positive results. Finally, 416 were positive for *V. cholerae*, 313 for *Salmonella*, 65 for other vibrios, and 189 for *Plesiomonas*, and 45 *Cryptosporidium* oocysts were seen in 822 samples. Of the 2,693 blood cultures processed, 369 suspected pathogens were isolated. ■

HISTOPATHOLOGY

Head: Moyeenul Islam

The Histopathology Laboratory provides services in support of patient care at the Clinical

Research Centre. These include biopsy and cytological examinations, bone marrow aspirates, and blood smear interpretations. In 1990 the Laboratory also did biopsies and cytological examinations for patients attending the staff clinic, Travellers' Clinic, Mirzapur Kumudini Hospital and for a small number of private cases, as well as tests to support research protocols. Totals of 728 blocks and smears on 317 patients were examined. During the year, 29 autopsies were carried out on fatal cases of diarrhoeal illness under the post-mortem protocol. Findings of these cases were regularly presented at monthly clinico-pathological conferences. In addition, the Laboratory also provided services in support of animal experiments carried out by several investigators. A total of 576 blocks on 373 cases were examined. Peroxidase anti-peroxidase immunohistochemical staining technique was established during 1990. ■

LOGISTIC SUPPORT

Head: Q.S. Ahmad

The Logistic Support Branch provides services

to the hospital and treatment centres and to Matlab by producing the various materials necessary for diagnosis and treatment. They are also involved in some hospital-based research protocols, though fewer of these were supported in 1990 than in the previous year. As routine activity last year, the Media and Washup and I.V. Fluid Section in Matlab supplied over 3,000 litres of culture media and about 22,000 litres of i.v. fluids. The freeze drying and antisera production units in Dhaka lyophilised over 2,000 ampoules or bottles of bacterial strains and research material, and produced about 150 ml of *V. cholerae* and *S. flexneri* antiserum. The pathology and bio-chemistry laboratories in Matlab also function as part of this branch. During the year they performed nearly 15,000 tests on rectal swabs, stools, blood, urine, throat swabs, and water samples. The Branch also supplied media, i.v. fluids, and reagents to many national and international institutions including the Dhaka University, Institute of Public Health, Dhaka, and the Institute of Post-graduate Medicine & Research, Dhaka. ■

LIBRARY AND INFORMATION DISSEMINATION

The Diarrhoeal Diseases Information Services Centre

Head: M.S.I. Khan

The Diarrhoeal Diseases Information Services Centre (DISC) continued to receive substantial support from the Swiss Development Cooperation (SDC) and the International Development Research Centre (IDRC) during 1990. These institutions have been extending financial support to DISC since 1982 and 1988 respectively. IDRC's funding commitment, however, is due to expire in April 1991. Assistance from both institutions has been instrumental in reshaping the library services, disseminating the Centre's research findings, and improving the information support system for the Centre's scientists and researchers of national academic and scientific organisations. The upgraded information delivery and retrieval system within DISC, with databases (MEDLINE and POPLINE) on CD-ROMs, has enabled

researchers, physicians, practitioners, teachers, and students to gain ready access to a much wider spectrum of scientific information. Retrieval has been rendered speedier, while searches can be carried out in many different ways.

During 1990, DISC has substantially improved its library infrastructure and has been able to participate more actively in international information networks. Efforts are now underway to further improve the service delivery and dissemination channels with a view to making it a specialised information centre for diarrhoeal disease-related topics.

A new functional set-up was begun within DISC having three separate units -- library services, publication services, and support services -- and persons were trained abroad and engaged to staff these units. The desktop publishing unit has continued to produce the



Mr. M.S.I. Khan, Head of the Diarrhoeal Diseases Information Services Centre demonstrates MEDLINE database on CD-ROM to a researcher.

Journal of Diarrhoeal Diseases Research, Glimpse, annotated (specialised) bibliographies, the Centre's annual report, and other internal publications, including leaflets and brochures. DISC's activities and accomplishments were evaluated by an external reviewer during the last month of the year.

Specialized Bibliography Series No. 14

ICDDR,B Studies in Matlab, Bangladesh

The Matlab Bibliography, published in 1990, is an important vehicle for disseminating information learned from the research studies developed there since its beginning. See Appendix C - for an excerpt from the introduction to the Bibliography.

Highlights of the DISC activities during 1990 are given below:

INFORMATION SERVICES:

- ** there were 15,633 readers using the library other than the Centre's own staff.
- ** 117,079 photocopies were supplied.
- ** 19,402 books and journals were loaned to the staff members.
- ** 3,699 books on inter-library loans and 68

duplicate journal issues were offered to the national institutes.

- ** 492 new books were added to the library; of these, 125 were purchased and the rest were received either on complimentary or exchange basis.
- ** 387 current journals were received -- 214 on subscription, and 173 on exchange or complimentary basis.
- ** 144 MEDLINE and POPLINE searches were made and offered to the researchers and scientists from within and outside ICDDR,B.
- ** 24 issues of the Current Awareness Service Bulletin, along with 4 issues of the book acquisitions lists, and 61 issues of the Fast Bulletin were generated to inform the Centre's scientists and other library users about the incoming books, availability of relevant journal articles, and incoming journal issues.
- ** 1,320 informal reference queries were met.
- ** 180 reprints of papers on diarrhoeal disease-related subjects were received from different sources.
- ** 11 abstracts from Asian ongoing projects were highlighted through the Centre's newsletter.

PUBLICATIONS SERVICES:

Lags in the publication schedule for both JDDR and Glimpse were removed in 1990 and avoided thereafter. Four issues of the JDDR (and Bibliography on Diarrhoeal Diseases) and six issues of Glimpse were produced and distributed. A new in-house newsletter was launched with support from the Belgian Administration for Development Cooperation.

A 149-page annotated bibliography on "ICDDR,B Studies in Matlab, Bangladesh" was compiled and published. This bibliography contains citations of 567 papers and publications (364 citations include abstracts). Another 121-page annotated bibliography on oral rehydration in diarrhoeal diseases was also compiled and published with citations of 567 papers and publications (278 papers include abstracts). Work on the preparation of

another annotated bibliography on diagnostic tools/kits for diarrhoeal disease-related research was initiated towards the end of the year. During the year, publication services also issued a colourful and informative booklet and leaflet promoting the Centre (2,000 and 5,000 copies respectively). Finally, the "Demographic Surveillance System - Matlab: vital events and migration - tables, 1983 (Scientific report no. 64)" was reprinted (500 copies).

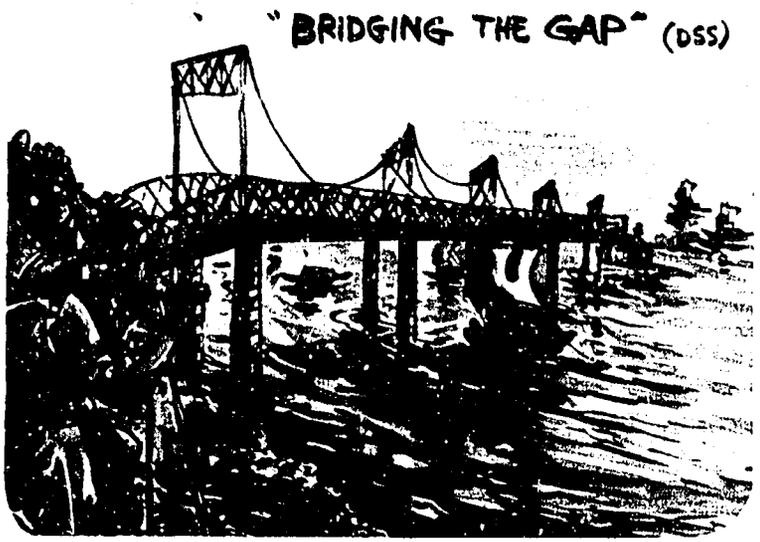
During the year, 26,485 copies of ICDDR,B publications and brochures were distributed to

relevant points worldwide; this includes 18,271 copies of the newsletter (Glimpse), 2,284 copies of annual reports, 2,563 copies of JDDR, 2,255 copies of other scientific reports, 343 copies of specialised bibliographies, 656 copies of promotional brochures and 113 reprints of the Centre's external publications.

In 1990, DISC continued to generate funds through journal subscriptions, memberships and through the sale of priced documents. Anyone interested in making use of these facilities may contact the Head of DISC at the address given in the front of the report. ■

CARTOONS OPPOSITE:

All is not serious business at the ICDDR,B. Laughter, too, is a common activity, especially at morning coffee hour in the Director's Conference Room, where the walls are papered with cartoons by the Centre's artist/photographer. Depicted in the humorous drawings are the faces of many of the staff members, who are engaged in otherwise hopelessly lamentable endeavours, or celebrating moments of superlative success. As shown in the cartoons opposite, funding is an incessant preoccupation and the butt of many jokes.



OTHER SERVICES

Medical Illustrations

Head: Asem Ansari

The Medical Illustration Cell prepares graphs, charts, photographs, slides, drawings, and posters; produces video films of important events and activities of the Centre; and provides film developing and audio-visual services. In 1990 the Cell produced videos of the MCH-FP Extension Projects work and the inauguration of the new Matlab facilities. During the year, their services were also hired by outside organisations, including the Dhaka University, Shishu Hospital, Helen Keller International, Global 2000, and the Cardiovascular Hospital. Its staff has for the first time started to develop colour slides directly from negatives. This method is much cheaper and the processing is faster than from slides and is not in use anywhere else in Bangladesh. Also in 1990 personal and official greeting cards with the Centre's logo were designed. These were very popular and were sold both within and outside the Centre. (see cartoons on page 53). ■

Computer Information Services

Manager: A.H. Mostafa

The Computer Information Services (CIS) provides mainframe computer services to the entire Centre. It provides computer facilities, systems development, and training, and now also gives engineering support for the installation and maintenance of microcomputers.

After 12 years of extensive and dependable service the IBM System/34 minicomputer was finally retired from service during 1990, and all application systems, including the resources accounting system, were successfully transferred to the mainframe. Several analytic and systems development tasks were undertaken by CIS during 1990:

- ** the inventory accounting system, designed for the Finance Division in 1989, was

successfully completed.

- ** The mailing list printing system for Glimpse and the Annual Report was converted to run on a microcomputer.
- ** A donor profile management system was designed and installed for the External Relations Office.
- ** The personnel management system was enhanced to produce additional reports.
- ** A thorough evaluation of the inventory management system of the Supply Branch was conducted.

The DSS continues to make the most use of computer resources (50%), followed by the Finance Division (18%), the MCH-FP Extension Project (15%), and the UVP (7%). A total of 109 computer users were logged onto the mainframe for a total of 17,000 hours, occupying the CPU for 570 hours. The CPU usage rate, 40%, was down from 1989 due to a significant drop in computer use during the political uncertainties. ▣

Data Archiving Unit

Head: M.A. Kashem Shaikh

The Data Archiving Unit recently received special attention from the Social Science Advisory Council (SSAC), as well as from various donors, since it will be the locus of the ICDDR,B's renewed effort to improve the dissemination and use of existing data. The SSAC specifically recommended "the establishment of a data archive programme that would distribute data sets upon request to outside investigators; that additional funding be sought to support this archive; and that a catalogue for the archive be released within one year." Work in all areas is well underway; the first well-documented data set (from the Meheran study) is now available, the catalogue is in rough draft, and other data sets are being identified for inclusion.

The Data Archiving Unit provides assistance to scientific studies, primarily by extracting files from the Centre's archives and helping researchers to use them. The Unit also archives data files created by the Centre's research projects (15 in 1990), corresponds with various Principal Investigators concerning their data sets, and reorganises, lists, and maintains the existing archival data sets. ■

Community Studies

Principal Investigator: A.K. Siddique

The Community Studies Branch is responsible for supervising, interviewing, collecting biological samples, and following the patients of the urban community-based studies of the Centre. In 1990 the Branch staff in their support of four projects, collected over 5,000 rectal swab and stool samples, performed over 10,000 anthropometric measurements, conducted almost 10,000 interviews, and surveyed over 1,500 families. ■

TRAINING

International
National
Fellowship programmes
Short terms
Seminars

STAFF DEVELOPMENT

Overseas
National
In-house
Post-graduate students
Specialised training



Asam Ansari

The participants in a course on the Clinical Management of diarrhoeal disease being taught how to evaluate the contents of a bucket from a "cholera cot," a special bed with a hole in the middle.

TRAINING AND STAFF DEVELOPMENT

The training and staff development activities are under the direct supervision of the Centre's director.

Training Branch

Coordinator: R.L. Akbar

Training in "areas of the Centre's competence" is a stated objective of the Centre. In view of this objective, as in previous years, the Centre's training programme has organised national and international training courses, offered fellowships, participated in workshops and organised seminars. During 1990, a total of 488 scientists, physicians, health administrators, health personnel, trainers and students from 14 countries received training at the Centre.

International: Four international training courses were arranged during the year attended by 44 participants from 9 countries. Their tuition fees, travel and living expenses were provided by grants from Japan and USAID, Pakistan.

Thirty-six physicians, nurses, and diarrhoeal disease control programme managers from Bangladesh (10), Bhutan (4), Nepal (4), Malaysia (2), Maldives (1), Myanmar (2), Pakistan (7), Thailand (4), and Uganda (2) attended three courses on the "Clinical Management of Diarrhoeal Diseases". This course was designed to provide participants with the skills necessary to diagnose and treat diarrhoea in both the hospital and the community. In addition, the participants were taught how to organise courses for health personnel in their own countries. One of these three courses was organised at the request of USAID, Islamabad.

A 3-week course on the "Laboratory Diagnosis of Common Diarrhoeal Disease Agents" was attended by 8 participants from Bangladesh (3), Thailand (2) and one each from Bhutan, Malaysia, and Myanmar. The course taught participants the fundamental principles of laboratory procedures to isolate

and identify pathogens responsible for causing diarrhoea and also encouraged the participants to prepare their own culture media in their home laboratories.

National: In 1990 the Centre organised seven national training courses for post-graduate medical students from the National Institute of Preventive and Social Medicine, nurses from the Bangladesh government hospitals and health workers from the Save the Children Fund (UK). A total of 71 participants attended these courses which aimed at providing adequate knowledge and skills in managing patients in both hospital and community. The courses gave emphasis on the use of ORS and the role of nutrition for the management of diarrhoea. Two of these courses were supported by UNICEF, Dhaka.

Fellowship Programme: The objectives of this programme are to develop specialised skills and to provide Fellows with an insight into research methods. The Fellows work either in current research studies or develop research protocols themselves in collaboration with their preceptors. During 1990, 42 students, researchers and health professionals from eight countries studied at the Centre for periods of a few weeks to a year.

SAARC Fellowship Programme: In 1990 the Centre continued to offer fellowships to the countries of the South Asian Association for Regional Cooperation (SAARC). Two each from Bangladesh and the Maldives and one each from Bhutan, Nepal, and Pakistan underwent training. Fellows from Bangladesh, Bhutan, Nepal, Indonesia, and Pakistan were provided theoretical and practical training in current practices in treating diarrhoeal diseases in doing research, and in performing specialised laboratory techniques. One Fellow from the Maldives was trained in techniques of clinical

microbiology to isolate and identify the most common pathogens causing diarrhoea, while the other Fellow received training in community health.

Government Fellowship: At the request of the Directorate-General of Health Services, Government of Bangladesh through the Centre's Programme Coordination Committee, the Centre agreed to offer 1-year fellowships to eight physicians from 8 medical colleges on the basis of merit. Accordingly, the Centre offered eight fellowships for intensive training on clinical management of diarrhoeal diseases.

Short-term: During the year a series of one and two-day courses were provided to 331 students from Bangladesh medical colleges and other government and non-government institutions on the management of diarrhoea with ORS.

Seminars: To provide opportunities for an exchange of information and views, 13 seminars were organised during the year in which both resident and visiting scientists presented talks on diarrhoeal and other related topics. ■

Staff Development

Manager: B.R. Saha

The Centre maintains a systematic staff development programme aimed at developing the skills of its staff to sustain its ongoing research and training and to create a well-trained manpower to meet future requirements. This programme has been undertaken by organising short courses in the Centre and sending staff members to national and overseas institutions. Besides fellowships for study or training of individual staff members from a number of agencies, ICDDR,B received direct financial support from the Swiss Development Cooperation (SDC) for the programme.

Overseas: At the beginning of 1990, 26 staff members were studying overseas. During the year, 12 more left Bangladesh to begin courses or training, while 13 returned, and at the end of the year, 25 staff members were on overseas study or training in Australia, Belgium, Canada, Japan, Sweden, Switzerland, the UK, and the USA. A brief description is given below:

Mr. M.R. Khalili, Budget and Finance Officer, Finance Division, left to begin studies at the University of Toronto, Canada for a Master in Public Health Management.

Mr. Abdur Razzak, Senior Statistical Officer, DSS, Population Science and Extension Division (PSED), who had earlier completed an MA in Demography from the Australian National University, was awarded a scholarship and left to begin his Ph.D. studies at the same University.

Ms. Shahnaz Ahmed, Community Health Services Coordinator, UVP, Community Health Division (CHD), left to begin her studies at the London School of Hygiene & Tropical Medicine (LSHTM) for a Master in Community Health Development.

Dr. Tahmeed Ahmed, Medical Officer, CRC, Clinical Sciences Division (CSD), left to begin his Ph.D. studies in Gastroenterology at the Tsukuba University, Japan.

Mr. Ashish Kumar Chowdhury, Chief, Clinical Biochemistry Section, Laboratory Sciences Division (LSD), left to begin a one-year training course in Clinical Biochemistry at the St. Pierre Hospital of the Free University of Belgium.

Dr. M.W. Muhluddin Ahmed, Medical Officer, MCH-FP Extension Project, PSED, left to begin studies at the Johns Hopkins University (JHU), USA for a Master of Public Health in Health Planning.

Dr. S.K. Roy, Associate Scientist, CRC, CSD, gained a Ph.D. in Human Nutrition from LSHTM, UK. His dissertation is entitled: "Impact of zinc supplementation on Bangladeshi children suffering from acute and persistent diarrhoea."

Dr. Rukhsana Halder, Medical Officer, CRC, CSD, returned after completing a Masters degree in Human Nutrition from LSHTM, UK.

Dr. P.K. Bardhan, Senior Medical Officer, CRC, CSD gained an MD in Gastroenterology from the University of Basel, Switzerland. His dissertation is entitled: "Plasma secretion as a test of gastric acid secretion: a tubeless approach."

Mr. Mofizur Rahman, Senior Operations Researcher, MCH-FP Extension Project, PSED, gained a M.Sc. in Population Planning from the University of Michigan, USA.

Mr. Mizanur Rahman, DSS, PSED, completed his Ph.D. in Demography at the Johns Hopkins University and was awarded a one-year post-doctoral fellowship at the Rand Corporation.

Dr. Shamim Akhter Khan, Senior Medical Officer, MCH-FP, PSED, **Mr. J.C. Chakraborty**, Manager, Health Services, Matlab Health and Research Centre, CHD, **Mr. M. Shamsul Islam Khan**, Head, DISC, **Mr. M. Mahfuzul Hassan**, Senior Secretary, DISC, and **Mr. Mir Motassem Ali**, Serials Librarian, DISC, Director's Office, attended short courses in institutions in the UK, USA, Philippines, Sri Lanka, and Bangkok respectively for training in different fields. **Mr. Shahidullah**, Senior Field Research Officer, MCH-FP, PSED, also attended a course in Bangkok. **Dr. Motaheer Hossain**, Veterinary Officer, Animal Resources, LSD, attended a workshop in India.

National: During 1991, 23 staff members were sent to institutions within the country for short courses of training in the fields, such as NGO management, training methodology, nutrition education, management audit, management, computer hardware, and digital electronics.

In-house: During the year, three courses on computer software (one on the statistical analysis system and two on Lotus 1-2-3) were organised. These courses were attended by 42 scientific and administrative staff members. Also a seminar on "What is a computer virus and how to deal with it" was conducted after several such viruses attacked microcomputers throughout the Centre. ■

Postgraduate students coordination programme
Coordinator: S.Q. Akhtar

One of the objectives of the Centre is to

collaborate with local institutions and to encourage and help them in their research and promotional activities. This objective has been very effectively fulfilled through the Students Coordination Programme. Many students have completed Masters theses during 1989-1990. An abstract has been presented at the 8th Annual Conference of the Bangladesh Society of Microbiologists from one Masters Thesis student and a manuscript has been accepted for international publication in the Journal of Tropical Medicine and Hygiene

Postgraduate students - national and international: In the Centre's laboratories, 10 M.Sc. students and 2 MPH students of the Dhaka University, and three Ph.D. students (2 from Karolinska Institute, Sweden and 1 from Gottingen University, West Germany) carried out their research studies. One post-doctoral fellow, supported by the Australian International Assistance Bureau, is also conducting her research here.

Specialised training: A two-day orientation and practical demonstration was provided to students of the American International School, Dhaka on diarrhoeal disease agents by the clinical laboratory. The Clinical Laboratory also gave several lectures and demonstrated training courses organised by the Government of Bangladesh. One of them was a one-week course on quality control assessment of biochemical tests for members of the Armed Forces Institute of Pathology and Transfusion.

A technician of the Red Crescent Maternity Hospital, Chandpur was trained in the Matlab laboratory on techniques to diagnose common enteric pathogens.

The Computer Information Service supervised an eight-week Internship programme for an M.Sc. student from the Department of Computer Science and Engineering, Indian Institute of Technology, Kharagpur, India. Assistance was also provided to several organisations in Bangladesh. ■

ARRIVALS AND DEPARTURES

Departures
New staff
Visitors and consultants
Obituaries
Retirement
Long service

COMMITTEES

Board of Trustees
Council of Associate Directors
Consultative Management Committee



Dr. Jane Menken, a Visiting Consultant from the University of Pennsylvania (USA), giving a workshop.

ARRIVALS AND DEPARTURES

Personnel Office

Chief Personnel Officer: Wahabuzzaman Ahmed

At the end of 1990, the Centre had 1,075 staff members plus 137 Community Health Workers and 112 Urban Volunteers. There were 28 international staff members, 14 of whom were on secondment, 153 National Officers and 394 of the General Services grade. This reflects a net difference of 296 employees, fewer than the 1989 total, and a successful attempt to contain payroll costs.

Departures

One Associate Director left the Centre during the year. DR. SAUL TZIPORI (Australia), Associate Director of the Laboratory Sciences Division, returned home after completing the two-year term of his contract. During this period, he reorganised the Division, recruited talented young scientists, set a research agenda for the next 3 years, and introduced state-of-the-arts laboratory techniques.



Dr. Saul Tzipori left the Centre in 1990.

After four and a half years of service with ICDDR,B and the Matlab MCH-FP Project, DR. VINCENT FAUVEAU (France), a physician with the Maternal Child Health and Family Planning Project, resigned in June 1990. He left the Centre to work in Population Studies, London School of Hygiene and Tropical Medicine. His wife MRS. CLAIRE FAUVEAU, Associate Investigator, Urban Volunteer Program, also left with him after three and a half years of service.

DR. LOKKY WAI (Canada), Demographer, Demographic Surveillance Systems, resigned in September 1990 after more than 2 years of

service at the DSS Project. He has now joined the Canadian International Development Agency (CIDA) to monitor their population and health projects in Bangladesh.

DR. MAXINE WHITTAKER (Australia), Operations Research Scientist of the MCH-FP Extension Project, left the Centre in November 1990 after almost 2 years of service as Consultant.

DR. SUSHILA ZEITLYN (UK) of the Department of Social Anthropology, London School of Economics completed her tenure as Consultant in the Child Health Programme (CHP) in March 1990.

Three Danish nationals provided on Secondment by DANIDA left during the year. MS BILTHE H. NIELSEN, Immunisation Coordinator, CHP left the Centre in August to return home after expiry of her two years contract. MS. BIRGITTE B. NIELSEN, Associate International Research Fellow (IMCC Medical Student) left after completion of her one year assignment in the CHP. DR. SHAKUNTALA H. THILSTED, Coordinator, CHP who was on leave from her previous position, left the Centre in December after expiry of her contract lasting almost three years. She returned to her position in the Royal Veterinary & Agricultural University, Copenhagen, Denmark.

Four US nationals seconded by the Johns Hopkins University left the Centre. DR. RICHARD BESSER, Fellow, Urban Volunteer Program left in May after one year of assistance to UVP; MS. KATHLEEN MCNAMARA, Field Services Coordinator, UVP, left in August after completion of her assignment; DR. DIANA SILIMPERI, whose contract ended in September 1990, served as Project Director, UVP during the three and a half years' tenure of her secondment; and DR. MARY KATE STEWART, Principal Investigator, served the Centre for the MCH-FP Project, Matlab for 2 years and left for the US in December.

After 6 years of service in the Clinical Sciences Division, Dr. F.P.L. VAN LOON (Netherlands) left the Centre in June 1990. During his long tenure of service, Dr. Van Loon worked as International Research Associate and later as Visiting Scientist in both the Clinical Sciences and Laboratory Sciences Divisions.

MR. DAVID WILLIAM PATTERSON (USA), Population Service Fellow seconded by the University of Michigan to work with the MCH-FP Extension Project, left the Centre in August 1990 after completion of his 2 years of assignment.

DR. MICHAEL BENNISH (USA), International Research Associate, Clinical Sciences Division, left the Centre to join the Tufts University School of Medicine, Boston in July 1990 after completion of his 6-year assignment, 3 years as a staff member and 3 years as a seconded staff member under a Tufts/ICDDR,B agreement.

MS. NANCY STARK (USA), a doctoral student in anthropology from Southern Methodist University was on a Fulbright scholarship in the Matlab MCH-FP Project. She left in March 1990 after completion of her field work.

DR. FU BINGNAN (China) left in December 1990 after having finished a tenure of 3 years as Visiting Scientist in the Laboratory Sciences Division.

From the Laboratory Sciences Division, Dr. K.A. CHOWDHURY, veterinarian pathologist, Mr. EMARAT HOSSAIN, Archive Manager, and Mr. GOLAM RABBANI left the Centre to go to the United States.

New Staff

Dr. L.A. de FRANCISCO (Colombia), a Medical Doctor pursuing his Ph.D. & formerly working as Senior Scientific Officer MRC Laboratories Banjul, The Gambia, West Africa, joined the Centre on November 1990 as MCH-FP Physician for the Matlab MCH-FP Project under the Community Health Division.

The six other international staff members who joined the Centre during 1990 were provided on secondment. Three of them were sponsored by the Johns Hopkins University for

the Urban Volunteer Program. Mr. NGUDIIP PALJOR (USA) joined as Project Director, UVP. Prior to secondment Mr. Paljor, M.P.H. from the University of Hawaii, was the Administrator, Office of Health Education, Department of Public Health & Social Services, Government of Guam. Dr. CHARLES LERMAN (USA), a Demographer & Sociologist, left his job as Population Consultant in the Indonesian National Family Planning Coordinating Board to join as Research Investigator, UVP. Dr. Abdullah H. BAQUI (Bangladesh), Assistant Scientist, Community Health Division, who was on study leave, has been seconded as Head, Research Branch, UVP.

Two Belgian nationals were provided on secondment by the BADC. They are Mr. ALBERT FELSENSTEIN as Head, BADC Support Group and Dr. JACQUES MYAUX as Visiting Scientist to the Community Health Division.

Ms. CHARLOTTE BRUN (Denmark), an IMCC Medical Student, was seconded by DANIDA to join as Associate International Research Fellow in the CHP under the Clinical Sciences Division.

Visitors and consultants

During the year several consultants were invited to provide consultancies to various projects or programmes.

Ms. JACQUELINE MONTANARO came from the Department of Microbiology, Royal Children's Hospital, Melbourne to establish immunoperoxidase technique and other histochemical methods in the Laboratory Sciences Division.

Mr. MALLA R. RAO came from the Asian Institute of Technology for data analysis for the project "Risk factors and sequelae shigellosis" in LSD.

Dr. ANDRE BRIEND (France) returned in 1990 for a brief consultancy for Matlab MCH-FP Project. He helped analyse data collected in the project area in 1989-1990 and finalised proposals for new studies to be carried out in Matlab and other sites.

Dr. BOGDAN WOJTYNIAK from the Department of Medical Statistics of the National Institute of Hygiene, Warsaw, Poland came to provide

consultancy for research on the evaluation of the mortality impact of the Matlab immunisation programme.

Mr. GRAHAM WRIGHT assisted the Project Director of UVP in fund-raising, budget preparation and internal cost analysis studies. Subsequently, he rendered assistance to the NORAD Project audit as Financial Analyst under guidance of the Associate Director, Finance.

Mr. NIMAL ATTANAYAKE, a Ph.D. candidate (Economics) of the University of Colombo, Sri Lanka came as a Health Economist Consultant for the MCH-FP Matlab Project. He came twice during the year to analyse cost effectiveness of the Matlab MCH-FP Project.

Mr. IMRE SOOS, Personnel Officer of the World Health Organization, Geneva was invited to render his consultancy on performance evaluation in personnel administration.

Dr. Jane MENKEN, Professor of Sociology and Demography at the University of Pennsylvania gave a workshop on Intermediate statistics for participants from various NGOs, government agencies, as well as ICDDR,B's population studies.

Ms. ANN RILEY a Demographer at the University of Michigan came to write a study protocol for a DMPA study, perform data analysis and co-author the final report with Dr. Kate Stewart.

Mr. PAUL OSBORN, Secretary General, SATIS, the Netherlands, was invited to conduct an evaluation of the activities of the Diarrhoeal Diseases Information Services Centre (DISC).

Dr. ELIZABETH ANN GOODBURN, a consultant to BRAC, funded by London School of Tropical Medicine & Hygiene, was invited to prepare an information booklet and brochure on ICDDR,B.

To complete research started while he was a Fulbright Fellow with the MCH-FP Extension Project, Mr. THOMAS McELRATH came as Consultant Demographer to the Extension Project.

Ms. MARSHA J. DAY who worked for the US Embassy's Medical Unit has been rendering

services as Administrative Consultant to the MCH-FP Extension Project for almost two years.

Ms. SARAH SALWAY, M.Sc. in Medical Demography from the London School of Hygiene & Tropical Medicine, will be spending one year as Research Assistant on an internship in MCH-FP Extension Project.

Ms. FAZILA BANU LILY, a consultant to DANIDA, was engaged to provide consultancy to the Child Health Programme.

A consultancy was offered to Dr. ABDUL LATIF MIAH, Ph.D., Ex-Director of the Institute of Public Health to carry out laboratory studies using *E. coli* phage in the Microbiology Branch under LSD.

Two Assistant Professors of the Biochemistry Department of Dhaka University, each with a Ph.D. in Immunology, have joined the Laboratory Sciences Division. They are under contractual service agreement to study the function of granulocytes in the Immunology unit and to participate in protocols.

Dr. MD. HABIBUR RAHMAN, Associate Professor of Radiology, Dhaka Shishu Hospital, was invited to the X-ray unit of the Clinical Research Centre to provide training to CRC Physicians and X-ray technicians on analysis and interpretation of radiological findings and to provide expert opinion on X-ray films.

Other visitors to the Centre include Ms. TETSUKO KUROYANAGI, a Japanese actress and UNICEF goodwill ambassador in December; and Senator The Honorable GARETH EVANS Q.C., Australian Minister for Foreign Affairs and Trade, who came from Canberra in August.

Visitors to the Dhaka Hospital included Dr. SCHULTZ, from the Paediatric Hospital, Stuttgart, West Germany; Madam OLAF PALME, UNICEF's Goodwill Ambassador and the wife of Sweden's late Prime Minister; Ms. BEVERLY CARLSON, Senior Adviser, Food and Nutrition Surveillance of UNESCO in New York Office; Mr. JOHN JAWARSKI, Senior Producer of BBC-TV in the UK; Mrs. CARIN DE PREE and daughters, family of the United States Ambassador to Bangladesh; Mr. J.B. CHRISTTENSER of DANIDA, Ministry of Foreign

A visit to the Centre by the Australian Minister for Foreign Affairs and Trade, Senator the Honorable Gareth Evans Q.C.



Affairs, Denmark; Princess ZAHRA AGA KHAN, Pakistan (The Princess is a medical student); Dr. JOHAN KUMLIEN of the Wallenberg Laboratory, University of Lund, Sweden and Dr. MARRIA FLODERNS; and SYREN DYSEGAARD, DANIDA, Copenhagen.

The Matlab Centre hosted 223 visitors during 1990 from home and abroad, including representatives of donor agencies, visiting scientists and participants of national and international training courses, as well as fellows.

The Programme Review and Strategy Development Mission, a 15-person team preparing UNFPA's 5-year Country Programme for Bangladesh, was briefed at the Centre on population and family planning activities, visited Matlab, and spent the night in the guest house in Jessore.

Other visitors of the Population Science and Extension Division were Dr. S.L.N. RAO, Team Leader, UNFPA, New York; PETER GOLDMARK, President, Rockefeller Foundation; RICHARD SEMBA, Johns Hopkins University, USA exploring the possibility of a cataract study; LADO RUZICKA, Australian National University; and BOGDAN WOJTYNIAK (National Institute of Hygiene in Warsaw, Poland). In May the PSED was reviewed by a team from the Netherlands: JOHAN DIRTEX, MARTIN DE LA BEY, and JEROEN VAN GINNEKIN.

Obituaries

It is sad to record the death of three members of the staff who have had long years of service with the Centre. They are: Mr. MD. AKRAM KHAN, Speedboat Driver (15 years), Mr. ALI AHMED, Carpenter (20 years), Mr. MD.

MOFIZUL ISLAM, Driver (10 years).

Retirement

Six members of staff also retired from the Centre during the year are: Dr. M.U. KHAN, Scientist/Epidemiologist, LSD; Mr. A.K.M. ABDUL MATIN, Head, Logistics & Field Support Branch; Mrs. RAHIMA KHATUN, Nursing Manager, CRC; Mrs. RUQUIYA H. SIRCAR, Secretary, Gr. II; Mr. MD. ABDUL JABBAR, Assistant Staff Nurse, CRC; Mr. MD. LUTFOR RAHMAN, Nursing Officer, CRC.

Long service

During 1990 one Officer of the National staff and 12 Officers from the General Services completed 25 years of service to the Centre and were awarded a meritorious increase in pay. They are: Dr. ANSARUDDIN AHMED, Associate Scientist & Scientific Editor, JDDR, DISC; Mr. MD. A. BASHAR BHUIYAN, Mechanic, Maintenance & Engineering Office; Mr. NUREZZAMAN, Foreman, Plumber Steam Fitter, Maintenance & Engineering Office; Mr. MOHAMMAD ALI, Senior Laboratory Attendant, LSD; Mr. MD. DHAN MIAH, Security Guard, General Services; Mr. JOYNAL ABEDIN KHAN, Senior Laboratory Attendant, LSD; Mr. MD. SHAMSUL HAQ, Cleaner, CRC; Mr. SIDDIQUR RAHMAN, Senior Health Assistant, Matlab Health and Research Centre; Mr. MOHAMMAD ABDUL KASHEM, Health Assistant, Matlab Health and Research Centre; Mr. Md. ALTAF HOSSAIN, Messenger, General Services; Mr. MD. AMJAT ALI, Gardener, Guest House; Mr. RUHUL AMIN, Health Assistant, Matlab Health and Research Centre; Mr. OSMAN GHANI BHUIYAN, Health Assistant, Matlab Diarrhoeal Treatment Centre. ■

COMMITTEES – 1990

The Board of Trustees provides general direction to the affairs of the Centre. The Board has 17 members: the Director of the Centre, three persons nominated by the Government of Bangladesh, one by the World Health Organization, one by the United Nations, and eleven members at large, of whom at least half must come from developing countries. Each June one-third of the members complete their three-year term unless re-elected for another term, after which they must retire.

The Board of Trustees meets twice a year and considers matters of science, finance, and personnel. The Director of the Centre is Secretary to the Board. The members of the Board as of 30th June 1990 were:

Dr. Peter Sumbung (Indonesia), Chairman
Prof. Demissie Habte (Ethiopia), Secretary
Dr. Y.Y. Al-Mazrou (Saudi Arabia)
Mr. M.K. Anwar (Bangladesh)
Dr. Deanna Ashley (Jamaica)
Mr. M.R. Bashir (Bangladesh), replacing Prof. K.A. Monsur
Prof. John C. Caldwell (Australia)
Prof. J.R. Hamilton (Canada)
Prof. D.A. Henderson (U.S.A.)
Dr. Ralph H. Henderson (WHO Representative), replacing Dr. M.H. Merson
Prof. A. Lindberg (Sweden)
Prof. V.I. Mathan (India)
Prof. Fred S. Mhalu (Tanzania)
Prof. A.S. Muller (The Netherlands), replacing Prof. Richard Feacham (U.K.)
Mr. Taslimur Rahman (Bangladesh)
Dr. Jon E. Rohde (UNICEF Representative), replacing Prof. V. Ramalingaswami
Dr. Takashi Wagatsuma (Japan), replacing Prof. H. Tanaka (Japan)

The Programme Coordination Committee (PCC) is a mandatory committee, which coordinates research with the work of national institutes in Bangladesh. Its objectives are :

** to ensure that the Centre offers fellowships

and facilities for training and research to Bangladeshi scientists and health personnel.

** to ensure that the Centre establishes and maintains contact with Bangladeshi Institutes by means of collaborative research, seminars, and exchange of visits.

** to ensure that the Centre avoids actions prejudicial to the interest of research in similar fields carried out by other organisations in Bangladesh.

** to assist in solving any controversy in relation to the involvement of the ICDDR,B in research and training.

The PCC has 50 members: five from ICDDR,B and the remainder from Government health departments/institutions, universities and non-governmental organisations related to science, health, nutrition, development, education and population studies. The present Committee will be in office until December 1992. The Chairman is Prof. M.A. Matin, Vice-Chairman is Prof. Kamaluddin Ahmad and the Member-Secretary is Prof. Demissie Habte. The members of PCC are:

Prof. M.A. Matin
Prof. Kamaluddin Ahmad
Prof. Nurul Islam
Maj. Gen. M.R. Choudhury
Prof. K.A. Monsur
Prof. T.A. Chowdhury
Dr. Humayun K.M.A. Hye
Brig. (Retd.) M. Hedayetullah
Dr. Zafrullah Choudhury
Dr. A.K. Khan
Dr. Mobarak Hossain
Dr. Sultana Khanum
Vice-Chancellor, Bangladesh Agricultural University
Vice-Chancellor, Dhaka University
Vice-Chancellor, Bangladesh University of Engineering & Technology
Vice-Chancellor, Chittagong University
Vice-Chancellor, Rajshahi University

Vice-Chancellor, Jahangir Nagar University
 Vice-Chancellor, Islamic University
 Vice-Chancellor, Shahjalal University
 of Science & Technology
 Vice-Chancellor, Khulna University
 Chairman, Bangladesh Agricultural
 Research Council
 Chairman, BCSIR Laboratories
 Research Director, Bangladesh Institute
 of Development Studies
 Medical Director, Bangladesh Institute
 of Research & Rehabilitation in
 Diabetes, Endocrine & Metabolic Disorders
 Director General of Health Services
 Director General, Family Planning
 Implementation
 Director General, National Institute
 of Population Research and Training
 Director, Institute of Post-graduate
 Medicine & Research
 Director, Institute of Nutrition &
 Food Science, Dhaka University
 Director, Institute of Public Health
 Director, National Institute of
 Preventive & Social Medicine
 Director, Institute of Public Health Nutrition
 Director, Bangladesh Fertility
 Research Programme
 Director, Programme, Bangladesh Rural
 Advancement Committee
 Director, MIS Unit, Family Planning Directorate
 Joint Director, Dhaka Shishu Hospital
 Director, Institute of Bangladesh Studies,
 Rajshahi University
 Director, Bangladesh Medical Research Council
 Project Director, CDD Programme,
 Government of Bangladesh
 Director, Cancer Institute & Research Hospital
 Director, Institute of Herbal Medicine
 Prof. D.A. Henderson, Member, Board
 of Trustees
 Prof. J.R. Hamilton, Member, Board of Trustees
 Dr. Deanna Ashley, Member, Board of Trustees
 Associate Director, Clinical Sciences
 Division, ICDDR,B
 Associate Director, Community Health
 Division, ICDDR,B
 Associate Director, Laboratory Sciences
 Division, ICDDR,B
 Associate Director, Population Science
 & Extension Division, ICDDR,B.

The PCC met on two occasions (once with the Board of Trustees) and the Standing Committee (executive body of PCC) met twice. The Scientific Review Committee of PCC

also met on two occasions and considered six protocols originating from national institutions, of which five received funds from the Centre and are progressing satisfactorily in the respective national institutions.

In eight ICDDR,B ongoing research protocols, investigators from five national institutions participated along with the scientists from the Centre. This collaboration is viewed as most rewarding for ICDDR,B researchers. It is hoped that these joint research activities will expand further, and the Centre will welcome the initiatives of national scientists to work in ICDDR,B protocols.

The Research Review Committee (RRC) evaluates all research proposals of the Centre in terms of their scientific value, competence of the Investigator, significance and feasibility in the light of the Centre's objectives, priorities, and financial resources. The RRC is composed of scientists and physicians from the ICDDR,B, external bodies and representatives from the PCC Standing Committee. During 1990, the RRC met 11 times and considered 19 protocols: 16 were approved, one disapproved and consideration of the remaining two were deferred. The members of RRC in 1990 were:

Prof. Demissie Habte, Chairman
 Prof. Kamaluddin Ahmad
 Maj. Gen. M.R. Choudhury
 Dr. Dilip Mahalanabis
 Dr. Saul Tzipori (To August 12)
 Dr. Michael A. Strong
 Dr. M. Moyenu Islam (From August)
 Dr. M.J. Albert
 Dr. P.K. Bardhan
 Dr. W. Gary Hlady (from August)

The Ethical Review Committee (ERC) is also a Mandatory Committee of the Centre, and this Committee meets regularly to examine the ethical issues of approved research protocols involving human subjects. It has fifteen members: four from the Centre, one each from the PCC Standing Committee, the Bangladesh Medical Research Council, and the WHO in Bangladesh, and eight persons representing other disciplines. The ERC has a five-member subcommittee to undertake periodic inspection and audit of research projects on behalf of the Committee, to ensure that studies are being conducted ethically and according to the approved proposal. The Committee ensures

that the study patients all receive the same quality treatment even if they wish to withdraw from the study, and that their privacy is not infringed upon.

In 1990, the ERC met nine times and considered 16 protocols including two PCC-collaborative studies. Fourteen protocols were approved, consideration of one protocol was deferred and one protocol was disapproved. In 1990, the members of ERC were:

Prof. Kamaluddin Ahmad, Chairman and representative of PCC Standing Committee; Biochemist & Nutritionist

Dr. Humayun K.M.A. Hye, Alternate Chairman; Pharmacologist

Prof. T.A. Chowdhury, 2nd Alternate Chairman and representative of Bangladesh Medical Research Council; Gynaecologist

Prof. K.A. Monsur, Scientist

Dr. Shafiqur Rahman, Community Scientist

Barrister K.Z. Alam, Lawyer (up to August)

Dr. Rafiqur Rahman, Lawyer (from September)

Mrs. Taherunnessa Abdullah, Behavioural Scientist

Mrs. Husnara Kamal, Behavioural Scientist

Mr. Md. Motazzal Hossain Khan, religious representative

Dr. Jamal Ara Rahman, non-scientific member

Dr. R.S. Giri, representative of WHO, Dhaka

Dr. D. Mahalanabis, ICDDR,B, Clinician

Dr. A.N. Alam, ICDDR,B, Clinician

Dr. K.M.A. Aziz, ICDDR,B, Anthropologist

Ms. Husna Ara Begum, ICDDR,B, Nursing profession

Council of Associate Directors is a consultative management body comprising the Associate Directors (or Acting Head) of the Divisions. They meet each week to advise and assist the

Director and to discuss matters of mutual interest. The members of the Council in 1990 were:

Prof. Demissie Habte, Director

Dr. Dilip Mahalanabis, CSD

Dr. Moyenuul Islam, LSD (Acting)

Dr. A.K.M. Siddique, CHD (Acting, every after three months)

Dr. K.M.A. Aziz, CHD (Acting, every after three months)

Dr. Michael Strong, PSED

Mr. John Winkelmann, Finance

Mr. M.A. Mahub, Administration and Personnel

Mrs. Judith Chowdhury, Minute Secretary

The Consultative Management Committee includes members of the Council of Associate Directors, other senior members of the Centre's administrative representatives of each Division, and the President of the Staff Welfare Association. It meets four to six times a year as an informal platform for a wider discussion of the management of the ICDDR,B. During 1990, the members of the Committee, in addition to the Council of Associate Directors, were:

Mr. M.S.I. Khan (DISC), Dr. R.L. Akbar (Training Branch), and President, SWA; Administration & Personnel: Mr. W. Ahmed, Mr. M.G. Morshed, and Mr. T.A. Khan; Community Health Division: Dr. K.M.A. Aziz, Dr. A.K.M. Siddique, Dr. Md. Yunus, and Mr. N. Paljor; Clinical Sciences Division: Dr. I. Khan, Dr. Aminul Islam, and Mrs. A. Stephen; Finance Division: Mr. M.R. Khalil; Laboratory Sciences Division: Dr. M.M. Islam, Mr. M.A. Wahed, and Dr. J. Albert; Population Science and Extension Division: Dr. R. Maru and Mr. M.A. Kashem Shalkh ■



The Board of Trustees meeting in the Mid-town Hotel, Dhaka, November 1990

Finance Division
External Relations
Donors' Support Group



Aam Anzari

The Director receiving the annual Japanese contribution from Mr. Tetsuo Ito, Minister, Embassy of Japan, Dhaka.

FINANCES AND DONORS

Finance Division

Associate Director: John F. Winkelmann

ICDDR,B had a dramatic change in both revenues and expenditure in 1990. Contributions from donors decreased by 25.6% from US\$11,798,000 to US\$8,922,000. Expenditures, including depreciation, decreased by 24.4% from US\$12,336,000 to US\$9,450,000. The Centre had a surplus of US\$481,000 before providing for depreciation of US\$865,000. Net current assets increased by US\$697,000 due to the surplus before depreciation and interest income on the reserve fund.

The reduction in revenue resulted from a decrease in capital funds with the completion of capital projects, flood relief funds received in 1989 for the 1988 flood and project funds. In late 1989 it became evident that the Centre's revenues would decrease significantly during 1990. To avoid a major financial problem, the following steps were taken in 1990:

- ** A hiring freeze was imposed for all National positions in which no hiring was undertaken for existing vacant positions, and staff that retired, resigned or their employment contract ended during the year were not replaced.
- ** Close monitoring of all operating expenditure to ensure only necessary expenditure was undertaken.

The above steps, along with devaluation of the Bangladesh taka by 10% during the year, resulted in the significant reduction in expenditure and the Centre avoiding a deficit in 1990. The Centre's cash flow also improved during the year and overdraft facilities were only required during the third quarter of the year.

Contributions received from donors to the work of the Centre over the past five years are

shown in Table 7.

External Relations

Programme Officer: M.I. Ali

The External Relations activities have succeeded in regenerating donor confidence in the Centre, manifested by a 73% increase in contributions to the core fund in 1990. There is also an increased willingness among donors to give multi-year grants to ICDDR,B. The overall fund requirement of the Centre was lower in 1990 in comparison to 1989, an outcome of strict implementation of personnel policies and close financial monitoring. As a result, the percentage of contribution of the largest single donor, which was 40% in 1989, came down to 33% indicating a move to a greater diversification of the sources of funds and to increased sustainability of the Centre.

Australia continued its support to the core fund in 1990 and also provided additional funds to engage a consultant at the Centre. Australia is a long-term donor to ICDDR,B.

Bangladesh continued to provide cash and in-kind support to ICDDR,B. The Centre also continues to enjoy excellent relations with its host country.

Belgium (the Belgian Administration for Development Co-operation: BADC) substantially increased contributions to both core and project funds in 1990. In addition to the above, BADC supported the secondment of three Belgian experts to ICDDR,B. This was the first year of a new five-year grant to the Centre.

Canada (the Canadian International Development Agency: CIDA) provided partial support to the Demographic Surveillance System in 1990. This was the last year of CIDA support to the project. Negotiations have been initiated for CIDA core support to the Centre.

Denmark's (the Danish International Develop-

ment Agency: DANIDA) support to the Child Health Programme continued in 1990. DANIDA has agreed to provide support to this programme in 1991 as well.

The Ford Foundation remains an important source of project funds for the Centre. In 1990 Ford supported several projects, of which Matlab MCH programme was a major beneficiary.

Japan is an important long-term donor of the Centre. In 1990 Japan provided valuable financial support to the clinical research, laboratory, and training activities.

The Netherlands made a major grant to the Demographic Surveillance System in 1990 which was vital to the continuation of the project. The Netherlands also continued its support to the Acute Respiratory Tract Infection project that year.

Norway (the Norwegian agency for development: NORAD) continued its financial support to the Matlab MCH/FP project in 1990 and has agreed to provide partial support to the project in 1991 as well.

Switzerland (the Swiss Development Cooperation: SDC), a traditional and committed donor, renewed its core and project grants for a two-year period beginning 1990. There was a modest increase in the project grant in the new agreement which provides support to the library and publications, and clinical research and staff development programmes.

Sweden's (SAREC) two-year core and project grant to ICDDR,B continued in 1990 and is due to expire in mid-1991. Negotiations have been initiated for a new grant cycle.

The United Kingdom (the Overseas Development Administration of the United Kingdom) remains an interested long-term donor to the Centre's core fund and continued its support in 1990.

UNCDF funded construction of the Diarrhoea Treatment Centre at Matlab. It was completed in 1990 and the facility was formally inaugurated. The United Nations Capital Development Programme also provided funds for some additional work there.

The United Nations Development Programme (UNDP) continued its support to the Centre's clinical research programme in 1990. The UNDP contribution remains an important source of research funds for ICDDR,B.

The United Nations Children's Fund (UNICEF) continued to provide core funds to the Centre. In 1990 UNICEF also provided some project funds.

The United States Agency for International Development (USAID) remains the largest long-term donor to the Centre's core and project funds. In 1990 USAID increased its contribution to the Centre's core fund but there was an overall decrease in the contribution to ICDDR,B. The USAID Mission in Dhaka continued to support the Urban Volunteer Program and the MCH/FP Extension Project in 1990.

The World University Services of Canada, supported by the Canadian International Development Agency (WUSC/CIDA), continued to provide financial assistance to the Matlab MCH/FP programme and the Matlab Treatment Centre in 1990. WUSC also provided staff on secondment and supported staff training activities.

The World Health Organization (WHO) remains an important source of research funds for the Centre, funding several research projects during the year.

France, International Child Health Foundation, International Development Research Centre and SKF, all provided funds for specific project activities.

Contacts were initiated with **Italy** and the **Sasakawa Foundation** as prospective donors. Collaboration with several institutions in **Bangladesh** is progressing satisfactorily. A Letter of Understanding between ICDDR,B and the Ministry of Public Health, **People's Republic of China** (MOPH, PRC) was signed in July 1990 when the Director of the Centre led a three-member team to that country. The aim of this agreement is to enhance scientific collaboration between the two sides on control of diarrhoeal disease through linkage between relevant institutions in MOPH, PRC and ICDDR,B.

Donors' Support Group

A meeting of the Donors' Support Group was held in June 1990 in which the participants

expressed their satisfaction with the activities of the Centre. The Donors' Support Group meeting scheduled for November 1990 could not be held due to political unrest in Dhaka.

Table 7

Contributions to ICDDR,B during the last 5 years on the basis of cash received in US\$
(see note 5: Auditors Report).

	1990	1989	1988	1987	1986
Central Funds					
Australia	185,711	191,845	216,893	126,325	123,237
Belgium	105,906	22,851	-	-	-
Bangladesh	21,042	37,288	38,071	-	59,311
Norway - NORAD	35,730	-	-	-	-
Saudi Arabia	-	-	70,000	-	70,000
Sweden - SAREC	93,007	-	-	-	117,810
Switzerland	836,533	709,212	792,931	-	780,309
UNICEF	250,000	250,000	250,000	250,000	500,000
United Kingdom - ODA	520,290	253,410	-	230,302	206,448
United States - AID	1,000,000	300,000	275,000	250,000	500,000
Others	-	-	2,649	1,217	10,000
Total central funds --	3,048,219	1,764,606	1,645,544	857,844	2,367,115
Project Funds:					
Aga Khan Foundation	-	<69,582>	155,983	45,585	17,951
Australia	14,566	46,188	-	-	-
Arab Gulf Fund	-	235,440	-	250,000	-
BAYER AG	-	122,000	-	-	-
Belgium	500,121	137,104	193,880	243,045	114,739
BOSTID	-	19,337	23,221	28,425	22,170
Canada - CIDA	452,932	1,153,661	599,143	953,979	1,021,677
Case Western Reserve University	-	-	-	12,160	12,782
DANIDA	131,830	662,957	511,989	506,016	-
FAO	-	-	-	-	37,987
Ford Foundation	79,574	39,226	319,498	-	68,349
France	15,698	11,445	-	55,568	-
ICHF	10,000	-	-	-	-
IDRC	38,332	68,082	-	53,884	93,796
IBM	-	-	-	30,916	-
IBRD	-	25,110	184,000	174,753	78,863
Japan	380,000	380,000	310,000	295,176	320,000
KATON Hospital, Switzerland	-	9,880	-	-	-
Medecins Sans Frontieres	-	-	-	-	24,063
Miles Pharmaceuticals	-	-	-	107,822	47,399
Nestle	-	-	3,704	2,793	9,205
Netherlands	875,748	37,817	50,000	-	-
Norway - NORAD	164,014	395,913	308,291	459,364	427,827

continued....

Table 7 continued ...

Norwich Eaton Pharmaceuticals	-	-	-	12,086	22,500
OPEC	-	-	-	-	30,000
Population Council	-	-	-	13,438	5,352
Saudi Arabia	-	406,333	-	530,708	536,596
Sweden - SAREC	86,795	-	-	-	-
SKF	33,189	-	-	-	-
Searle France	-	15,000	15,000	-	-
Switzerland - SDC	779,805	446,696	-	136,920	-
UNDP/UNROB	-	-	-	-	43,571
UNDP - UVP	-	-	-	-	103,154
UNDP/WHO	300,000	300,000	-	300,000	388,000
UNICEF	37,401	6,000	57,580	193,665	335,480
United States - AID	2,420,006	4,653,206	3,786,737	3,189,544	3,167,627
WHO	271,290	175,814	201,563	195,040	88,104
Wellcome Trust	-	17,228	28,658	29,019	-
WUSC/CIDA	690,105	689,662	571,879	-	-
Flood Relief Funds	-	351,474	464,494	-	-
Others	11,213	20,376	7,323	17,720	18,661
Total project funds	7,292,619	10,359,367	7,792,943	7,837,626	7,035,853
Capital Funds:					
UNCDF	28,788	272,159	526,420	-	-
GRAND TOTAL	US\$ 10,369,626	12,396,132	9,964,907	8,695,470	9,402,968

ICDDR,B PUBLICATIONS 1990

A INTERNAL PUBLICATION SERIES:

- A1 ICDDR,B Annual Report, 1989. September 1990. 89 p.

Specialized Bibliography Series

- A2 Annotated bibliography of ICDDR,B studies in Matlab, Bangladesh, compiled by M Shamsul Islam Khan, M Motasem Ali, Malik M Abdul Quader and M M Hassan. Editor-in-Chief: D Habte. 1990. viii, 149 p. (Specialized bibliography series, 14)
- A3 Annotated bibliography on oral rehydration in diarrhoeal diseases, compiled by M Shamsul Islam Khan, M Motasem Ali, Malik M Abdul Quader and M M Hassan. Editor-in-Chief: Dilip Mahalanabis. 1990. vii, 121 p. (Specialized bibliography series, 15)

Journal and Newsletter

- A4 Journal of Diarrhoeal Diseases Research (also includes: Bibliography on Diarrhoeal Diseases). V. 7, nos. 3&4, 1989, and v. 8, nos. 1&2, 3-4, 1990.
- A5 Glimpse. V. 11, nos. 5&6, 1989, and v. 12, nos. 1-5, 1990.

B ORIGINAL SCIENTIFIC PAPERS (Including Short Reports/Communications):

- B1 Ahmed ZU, Sarker MR, Sack DA. Protection of adult rabbits and monkeys from lethal shigellosis by oral immunization with a thymine-requiring and temperature-sensitive mutant of *Shigella flexneri* Y. Vaccine 1990 Apr;8:153-8
- B2 Alam AN, Alam NH, Ahmed T, Sack DA. Randomised double blind trial of single dose doxycycline for treating cholera in adults. Br Med J 1990 Jun 23;300(6740):1619-21
- B3 Aziz KMA, Hoque BA, Hasan KZ, Patwary MY, Huttly SRA, Rahaman MM, Feachem RG. Reduction in diarrhoeal diseases in children in rural Bangladesh by environmental and behavioural modifications. Trans R Soc Trop Med Hyg 1990 May-Jun;84(3):433-8
- B4 Barja JL, Santos Y, Huq I, Colwell RR, Toranzo AE. Plasmids and factors associated with virulence in environmental isolates of *Vibrio cholerae* non-01 in Bangladesh. J Med Microbiol 1990 Oct;33(2):107-14
- B5 Bennish ML, Harris JR, Wojtyniak BJ, Struelens M. Death in shigellosis: incidence and risk factors in hospitalized patients. J Infect Dis 1990 Mar;161(3):500-6
- B6 Bennish ML, Azad AK, Rahman O, Phillips RE. Hypoglycemia during diarrhea in childhood; prevalence, pathophysiology, and outcome. N Engl J Med 1990 Apr;322(1C):1357-63
- B7 Bennish ML, Salani MA, Haider R, Barza M. Therapy for shigellosis. II. Randomized, double-blind comparison of ciprofloxacin and ampicillin. J Infect Dis 1990 Sep;162(3):711-6
- B8 Briend A, Hoque BA, Aziz KMA. Iron in tubewell water and linear growth in rural Bangladesh. Arch Dis Child 1990 Feb;65(2):224-5
- B9 Choe MK, Razzaque A. Effect of famine on child survival in Matlab, Bangladesh. Asia-Pacific Pop J 1990 Jun;5(2):53-72
- B10 Chowdhury MK, Gupta VM, Balragi R, Bhattacharya BN. Does malnutrition predispose to diarrhoea during childhood? Evidence from a longitudinal study in Matlab, Bangladesh. Eur J Clin Nutr 1990 Jul;44(7):515-25

- B11 Chowdhury MK, Khan NU, Wai L, Bairagi R. Sex differences and sustained excess in mortality among discordant twins in Matlab, Bangladesh: 1977-1985. *Int J Epidemiol* 1990 Jun;19(2):387-90
- B12 Chowdhury MK, Bairagi R. Son preference and fertility in Bangladesh. *Pop Dev Rev* 1990 Dec;16(4):749-57
- B13 Clemens JD, Sack DA, Harris JR, Khan MR, Chakraborty J, Chowdhury S, Rao MR, van Loon FPL, Stanton BF, Yunus M, Ali M, Ansaruzzaman M, Svennerholm A-M, Holmgren J. Breast feeding and the risk of severe cholera in rural Bangladeshi children. *Am J Epidemiol* 1990 Mar;131(3):400-11
- B14 Clemens JD, Sack DA, Chakraborty J, Rao MR, Ahmed F, Harris JR, van Loon F, Khan MR, Yunus M, Huda S, Kay BA, Svennerholm A-M, Holmgren J. Field trial of oral cholera vaccines in Bangladesh: evaluation of anti-bacterial and anti-toxic breast-milk immunity in response to ingestion of the vaccines. *Vaccine* 1990 Oct;8(5):469-72
- B15 Clemens JD, Sack DA, Harris JR, van Loon F, Chakraborty J, Ahmed F, Rao MR, Khan MR, Yunus M, Huda N, Stanton BF, Kay BA, Walter S, Eeckels R, Svennerholm A-M, Holmgren J. Field trial of oral cholera vaccines in Bangladesh: results from three-year follow-up. *Lancet* 1990 Feb 3;335(8684):270-3
- B16 Clemens JD, Svennerholm A-M, Harris JR, Huda S, Rao M, Neogy PK, Khan MR, Ansaruzzaman M, Rahaman S, Ahmed F, Sack D, van Loon F, Holmgren J. Seroepidemiologic evaluation of anti-toxic and anti-colonization factor immunity against infections by LT-producing *Escherichia coli* in rural Bangladesh. *J Infect Dis* 1990 Aug;162(2):448-53
- B17 Fauveau V, Wojtyniak B, Chakraborty J, Sarder AM, Briend A. The effect of maternal and child health and family planning services on mortality: is prevention enough? *Br Med J* 1990 Jul 14;301(6743):103-7
- B18 Fauveau V, Wojtyniak B, Mostafa G, Sarder AM, Chakraborty J. Perinatal mortality in rural Bangladesh: a community-based study. *Int J Epidemiol* 1990 Sep;19(3):606-12
- B19 Fauveau V. Surve des enfants et des meres au Bangladesh: peut-on faire plus? *Population* 1990 Nov-Dec;45(6):1075-83
- B20 Hak'er K, Azad AK, Qadri F, Nahar S, Ciznar I. Role of plasmids in virulence-associated attributes and in O-antigen expression in *Shigella dysenteriae* type 1 strains. *J Med Microbiol* 1990 Sep;33(1):1-9
- B21 Halder K, Chatkaeomorakot A, Kay BA, Talukder KA, Taylor DN, Echeverria P, Sack DA. Trimethoprim resistance gene in *Shigella dysenteriae* 1 isolates obtained from widely scattered locations of Asia. *Epidemiol Infect* 1990 Apr;104(2):219-28
- B22 Hall A, Romanova T. *Ascaris lumbricoides*: detecting its metabolites in the urine of infected people using gas-liquid chromatography. *Exp Parasitol* 1990 Jan;70(1):35-42
- B23 Haque R, Hall A, Tzipori S. Zymodemes of *Entamoeba histolytica* in Dhaka, Bangladesh. *Ann Trop Med Parasitol* 1990 Dec;84(6):629-32
- B24 Henry FJ, Patwary Y, Huttly SRA, Aziz KMA. Bacterial contamination of weaning foods and drinking water in rural Bangladesh. *Epidemiol Infect* 1990 Feb;104(1):79-85
- B25 Henry F, Briend A, Fauveau V. Child survival: should the strategy be redesigned? Experience from Bangladesh. *Health Pol Plann* 1990 Sep;5(3):226-34
- B26 Henry FJ, Huttly SRA, Patwary Y, Aziz KMA. Environmental sanitation, food and water contamination and diarrhoea in rural Bangladesh. *Epidemiol Infect* 1990 Apr;104(2):253-9
- B27 Henry FJ, Rahim Z. Transmission of diarrhoea in two crowded areas with different sanitary facilities in Dhaka,

- Bangladesh. J Trop Med Hyg 1990 Apr;93(2):121-6
- B28 Hlady WG, Islam MN, Wahab MA, Johnson SD, Waiz A, Krawczynski KZ. Enterically transmitted non-A, non-B hepatitis associated with an outbreak in Dhaka: epidemiology and public health implications. Trop Doct 1990 Jan;20(1):15-7
- B29 Hossain MA, Albert MJ, Hasan KZ. Epidemiology of shigellosis in Teknaf, a coastal area of Bangladesh: a ten-year survey. Epidemiol Infect 1990 Aug;105(1):41-50
- B30 Huq F, Rahman M, Nahar N, Alam A, Haque M, Sack DA, Butler T, Haider R. Acute lower respiratory tract infection due to virus among hospitalized children in Dhaka, Bangladesh. Rev Infect Dis 1990 Nov-Dec;12(suppl 8):S982-7
- B31 Islam MS. Effect of various biophysicochemical conditions on toxigenicity of *Vibrio cholerae* O1 during survival with a green alga, *Rhizoclonium fontanum*, in an artificial aquatic environment. Can J Microbiol 1990 Jul;36(7):464-8
- B32 Islam MS. Increased toxin production of *Vibrio cholerae* O1 during survival with a green alga, *Rhizoclonium fontanum*, in an artificial aquatic environment. Microbiol Immunol 1990;34(7):557-63
- B33 Islam MS, Drasar BS, Bradley DJ. Long-term persistence of toxigenic *Vibrio cholerae* O1 in the mucilaginous sheath of a blue-green alga, *Anabaena variabilis*. J Trop Med Hyg 1990 Apr;93(2):133-9
- B34 Islam MS, Drasar BS, Bradley DJ. Survival of toxigenic *Vibrio cholerae* O1 with a common duckweed, *Lemna minor*, in artificial aquatic ecosystems. Trans R Soc Trop Med Hyg 1990 May-Jun;84(3):422-4
- B35 Khan MSI, Ahmed Z, Akhter N. Health sciences libraries and information services in Bangladesh. Bull Med Libr Assoc 1990 Oct;78(4):370-5
- B36 Khan MU, Alam AN, Rahman N. Impact of acute diarrhoea on parasite loads. Trop Med Parasitol 1990;4:163-4
- B37 Khan MU. Survival of *Vibrio cholerae* in soil and its possible relevance to cholera outbreak. Bangladesh J Microbiol 1990 Jun;7(1):1-4
- B38 Koenig MA, Phillips JF, Campbell OM, D'Souza S. Birth intervals and childhood mortality in rural Bangladesh. Demography 1990 May;27(2):251-65
- B39 Koenig MA, Khan MA, Wojtyniak B, Clemens JD, Chakraborty J, Fauveau V, Phillips JF, Akbar J, Barua US. Impact of measles vaccination on childhood mortality in rural Bangladesh. Bull WHO 1990;68(4):441-7
- B40 Kofoed P-EL, Nielsen B, Rahman AKSM. Immunisation in a curative setting. Br Med J 1990 Sep 22;301(6752):593-4
- B41 Kofoed P-EL, Sorensen N. [Preventive health education in a diarrhoea centre]. Ugeskrift for Laeger 1990;1616-8
- B42 Mitra AK, Rabbani GH. A double-blind, controlled trial of Bioflorin (*Streptococcus faecium* SF68) in adults with acute diarrhea due to *Vibrio cholerae* and enterotoxigenic *Escherichia coli*. Gastroenterology 1990 Oct;99(4):1149-52
- B43 Mitra AK, Engleberg NC, Glass RI, Chowdhury MK. Fatal dysentery in rural Bangladesh. J Diarrhoeal Dis Res 1990 Mar&Jun;8(1&2):12-7
- B44 Mozumder ABMKA, Koenig MA, Phillips JF, Murad S. The sample registration system: an innovative system for monitoring demographic dynamics. Asia-Pacific Pop J 1990 Dec;5(4):63-72
- B45 Nord J, Ma P, Djohan D, Tzipori S, Tacket CO. Treatment with bovine hyperimmune colostrum of cryptosporidial diarrhea in AIDS patients. AIDS 1990 Jun;4(6):581-4
- B46 Parveen S, Huq A. Enterotoxicity of *Aeromonas* spp. isolated from environmental sources. Bangladesh J Microbiol 1990 Dec;7(2):89-93

- B47 Patra FC, Rahman ASMH, Wahed MA, Al-Mahmud KA. Enhanced sodium absorption by citrate: an *in vivo* perfusion study of rat small intestine. *J Pediatr Gastroenterol Nutr* 1990 Oct;11(3):385-8
- B48 Qadri F, Raqib R, Husain IA, Ciznar I. Cell surface proteins from *Shigella - dysenteriae* type 1. *Zentl Bakteriol Mikrobiol Hyg. Series A* 1990;273(3):287-9
- B49 Rahman ASMM, Bari A. Feasibility of home treatment of diarrhoea with packaged rice-ORS. *J Diarrhoeal Dis Res* 1990 Mar&Jun;8(1&2):18-23
- B50 Rahman M, Huq F, Sack DA, Butler T, Azad AK, Alam A, Nahar N, Islam M. Acute lower respiratory tract infections in hospitalized patients with diarrhea in Dhaka, Bangladesh. *Rev Infect Dis* 1990 Nov-Dec;12(suppl 8):S899-906
- B51 Rahman M, Shahid NS, Rahman H, Sack DA, Rahman N, Hossain S. Cryptosporidiosis: a cause of diarrhea in Bangladesh. *Am J Trop Med Hyg* 1990 Feb;42(2):127-30
- B52 Rahman MM, Wahed MA, Ali MA. β -Carotene losses during different methods of cooking green leafy vegetables in Bangladesh. *J Food Comp Analysis* 1990;3:47-53
- B53 Razzaque A, Alam N, Wai L, Foster A. Sustained effects of the 1974-5 famine on infant and child mortality in a rural area of Bangladesh. *Pop Stud* 1990 Mar;44(1):145-54
- B54 Razzaque A, Ahmed K, Wai L. Twinning rates in a rural area of Bangladesh. *Human Biol* 1990 Aug;62(4):505-14
- B55 Roy SK, Halder R, Akbar MS, Alam AN, Khatun M, Eeckels R. Persistent diarrhoea: clinical efficacy and nutrient absorption with a rice based diet. *Arch Dis Child* 1990 Mar;65(3):294-7
- B56 Sethabutr O, Unicomb LE, Holmes IH, Taylor DN, Bishop RF, Echeverria P. Serotyping of human group A rotavirus with oligonucleotide probes. *J Infect Dis* 1990 Aug;162(2):368-72
- B57 Shaikh K. Marriage and mortality: a life table analysis. *J Biosoc Sci* 1990 Jan;22(1):53-61
- B58 Shaikh K, Wojtyniak B, Mostafa G, Khan MU. Pattern of diarrhoeal deaths during 1965-1987 in a demographic surveillance area in rural Bangladesh. *J Diarrhoeal Dis Res* 1990 Dec;8(4):147-54
- B59 Shireen T, Sarker MR, Ahmed ZU. Studies on transformation in *Shigella*. *Can J Microbiol* 1990 May;36(5):348-51
- B60 Siddique AK, Mutsuddy P, Islam Q, Majumder Y, Akram K, Zaman K. Make-shift treatment centre during a cholera epidemic in Bangladesh. *Trop Doct* 1990 Apr;20(2):83-5
- B61 Simmer K, Ahmed S, Carlsson L, Thompson RPH. Breast milk zinc and copper concentrations in Bangladesh. *Br J Nutr* 1990 Jan;63(1):91-6
- B62 Simmons R, Koenig MA, Huque AAZ. Maternal-child health and family planning: user perspectives and service constraints in rural Bangladesh. *Stud Fam Plann* 1990 Jul/Aug;21(4):187-96
- B63 Stanton BF, Clemens JD, Ahmed S. Methodological considerations in defining chronic diarrhoea using a distributional approach. *Int J Epidemiol* 1990 Jun;19(2):439-43
- B64 Stewart MK, Fauveau V, Chakraborty J, Briand A, Yunus M, Sarder AM. Post-flood nutritional anthropometry of children in Matlab, Bangladesh. *Ecol Food Nutr* 1990;24:121-31
- B65 Struelens MJ, Mondal G, Roberts M, Williams PH. Role of bacterial and host factors in the pathogenesis of *Shigella* septicemia. *Eur J Clin Microbiol Infect Dis* 1990 May;9(5):337-44
- B66 Tamplin ML, Gauzens AL, Huq A, Sack DA, Colwell RR. Attachment of *Vibrio cholerae* serogroup O1 to zooplankton and phytoplankton of Bangladesh waters. *Appl Environ Microbiol* 1990 Jun;56(6):1977-80
- B67 van Loon FPL, van Schaik S, Banik AK,

- Ahmed T, Zaman A, Kay BA. *Clostridium perfringens* type-C in bloody and watery diarrhoea in Bangladesh. *Trop Geogr Med* 1990 Apr;42(2):123-7
- B68 van Loon FPL, Clemens JD, Shahrier M, Sack DA, Stephensen CB, Khan MR, Rabbani GH, Rao MR, Banik AK. Low gastric acid as a risk factor for cholera transmission: application of a new non-invasive gastric acid field test. *J Clin Epidemiol* 1990;43(12):1361-7
- B69 Ward RL, Nakagomi O, Knowlton DR, McNeal MM, Nakagomi T, Clemens JD, Sack DA, Schiff GM. Evidence for natural reassortants of human rotaviruses belonging to different genogroups. *J Virol* 1990 Jul;64(7):3219-25
- C REVIEW ARTICLES, PROCEEDINGS, MONOGRAPHS, BOOK CHAPTERS, ETC.**
- C1 Aziz KMA, Hoque BA, Huttly SRA, Minnatullah KM, Hasan Z, Patwary MK, Rahaman MM, Cairncross S. Water supply, sanitation and hygiene education: report of a health impact study in Mirzapur, Bangladesh. New York: International Bank for Reconstruction and Development/World Bank, 1990. xiii, 91 p. (Water and sanitation report series, 1)
- C2 Bhuiya A, Streatfield K, Meyer P. Mothers' hygienic awareness, behaviour and knowledge of major childhood diseases in Matlab, Bangladesh. *In: Caldwell J, Findley S, Caldwell P, Santow G, Cosford W, Braid J, Broers-Freeman D, eds. What we know about health transition: the cultural, social and behavioural determinants of health; proceedings of an International Workshop, Canberra, May 1989, v. 1. Canberra: Health Transition Centre, The Australian National University, 1990:462-77*
- C3 Chowdhury AI, Aziz KMA, Fauveau V. Recent trend in contraceptive use prevalence and fertility in Matlab, rural Bangladesh. *In: Proceedings of paper presented in the Third National Conference - 1988. Dhaka: Bangladesh Population Association, 1989:156-65**
- C4 Chowdhury AI, Banu LA, Aziz KMA, Huq AMM, Chowdhury AMR. Effectiveness of a nutrition education program in rural Bangladesh. Dhaka: Program for the Introduction & Adaptation of Contraceptive Technology, Bangladesh, 1990. 84 p.
- C5 Chowdhury AY, Bhuiya A. Periodic crisis, public health intervention and severe malnutrition among children in rural area of Bangladesh. Dhaka: Program for the Introduction & Adaptation of Contraceptive Technology, Bangladesh, 1990. 15 p.
- C6 Chowdhury MK, Bairagi R. Effect of parental sex preference on fertility in Bangladesh: hypothesis and data. *In: Selected statistics and indicators on demographic and socio-economic situation of women in Bangladesh; proceedings of a national workshop, Dhaka, 29-30 May 1989. Dhaka: Bangladesh Bureau of Statistics, 1989:85-95**
- C7 Duza MB. The conditions of fertility transition in East and South-east Asia and prospects for the 1990s. *In: Proceedings of the International Population Conference, New Delhi, 20-27 September 1989, v. 1. Liege: International Union for the Scientific Study of Population, 1989:3-13**
- C8 Habte D, Strong M. Matlab-based research: an introduction. *In: Annotated bibliography of ICDDR,B studies in Matlab, Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1990:1-9 (Specialized bibliography series, 14)*
- C9 Hoque BA, Aziz KMA, Hasan KZ, Patwary Y. Rural women in sanitation programme. *In: Infrastructure for low-income communities; proceedings of the 16th WEDC Conference, Hyderabad, 27-31 August 1990 (pre-prints). Leicestershire: Water Engineering and Development Centre, Loughborough University of Technology, 1990:37-9*
- C10 Huq F, Ahmed ZU. Feasibility study of vaccine production in Bangladesh. *In: Sack DA, Freij L, eds. Prospects for public health benefits in developing*

*Not listed in earlier annual reports

- countries from new vaccines against enteric infections; a SAREC research symposium, held in Gothenburg, Sweden, 28-29 May 1990. Gothenburg: Swedish Agency for Research Cooperation, 1990:208-12
- C11 Islam A. Giardiasis in developing countries. *In*: Meyer EA, ed. Giardiasis; human parasitic diseases, v. 3. Amsterdam: Elsevier, 1990:236-64
- C12 Khan MSI. A diarrhoeal disease information centre in Bangladesh: a centre of excellence for the Muslim World and other developing countries. *In*: The Third Congress of Muslim Librarians and Information Scientists (COMLIS III), 24-26 May 1989, Istanbul, Turkey: Papers. Ankara: Ministry of Culture, 1989:91-104 (Librarianship series, 15)*
- C13 Khan MSI. Role of new information technology in dissemination of information during natural disasters. *In*: Ahsanullah AKM, Khan MSI, Ghani MO, Satter MA, eds. Proceedings of the Seminar on the Impact of Information and Documentation Towards Mitigation of Natural Disaster, 7-8 January 1989. Dhaka: Bangladesh National Scientific and Technical Documentation Centre, 1989:109-14*
- C14 Koenig MA, Khan MA, Wojtyniak B, Clemens JD, Chakraborty J, Fauveau V, Phillips JF, Akbar J, Barua US. The impact of measles vaccination on childhood mortality in Matlab, Bangladesh. New York: Population Council, 1990. 20 p. (Working papers, 3)
- C15 Koenig MA, Fauveau V, Wojtyniak B. Potential reductions in childhood mortality through immunisation programmes: evidence from Matlab, Bangladesh. *In*: Proceedings of the International Population Conference, New Delhi, 20-27 September 1989, v. 1. Liege: International Union for the Scientific Study of Population, 1989:433-48*
- C16 Lindenbaum S. Maternal education and health care processes in Bangladesh: the health and hygiene of the middle classes. *In*: Caldwell J, Findley S, Caldwell P, Santow G, Cosford W, Braid J, Broers-Freeman D, eds. What we know about health transition: the cultural, social and behavioural determinants of health; proceedings of an International Workshop, Canberra, May 1989, v. 1. Canberra: Health Transition Centre, The Australian National University, 1990:425-40
- C17 Mahalanabis D. Improved ORS formulations. *J Diarrhoeal Dis Res* 1990 Mar&Jun;8(1&2):1-11
- C18 Mahalanabis D. Oral rehydration for diarrhoeal diseases: an introduction. *In*: Annotated bibliography on oral rehydration in diarrhoeal diseases. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1990:1-4 (Specialized bibliography series, 15)
- C19 Mitra AK. Shigellosis: a continuing health problem in Bangladesh. *Bangladesh Private Med Pract J* 1990 Jul;1(2):91-6
- C20 Molla AM, Molla A, Khatun N, Khatun M. Feeding in diarrhea during the acute stage and after recovery: experience in developing countries. *In*: Lifschitz CH, Nichols BL, eds. Malnutrition in chronic diet-associated infantile diarrhea: diagnosis and management. San Diego: Academic Press, 1990:293-303
- C21 Molla AM, Molla A, Bari A. Role of glucose polymer (cereal) in oral rehydration therapy. *Clin Ther* 1990;12(suppl A):113-21
- C22 Mostafa AH, Khan MSI. Future approaches and prospects of computerised information network among the countries of South Asian Association for Regional Co-operation (SAARC). *Sekitar Perpustakaan (Perpustakaan Negara Malaysia)* 1989;(13):23-6*
- C23 Mozumder BMKA, Murad S, Koenig MA. Levels and trends in fertility and mortality in two rural areas of Bangladesh. *In*: Proceedings of the Third National Conference-1988. Dhaka: Bangladesh Population Association, 1989:244-53*
- C24 Phillips JF, Hossain MB, Huque AAZ, Akbar J. A case study of contraceptive introduction: domiciliary depot-medroxy

- progesterone acetate services in rural Bangladesh. *In*: Segal SJ, Tsul AO, Rogers SM, eds. Demographic and programmatic consequences of contraceptive innovations. New York: Plenum, 1990:227-48
- C25 Phillips JF, Hossain MB, Koblinsky MA. Improving the climate of choice: the effect of organizational change on contraceptive behavior in rural Bangladesh. *In*: Bulatao RA, Palmore JA, Ward SE, eds. Choosing a contraceptive: factors in method choice in Asia and the United States. Boulder: Westview Press, 1989:212-33*
- C26 Rabhani GH, Greenough WB, III. Cholera. *In*: Leberthal E, Duffey M, eds. Textbook of secretory diarrhoea. New York: Raven Press, 1990:233-53
- C27 Rahman ASMM. Diarrhoea: treatment and prevention. *In* Touch 1990 Mar;9(94):3-5
- C28 Rcb AKU. Regional variation of fertility in Bangladesh: an application of proximate determinants framework. *In*: Proceedings of the Third National Conference-1988. Dhaka: Bangladesh Population Association, 1989:136-55*
- C29 Roy SK, Halder R, Tomkins AM, Behrens RH. Effect of systemic infection on intestinal permeability in Bangladeshi children with persistent diarrhoea. *In*: Lifschitz CH, Nichols BL, eds. Malnutrition in chronic diet-associated infantile diarrhoea: diagnosis and management. San Diego: Academic Press, 1990:385-9
- C30 Roy SK, Akramuzzaman SM. Understanding and management of persistent diarrhoea. Bangladesh Private Med Pract J 1990 Apr;1(1):25-33
- C31 Tzipori S. Rotavirus vaccine for children in 1990s? Dhaka Shishu (Child) Hosp J 1990 Jun;6(1):5-7
- D **ABSTRACTS, LETTERS, EDITORIALS, ANNOTATIONS, ETC.**
- D1 Alam N, Wai L. Birth interval and infant and child mortality, is age at death of the previous child important? [abstract]. *In*: Souvenir; VIII Annual Convention of the Indian Society for Medical Statistics, Vellore, 1-3 November 1990. Vellore: Christian Medical College, 1990:34-5
- D2 Albert MJ, Kibriya AKMG, Tzipori S. Reliability of colony characteristics on MacConkey agar to identify *Escherichia coli* for epidemiological investigations [letter]. J Diarrhoeal Dis Res 1990 Dec;8(4):166-7
- D3 Behrens RH, Tomkins AM, Roy SK. Zinc supplementation during diarrhoea, a fortification against malnutrition [letter]. Lancet 1990 Aug 18;336(8712):442-3
- D4 Bennish M, Azad AK, Rahman O, Phillips RE. Hypoglycemia during diarrhoea in childhood [reply]. N Engl J Med 1990 Oct 4;323(14):1000-1
- D5 Briand A, Hasan KZ, Aziz KMA, Hoque B. Diarrhoea and catch-up growth [reply]. Lancet 1990 May 12;335(8698):1157-8
- D6 Chowdhury AI, Aziz KMA, Fauveau V. Recent trend of contraceptive use prevalence, crude birth, infant and child mortality rates in Matlab, rural Bangladesh [abstract]. *In*: Abstracts; proceedings of the Seventh Annual Conference of the Indian Society for Medical Statistics, Varanasi, 1-3 February 1990:57
- D7 Chowdhury AI, Aziz KMA, Fauveau V. Seasonality of contraceptive acceptance and discontinuation in Matlab, rural Bangladesh [abstract]. *In*: Souvenir; VIII Annual Convention of the Indian Society for Medical Statistics, Vellore, 1-3 November 1990. Vellore: Department of Biostatistics, Christian Medical College, 1990:33
- D8 Haque R, Hall A, Tzipori S. Cellulose acetate electrophoresis of isoenzymes from *E. histolytica* isolates (abstract). *In*: Programme and abstracts; proceedings of the Symposium on Amoebiasis, New Delhi, 14-16 December 1990.
- D9 Hlady WG. Enterically transmitted non-A, non-B hepatitis associated with an outbreak in Dhaka [reply]. Trop Doct 1990 Jul;20(3):130

- D10 Hoque BA, Aziz KMA, Hasan KZ. Differential impacts of a rural water-sanitation project in Bangladesh [abstract]. *In: Abstracts; proceedings of the 12th Scientific Meeting of the International Epidemiological Association, 5-9 August 1990. Los Angeles: International Epidemiological Association, 1990:101*
- D11 Mita R, Whittaker M. Listening to the women: an attempt to measure "Felt need" for maternity care. *WIPHN Newslett 1990 Spring;1:5*
- D12 Mitra AK, Khan MR, Alam AN. Non-diarrhoeal problems in a diarrhoeal hospital [abstract]. *In: Islam S, Amin R, eds. Saranika; proceedings of the 9th National Conference of the Bangladesh Paediatric Association, Dhaka, 15-17 March 1990. Dhaka: Bangladesh Paediatric Association, 1990:14*
- D13 Mitra AK, Kabir I, Hossain MA. Plymecillinam-resistant *Shigella dysenteriae* type 1 infection in Bangladesh [letter]. *Lancet 1990 Jun 16;335(8703):1461-2*
- D14 Mostafa G, Fauveau V, Wojtyniak B, Foster A. The influence of socio-biological factors on perinatal mortality in a rural area of Bangladesh [abstract]. *In: Souvenir; VIII Annual Convention of the Indian Society for Medical Statistics, Vellore, 1-3 November 1990. Vellore: Department of Biostatistics, Christian Medical College, 1990:34*
- D15 Rabbani GH, Lebenthal E, Horvat P. Chloride channel blocker (anthracene-9-carboxylic acid) and glucose polymer inhibit water and electrolyte secretion induced by dBcAMP in the small intestine of rat [abstract]. *In: Islam S, Amin R, eds. Saranika; proceedings of the 9th National Conference of the Bangladesh Paediatric Association, Dhaka, 15-17 March 1990:3*
- D16 Rahim Z, Aziz KMS. Suspected role of *Aeromonas* spp. in causing ulceration in fish. *In: Abstracts; proceedings of the Seventh National Conference of the Zoological Society of Bangladesh, Dhaka, 17-20 January 1990. Dhaka: Zoological Society of Bangladesh, 1990:20*
- D17 Rahman ASMM. Neutral fat in stool as clinical indicator of rotavirus diarrhoea in under-five children [letter]. *J Trop Pediatr 1990 Oct;36(5):265*
- D18 Roy SK, Haider R, Akramuzzaman SM, Behrens R, Tomkins A. Relationship between nutritional status and urinary excretion of lactulose and mannitol among Bangladeshi children with persistent diarrhoea syndrome (PDS) [abstract]. *Gut 1990 May;31(5):A609*
- D19 Shaikh K, Strong MA. Level of mortality and population growth of Bangladesh [abstract]. *In: Souvenir; VIII Annual Convention of the Indian Society for Medical Statistics, Vellore, 1-3 November 1990. Vellore: Christian Medical College, 1990:42*
- D20 van Loon FPL. Acute diarrhoea in expatriates in Bangladesh [reply]. *Gut 1990 Jan;31(1):123*

APPENDIX A

**AUDITORS' REPORT
TO THE BOARD OF TRUSTEES OF
INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH**

We have examined the Balance Sheet of International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) as of December 31, 1990 and the related statement of Income and Expenditure (Operating Fund) for the year then ended which are in agreement with the books of account maintained by the Centre and produced to us. Our examination was made in accordance with generally accepted auditing standards and, accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion and to the best of our information and according to the explanations given to us, the Balance Sheet and the Statement of Income and Expenditure together with the notes attached thereto, present respectively a true and fair view of the state of affairs of the Centre as at December 31, 1990 and the results of its operations for the year then ended.



HODA VASI CHOWDHURY & CO.
Chartered Accountants



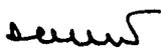
DELOITTE HASKINS & SELLS
Chartered Accountants

Dhaka, March 27, 1991

**INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH
BALANCE SHEET AS AT DECEMBER 31, 1990**

	Notes	<u>1990</u>	<u>1989</u>
FIXED ASSETS: Cost less accumulated depreciation	(3)	3,504,041	4,067,149
CURRENT ASSETS:			
Stock of stores and spares	(4)	450,766	472,415
Contributions receivable from donors	(5)	597,582	906,872
Advances, deposits and prepayments	(6)	300,899	436,890
Deposits with Banks against Reserve Fund	(7)	1,978,248	1,819,073
Cash and bank balances	(8)	3,059,984	966,022
		<u>6,387,479</u>	<u>4,601,272</u>
LESS: CURRENT LIABILITIES:			
Interest free loan	(9)	1,186,080	1,186,080
Contributions paid in advance by donors	(5)	2,157,947	1,063,897
Other current liabilities & Provisions	(10)	1,618,660	1,623,026
		<u>4,962,687</u>	<u>3,873,003</u>
NET CURRENT ASSETS		<u>1,424,792</u>	<u>728,269</u>
	US\$	<u>4,928,833</u>	<u>4,795,418</u>
FINANCED BY:			
Capital Development Fund	(11)	8,770,216	8,411,651
Operating Fund	(12)	(6,108,030)	(5,435,306)
Reserve Fund	(13)	1,978,248	1,819,073
Capital Development Reserve Fund	(14)	288,429	-
		<u>US\$ 4,928,833</u>	<u>4,795,418</u>

THE ATTACHED NOTES 1 TO 18 CONSTITUTE AN INTEGRAL PART OF THESE ACCOUNTS



Director
ICDDR,B



Member
Board of Trustees

This is the Balance Sheet referred to in our report of same date.



HODA VASI CHOWDHURY & CO.
Chartered Accountants



DELOITTE HASKINS & SELLS
Chartered Accountants

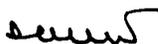
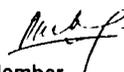
Dhaka, March 27, 1991

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

STATEMENT OF INCOME AND EXPENDITURE (OPERATING FUND)
FOR THE YEAR ENDED DECEMBER 31, 1990

INCOME	NOTES	1990	1989
Contributions	(5)	8,921,663	11,797,755
LESS:			
Transferred to Capital Development Fund to the extent of capital expenditure	(11)	309,777	912,310
		<u>8,611,886</u>	<u>10,885,445</u>
ADD:			
Exchange gains		135,153	53,807
Other receipts		318,492	318,829
		<u>9,065,531</u>	<u>11,258,081</u>
EXPENDITURE			
Personnel salaries & benefits - local		5,144,707	6,501,523
Personnel salaries & benefits - international		1,108,329	1,480,027
Consultancy - Local & International		106,488	237,000
Mandatory Committee Meetings	(16)	94,928	128,428
Travel		177,014	350,272
Supplies and materials		801,265	1,226,072
Repairs and maintenance		78,027	89,984
Rent, communication & public utilities		305,277	322,984
Printing and publications		108,265	157,397
Other contractual services		660,515	797,287
		<u>8,584,815</u>	<u>11,290,974</u>
Surplus/(Deficit) before depreciation		480,716	(32,893)
LESS:			
Provision for Depreciation	(3)	(865,041)	(1,045,288)
DEFICIT OF INCOME OVER EXPENDITURE FOR THE YEAR	US\$	<u><u>(384,325)</u></u>	<u><u>(1,078,181)</u></u>

THE ATTACHED NOTES 1 TO 18 CONSTITUTE AN INTEGRAL PART OF THESE ACCOUNTS

Director
ICDDR,BMember
Board of Trustees

This is the Statement of Income and Expenditure referred to in our report of same date.

HODA VASI CHOWDHURY & CO.
Chartered AccountantsDELOITTE HASKINS & SELLS
Chartered Accountants

Dhaka, March 27, 1991

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

STATEMENT OF SOURCES AND APPLICATIONS OF FUNDS
FOR THE YEAR ENDED DECEMBER 31, 1990

	<u>1990</u>	<u>1989</u>
SOURCES		
* Net Operating Surplus/(Deficit)	509,464	(30,840)
Increase in Capital Fund		
- Donors' Contribution utilised for capital expenditure	309,777	912,310
- UNCDF Restricted fund for construction of hospital at Matlab:		
- Cash	48,788	258,266
- In kind	-	13,893
	358,565	1,184,469
Increase in Reserve Fund		
- Interest received on time deposits	80,596	71,663
- Interest accrued on time deposits	78,579	77,684
	159,175	149,347
* Proceeds of fixed assets	2,958	1,837
	US\$ 1,030,162	1,304,313
	<u>1,030,162</u>	<u>1,304,313</u>
APPLICATIONS		
Additions to fixed assets	260,738	831,954
Increase in capital work-in progress	72,901	342,897
Increase in net current assets	696,523	129,962
	US\$ 1,030,162	1,304,813
	<u>1,030,162</u>	<u>1,304,813</u>
* CALCULATION OF NET OPERATING SURPLUS/(DEFICIT)		
Deficit appearing in the Statement of Income and Expenditure (Operating Fund)	(384,325)	(1,078,181)
Add - Depreciation charge for the year	865,041	1,045,288
- Loss on sale of fixed assets	28,748	2,053
	US\$ 509,464	(30,840)
	<u>509,464</u>	<u>(30,840)</u>

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

NOTES TO THE ACCOUNTS FOR THE YEAR ENDED DECEMBER 31, 1990

1. NATURE OF ACTIVITIES

The International Centre for Diarrhoeal Disease Research, Bangladesh (here-in-after referred to as the "Centre") was established in 1978 by an Ordinance of the Government of The People's Republic of Bangladesh to provide for the establishment of an international centre in Bangladesh with multinational scientific collaboration and financial contribution to conduct research in diarrhoeal diseases and directly related subjects of nutrition and fertility with special relevance to developing countries and for matters ancillary thereto. The activities of the centre are mainly funded by various Governments and international organisations.

2. SIGNIFICANT ACCOUNTING POLICIES

- i) These accounts have been prepared on a going concern basis and in accordance with generally accepted accounting principles on historical cost convention.
- ii) The Statement of Income and Expenditure and the Balance Sheet of the centre are prepared in the manner as prescribed and approved by the Board of Trustees.
- iii) "Income" and "Expenditure" of the Centre for the year have been accounted for on an accrual basis except "other receipts" which are accounted for on cash receipt basis in conformity with the past practice.
- iv) Contributions have been considered as income on the following bases.
 - (a) Core Funds have been accrued to the extent they relate to current period and those pertaining to future period have been carried forward.
 - (b) Project Funds received during the year but not expended have been carried forward as contributions received in advance. Correspondingly, amounts equal to the expenses incurred but not yet reimbursed by donors have been treated as contributions receivable. Project funds include overhead recoveries at the rate provided for in the various Donor agreements.
- v) Other receipts mainly includes fees and charges for services provided to staff and third parties.
- vi) Grants by way of various services rendered by the various Donor agencies and those directly paid by Donor(s) to other organisation(s) and those directly paid to other institutions have not been considered in these accounts.
- vii) Fixed assets acquired up to August 1981 have been brought to account at material cost only. Subsequent to that date incidental expenses such as labour, freight, insurance etc. (excluding clearing charges) have also been taken into consideration in arriving at the cost of fixed assets.
Depreciation on fixed assets has been charged on the "Straight Line" method based on the estimated effective span of life of such assets.
- viii) Stores and spares are valued at invoice price. Stores and spares issued to Service Centres other than those issued to Matlab Health Complex which are expensed and the stock of such items remaining unconsumed at the year-end considered immaterial are not included in the closing stock.
- ix) Currency conversion of non-US currencies to US Dollars: a) Advances, liabilities (except interest free loan), cash and bank balances are translated into US Dollar at the prevailing year-end exchange rates. b) All items other than those stated under (a) above are translated into US Dollar at the rates of exchange prevailing at the beginning of that month.
- x) All assets costing US\$50 or below have been depreciated in full by way of one time depreciation charge.

3. FIXED ASSETS

PARTICULARS	C O S T				D E P R E C I A T I O N				Net Book value as at December 31, 1990
	At January 1, 1990	Additions during the year	Disposals/ adjustments during the year	At December 31, 1990	At January 1, 1990	Charge for the year	Adjustments during the year	At December 31, 1990	
Land	71,362			71,362					71,362
Buildings	1,955,979	34,010	36,556	1,953,433	437,418	105,498	7,296	535,620	1,417,813
Vehicles	626,154	13,324	639,478	444,050	61,444			505,494	133,984
Furniture	416,015	21,873	19,772	418,116	337,101	54,354	17,358	374,099	44,017
Equipment	4,411,634	191,531	2,127	4,601,038	3,025,632	643,745	2,097	3,687,280	933,758
Capital Work in progress	830,206	60,388	87,487	903,107					903,107
1990 US\$	<u>8,311,350</u>	<u>421,126</u>	<u>145,942</u>	<u>8,586,534</u>	<u>4,244,201</u>	<u>865,041</u>	<u>26,749</u>	<u>5,082,492</u>	<u>3,504,041</u>
1989 US\$	<u>7,219,902</u>	<u>1,261,330</u>	<u>169,882</u>	<u>8,311,350</u>	<u>3,278,426</u>	<u>1,045,288</u>	<u>79,513</u>	<u>4,244,201</u>	<u>4,067,149</u>

i) Two plots of land measuring 4.10 and 0.51 acres situated at Mohakhall (Dhaka) and Matlab (Chandpur) received as donations from the Government of the People's Republic of Bangladesh and a private individual respectively have not been valued and therefore not incorporated in these accounts.

ii) Cost of buildings includes an amount of US\$103,488 spent for use by the Centre on the extension of the Institute of Public Health building, owned by the Government of the People's Republic of Bangladesh and which is at present partly accommodating the Centre.

iii) No provision for depreciation on fixed assets has been made up to December 31, 1982.

4. STOCK OF STORES AND SPARES

	<u>1990</u>	<u>1989</u>
Supply stores	283,268	301,595
Maintenance stores	<u>126,933</u>	<u>134,076</u>
	410,201	435,671
Stores in transit	<u>40,565</u>	<u>36,744</u>
	<u>US\$ 450,766</u>	<u>472,415</u>

5. CONTRIBUTIONS

Donor	Advances/ (Receivable) as at 1.1.90	1990			Advances Carr - iedover to 91	Income for the year	1989 Income
		Received during the year	Receivable as at 31.12.90				
1	2	3	4	5	6	7	
Core Funds:							
Australia		185,711			185,711	191,845	
Bangladesh		21,042	(6,653)		27,695	29,838	
Belgium	(49,929)	105,906			55,976	48,735	
NORAD		35,730			35,731	0	
Switzerland		836,533			836,533	709,212	
USA		1,000,000			1,000,000	300,000	
UK		520,290		134,078	386,212	253,410	
UNICEF		250,000			250,000	250,000	
SAREC	(89,760)	93,007	(84,607)		87,854	89,760	
Total Core Funds (A)	(139,689)	3,048,219	(91,260)	134,078	2,865,712	1,872,800	
Project Funds:							
AKF - Kenya Project	12,338			10,000	2,338	51,519	
Australia - Nandipara project							
HBC study & training	43,568			17,012	26,556	2,620	
Consultant to LSD		14,566		10,693	3,872	0	
BRAC	(3,750)	3,768			18	13,750	
BOSTID/NAS						6,566	
Belgium	20,235	500,121		287,340	233,016	275,801	
Bayer Ag	87,519			12,759	74,760	34,481	
Canada							
CIDA - DSS	(237,237)	441,035		5,081	198,717	1,114,625	
CIDA - Training	20,878			13,555	7,323	167,400	
CIDA - 3rd African conference	(2,476)	2,476					
CIDA - External review		9,421		2,438	6,982		
Case Western Reserve University	(7,871)		(7,871)				
Danida - CHP	225,574	131,830		187,763	169,641	437,383	
Ford Foundation	25,596	79,574	(50,958)	42,901	113,227	147,524	
French Embassy	16,138	15,698		27,793	4,043	10,271	
IBRD/WB						5,409	
HKI - Nutritional Surveillance		1,556	(3,134)		4,690		
IDRC - Infant Mortality	(851)	851				5,366	
IDRC/ICDDR,B Fellowship	4,168		(4,016)		8,184	919	
DISC	26,601	37,481		20,535	43,547	21,422	
ICHF - Training	(5,000)	10,000			5,000	5,000	
Japan - CSD, LSD & TRN	150,170	380,000		143,170	387,000	314,918	
Kanton Hospital	9,880			7,393	2,487		
Norway - NORAD - MCH/FP Matlab	289,000	164,014		162,104	290,910	321,755	
Norwich - Furazolidone	4,930			4,030	900		

5. CONTRIBUTIONS (Contd.)

Donor	Advances/ (Receivable) as at 1.1.90	1990				1989 Income
		Received during the year	Receivable as at 31.12.90	Advances Carr- ledover to 91	Income for the year	
1	2	3	4	5	6	7
Netherlands: ARI Projects	(42,537)	51,174	(105,261)		113,898	111,553
DSS activities		819,144		171,496	647,647	
X-ray machine		5,430		2,185	3,245	
Saudi Arabia						33
Sandoz Ltd.	(547)		(547)			4,547
Searle - France	(20,299)		(20,299)			28,090
SDC - DISC, Research HD & SD	54,076	779,805		524,782	309,100	331,464
Swiss/Basel University						2,000
SAREC - Goteborg University		86,795		53,158	33,637	
SKF - Albendazole		33,189		5,025	28,164	
UNDP/WHO - Projects	(290,790)	300,000	(154,542)		163,752	361,416
GOPP Workshop	(5,217)		(5,217)			17,355
UNICEF - Research		37,401		37,401		
Training			(2,538)		2,538	6,383
UNESCO - Training						3,099
USAID - Training		18,753	(1,300)		20,050	
Coop. Agreement	(63)	500,000			499,937	2,089,170
Child Health/UVP	(22,574)	757,024		76,990	657,460	1,201,756
MCH/FP Extension	(5,488)	1,144,232		64,996	1,073,748	1,387,359
WUSC - MCH/FP & Matlab	(79,770)	690,105	(131,579)		741,914	742,318
WHO	28,406	271,290		133,268	166,428	1241,417
Wellcome Trust						11,737
Others	2,110	5,889	(6,930)	3,707	11,222	3,232
Emergency Flood Relief						455,057
	296,714	7,292,619	(494,193)	2,027,575	6,055,951	9,924,955
Adjustments:						
Others - Mackinnon Trust				(3,707)		
Case Western Reserve Univ.			7,871			
Total Project Funds (B)	296,714	7,292,619	(486,322)	2,023,869	6,055,951	9,924,955
Total Contribution (A+B)	157,025	10,340,838	(577,582)	2,157,947	8,921,663	11,797,755
Capital Development Fund (C)						
UNCDF - Matlab Construction		28,788	(20,000)		48,788	272,159
Grand Total (A+B+C) US\$	157,025	10,369,626	(597,582)	2,157,947	8,970,451	12,069,914

6. ADVANCES, DEPOSITS AND OTHER RECEIVABLES

	<u>1990</u>	<u>1989</u>
Advances to employees:		
- Official	33,489	72,800
- Personal	61,945	69,305
- Flood	-	110
- Other	(120)	44,701
	<u>95,314</u>	<u>186,916</u>
Operating advances to Projects (including cash and bank balance of the projects US\$ 9,343, 1989: US\$ 14,957)	23,859	32,846
Advances to Suppliers & Others	148,665	209,763
Deposits	3,263	3,681
Other receivables	29,798	3,684
	<u>300,899</u>	<u>436,890</u>
	US\$	

7. DEPOSITS WITH BANKS AGAINST RESERVE FUNDS

American Express Bank Ltd. -

New York

- Time Deposit	500,000	500,000
- Current Account	1,448	2,563

Dhaka

- Time Deposit (includes accrued interest US\$78,579, 1989 :US\$77,684)	1,471,579	1,315,684
- Current Account	5,221	826

	<u>1,978,248</u>	<u>1,819,073</u>
	US\$	

8. CASH AND BANK BALANCES

	<u>1990</u>	<u>1989</u>
Cash in hand		
(Taka converted to US Dollar)	1,128	1,256
Cash at banks:		
Taka Account		
American Express Bank Ltd., Dhaka		
- Current Account (Convertible - NORAD)	21,725	28,460
- Time Deposit - NORAD	141,659	304,656
- Current Account (Convertible)	28,963	13,259
- Current Account (UNCDF Fund)	39,222	75,097
- Current Account	110	-
- Time Deposit	404,318	-
Agrani Bank, Dhaka		
- Current Account	63,989	20,964
	<u>699,986</u>	<u>442,436</u>
US\$ Accounts		
American Express Bank Ltd. -		
New York		
- Current Account	49,235	150,726
Dhaka		
- Current Account	424,781	53,880
- Current Account (USAID - MCH) - 2nd cont.	143,136	137,168
- Current Account (USAID - MCH)	38	94
- Current Account (USAID - UVP)	128,501	153,474
- Time Deposit	1,400,000	-
- Time Deposit (Capital Development Reserve Fund)	200,000	-
	<u>2,345,691</u>	<u>495,342</u>
UK£ Account		
American Express Bank Ltd., London		
- Current Account	13,179	26,988
	<u>US\$ 3,059,984</u>	<u>966,022</u>

9. INTEREST FREE LOAN

In May 1983, the Centre was provided by the Government of the People's Republic of Bangladesh with an interest-free loan of Tk. 28,928,775 (US\$1,186,680 converted at the then exchange rate) initially for a period of one year. After several extensions by the Government the repayment date expired on June 30, 1986. In terms of the loan, the Centre is liable to pay interest at the prevailing commercial lending rate if the loan remained unpaid beyond the expiry of the period of repayment which at the option of the Centre can be effected either in Taka or in foreign currency. No provision for interest has been made in these accounts in this regard as the Centre holds the view that the loan should be converted into a grant as it was originally intended to be a grant to the Centre by UNROB and was utilized for providing free medical treatment to patients in Bangladesh as well as to provide free training to Bangladeshis.

10. OTHER CURRENT LIABILITIES

	<u>1990</u>	<u>1989</u>
For supplies and materials	171,876	212,739
For expenses (Includes advance lease rentals US\$61,240, 1989: US\$50,303)	1,385,645	1,347,953
Security and other deposits	61,139	62,334
	<u>US\$ 11,618,660</u>	<u>1,623,026</u>

11. CAPITAL DEVELOPMENT FUND

Balance as at January 1	8,411,651	7,227,182
Add: Capital contribution received		
- in cash	48,788	258,266
- in kind	-	13,893
Transferred from the Statement of Income and Expenditure to the extent of Capital expenditure incurred during the year (net of capital contribution received during the year)	309,777	912,310
	<u>US\$ 8,770,216</u>	<u>8,411,651</u>

12. OPERATING FUND

Balance as at January 1	(5,435,306)	(4,357,125)
Deficit for the year	(384,325)	(1,078,181)
	<u>(5,819,631)</u>	<u>(5,435,306)</u>
Less: 60% of cash surplus (before depreciation) for the year transferred to Capital Development Reserve Fund	(288,429)	-
	<u>US\$ (6,108,060)</u>	<u>(5,435,306)</u>

13. RESERVE FUND	<u>1990</u>	<u>1989</u>
Balance as at January 1	1,819,073	1,669,726
Add: Net interest earned on deposits (Including accrued interest of US\$78,579; 1989:US\$77,684)	<u>159,175</u>	<u>149,347</u>
	US\$ <u>1,978,248</u>	<u>1,819,073</u>

14. CAPITAL DEVELOPMENT RESERVE FUND

This Fund, which has been created this year at the directive of the Board of Trustees at their meeting held in November 1990 by transfer of 60% of the cash surplus for the year (before providing for depreciation), will be utilised for the acquisition or replacement of fixed assets and as far as possible the balance of this Fund is to be retained in interest-bearing account with a bank as distinct from the Centre's general and other earmarked funds. The interest so earned will constitute an integral part of this Fund. Had the transfer not been made the accumulated operating deficit for the year would have been lower by the transfer of US\$ 288,429 made during the year. Against this amount, a sum of US\$ 200,000 only is being held with a bank in time-deposit.

15. EMPLOYEES RETIREMENT FUND

i) The centre operates a retirement fund called "ICDDR,B Employees Separation Payment Fund" for all National employees with GENERALI GROUP of UK under an agreement between ICDDR,B and Institute of International Education (IIE), USA. During the year the Centre and staff members contributed 14.8% and 7.4% of the base pay respectively to the fund. The amounts so accumulated are remitted to GENERALI GROUP through IIE on quarterly basis by the Centre. The GENERALI GROUP is empowered to invest the fund available with them as considered profitable by them and at the end of each calendar year the profits earned out of these investments are distributed among the staff members' accounts. Such accumulated fund which at December 31, 1990 was estimated at US\$ 5,607,839 (1989: US\$ 4,510,520) is not reflected in the books of account as it is not considered as a part of the Centre's assets.

ii) The Centre operates a fund called "ICDDR,B Severance Pay Fund" for Community Health Workers since July 01, 1987 which fund is not reflected in these accounts. The balance of this fund stands at US\$52,655 (1989: US\$ 55,367) as on December 31, 1990.

16. HONORARIUM

The expenses under "Mandatory committee meetings" include an amount of US\$17,552 (1989: US\$27,145) paid as honorarium to the members of the Board of Trustees.

17. CURRENCY TRANSLATION

Currency	Average monthly exchange rates	Year-end exchange rate
	US\$	US\$
Tk. 1.00	0.0293	0.0282
UK £ 1.00	1.7846	1.9292

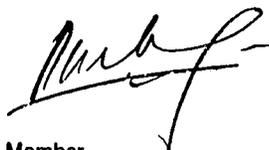
18. OTHERS

Previous year's figures have been rearranged and regrouped, wherever considered necessary, to conform to current year's presentation.

Figures appearing in these Accounts have been rounded off to the nearest US dollar.



Director
ICDDR,B



Member
Board of Trustees



The auditors signing the final report.

APPENDIX B

ACRONYMS AND ABBREVIATIONS

ARI	Acute respiratory infections	IPH	Institute of Public Health
BADC	Belgian Administration for Development Cooperation	JDDR	Journal of Diarrhoeal Diseases Research
BBS	Bangladesh Bureau of Statistics	LSD	Laboratory Sciences Division
BOSTID	Board on Science and Technology for International Development	MBO	Management by Objectives
BRAC	Bangladesh Rural Advancement Committee	MCH/FP	Maternal and Child Health - Family Planning
CHD	Community Health Division	MDTC	Matlab Diarrhoea Treatment Centre
CHP	Child Health Programme	MUAC	Mid - upper - arm circumference
CHW	Community Health Worker	NGO	Non - governmental organisation
CIDA	Canadian International Development Agency	NIPSOM	National Institute of Preventive and Social Medicine
CIS	Computer Information Services	NORAD	Norwegian Agency for Development
COTC	Community - operated Treatment Centres	ODA	Overseas Development Administration (UK)
CPU	Central processing unit	ORS	Oral rehydration salts; oral rehydration solution
CRC	Clinical Research Centre	ORT	Oral rehydration therapy
CSD	Clinical Sciences Division	PCC	Programme Coordination Committee
DANIDA	Danish International Development Agency	PSED	Population Science and Extension Division
DiSC	Diarrhoeal Diseases Information Services Centre	RKS	Record - keeping System
DSS	Demographic Surveillance System	SAARC	South Asian Association for Regional Cooperation
EAggEC	Enteroaggregative <i>E.coli</i>	SAREC	Swedish Agency for Research Cooperation with Developing Countries
ECPP	Epidemic Control Preparedness Programme	SDC	Swiss Development Cooperation
EHEC	Enterohaemorrhagic <i>E.coli</i>	SRS	Sample Registration System
EIEC	Enteroinvasive <i>E.coli</i>	SWA	Staff Welfare Association
ELISA	Enzyme - linked immunosorbent assay	UNCDF	United Nations Capital Development Fund
EPEC	Enteropathogenic <i>E.coli</i>	UNDP	United Nations Development Programme
EPI	Expanded Programme of Immunization	UNFPA	United Nations Fund for Population Activities
ERC	Ethical Review Committee	UNICEF	United Nations Children's Fund
ETEC	Enterotoxigenic <i>E.coli</i>	UNROB	United Nations Relief Organisation in Bangladesh
FWV	Family Welfare Visitors	USAID	United States Agency for International Development
IBM	International Business Machine	UVP	Urban Volunteers Program
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh	WEPP	Women's Empowerment Pilot Project
ICHF	International Child Health Foundation	WHO	World Health Organization
IDRC	International Development Research Centre (Canada)	WUSC	World University Service of Canada
IPGM&R	Institute of Post - graduate Medicine and Research		

APPENDIX C

Selections from the Introduction to the Annotated Bibliography of ICDDR,B Studies in Matlab

The foundation in December 1960 of the Pakistan-SEATO Cholera Research Laboratory (CRL), the predecessor of the ICDDR,B, came at the height of a renewed interest in cholera. That interest increased during the next decade and important developments in the understanding of the disease took place. In addition to the clinical, pathological, and microbiological research on cholera that was needed, those present at the opening conference of the CRL knew that a site for field testing of both new and existing vaccines was also required. Several conditions for adequate field trials of vaccines were set down: cholera had to be endemic in the area; the area had to be accessible so that long-term follow-up studies could be undertaken; there had to be laboratory facilities for identifying cholera in patients with diarrhoea and the studies had to be well conducted, with samples properly randomised and only proven cholera cases considered.

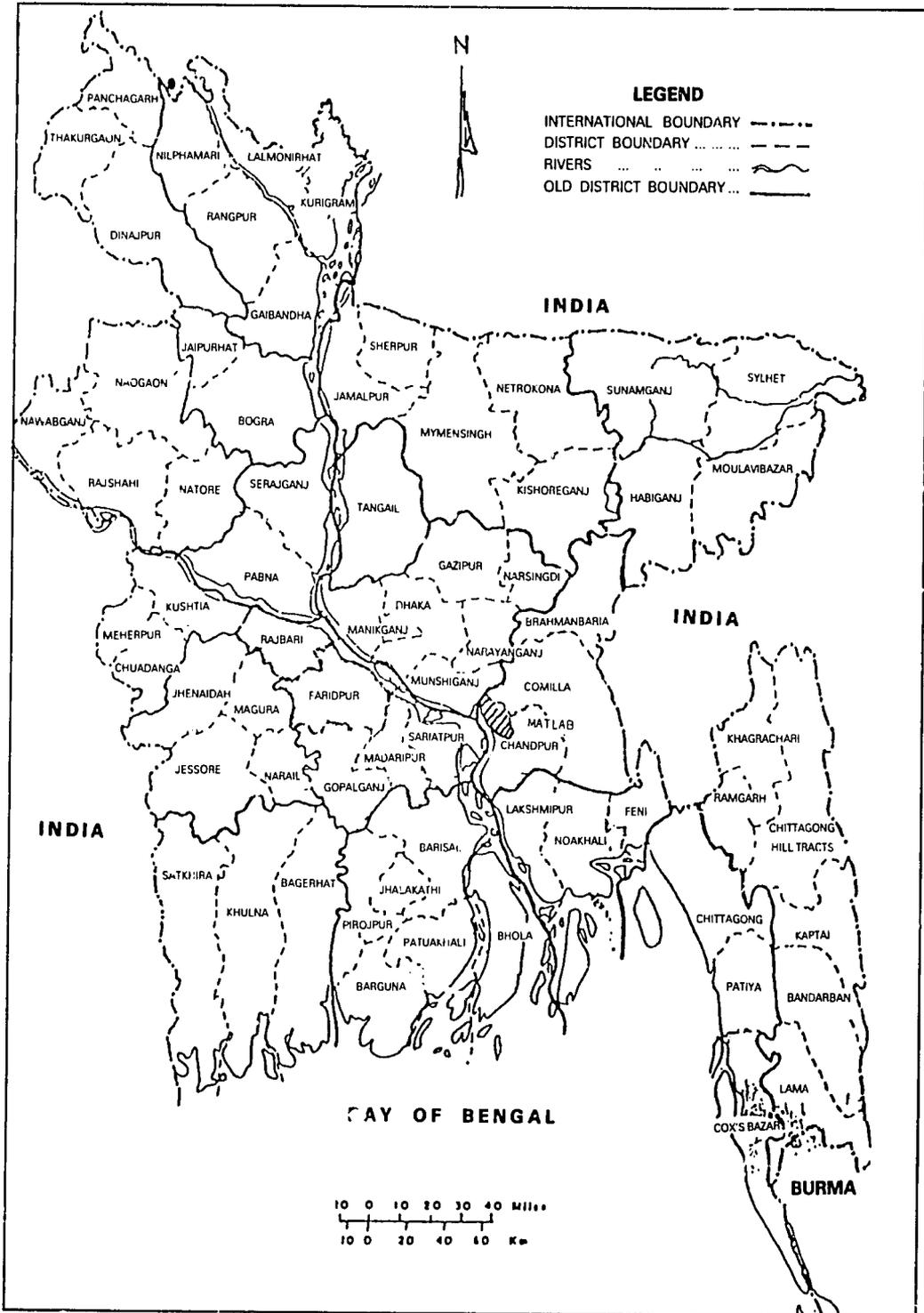
In 1963 the Director of the CRL, Abram Benenson, together with Robert Oseasohn and A.K.M. Fahimuddin, made numerous trips by boat to find a suitable location for these field trials. Several villages wanted nothing to do with cholera research while others hoped for the economic advantages which participation might bring. Finally a group of 23 villages were chosen in Matlab thana, then a subdivision of Comilla district. This area had a high prevalence of cholera, it was crossed by several rivers and canals making access easier, and it was densely populated making field work more efficient. In addition there had been a census of the villages during the smallpox eradication campaign in 1961 and the census cards were still available and easily updated. Each inhabitant was located again and given a number and the first cholera vaccine trial was launched in November 1963. Little could the scientists involved imagine that research in the area would still be going on 27 years later, that the study area would have grown several times, that the research would become truly multidisciplinary, and that the body of knowledge gained from the Matlab area would require its own bibliography!

Matlab is a large upazila, a subdivision of Chandpur district, with a population of about 400,000. (Until recent changes in the structure of local administration Matlab was a "thana" in Comilla district.) The area is a delta and is intersected by numerous canals and branches of two major rivers, the Meghna and the Gumti. During the monsoon most of the land is flooded. The climate is subtropical and the Tropic of Cancer passes through the area.

About 85% of the population is Muslim, and the remainder mostly Hindu. There are on average between five and six people in each family and each family typically owns a one or two room house, with a dirt floor and walls, and with a roof made of jute sticks, corrugated iron sheet or thatch. Some people have a separate shed, kitchen, or other out-building. Three to six families, usually related to each other, live around a common courtyard in a unit called a "bari". Several *baris* form a village. Most villages are separated from each other by fields or water. The average village has grown in size from 1,200 people in 1963 to over 1,400 in 1990. Although villages range in size from a few hundred people to well over two thousand.

The staple food of those Bangladeshis is rice, grown during the monsoon "aman" season. A second rice crop, or vegetable crop, is often possible during the winter "boro" season. Jute, the predominant cash crop in Bangladesh, is grown during the spring-summer season. Most employed work in agriculture, either as owner-operator farmers, as sharecroppers, or as labourers, as a mixture of these. Other important activities are fishing and small-scale trading.

MAP OF BANGLADESH (showing location of Matlab)



Matlab bazaar, the town containing the upazila headquarters, is the centre of regional government and contains a police station, a court, schools, health facilities, a post office, banks, markets, crop storage facilities, etc. Matlab bazaar is connected to the district capital, Chandpur, by a motorable road. Several smaller towns along the rivers are linked to Matlab bazaar by scheduled service of riverboats. Communication between villages is only possible by foot or by small, man powered boats.

Glancing at the table of contents or skimming through the abstracts will reveal the rich diversity of scientific investigation which has taken place since Oseasohn and Fahimuddin "discovered" Matlab on 4 October 1963. The 567 works are a tribute to the hundreds of dedicated field workers, scientists, and support staff who have worked in Matlab for almost three decades.

Annotated Bibliography of ICDDR,B Studies in Matlab, Bangladesh, compiled by M. Shamsul Islam Khan, Mir Motasem Ali, Malik M. Abdul Quader and M.M. Hasan. Editor-in-Chief: D. Habte. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1990. viii, 149 p. (Specialized Bibliography Series, 14).

The **Specialized Bibliography Series** is a part of the larger effort to facilitate the exchange of information and to establish an information network in the field of diarrhoeal disease-related subjects -- an effort being carried out by the Diarrhoeal Diseases Information Services Centre (DISC) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The present issue, the 14th of the Series, includes citations of 567 papers and publications (364 abstracted) on ICDDR,B studies done in Matlab, Bangladesh. The Bibliography was compiled from existing information available at the DISC. This bibliography is expected to serve the interests of the diarrhoeal disease researchers and practitioners, demographers, nutritionists, and other interested groups, as well as to contribute towards generating greater interest and awareness on research done in Matlab, Bangladesh and the results obtained from these studies. Most of the published papers and publications, cited in this Bibliography, are available from the DISC of ICDDR,B to interested persons/organisations for consultation and dissemination.

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15/11/11

RESEARCH FACILITIES AT THE ICDDR,B



Bangladesh has many major health problems in common with other developing countries, such as diarrhoeal diseases and malnutrition. It too has widespread poverty and illiteracy, an increasing population, and a health system poorly equipped to respond to these challenges. The Centre is therefore in an exceptional position to conduct research in a natural setting on the problems of diarrhoea, nutrition, fertility, and public health.

Clinical facilities

A large number of patients with diarrhoeal diseases attend the Centre's two hospitals each year, one in urban Dhaka, the other in rural Matlab. The Clinical Research Centre in Dhaka has a 25 bed research ward, a 10 bed metabolic ward, specific wards for persistent and invasive diarrhoea, a nutrition rehabilitation ward for children who have become severely malnourished from diarrhoeal diseases, and a laboratory to provide a wide range of biochemical and microbiological tests. In Matlab, the new two story hospital complex also provides facilities for medical care, training, and research.

Research laboratories

There are well equipped and well staffed laboratories for research in bacteriology, bacterial genetics, histopathology, immunology, molecular biology, environmental microbiology, nutritional biochemistry, parasitology, and virology. The Centre has a walk-in cold room and freezer, facilities for growing and isolating pathogens, a large animal house, and many items of test equipment including an atomic absorption spectrophotometer, a cobas-bio analyser, a gas-liquid chromatograph, a high performance liquid chromatograph, and a centrifugal analyser.

Demographic surveillance

Information collected on vital events concerning 200,000 people in the Centre's Matlab field area over the last 25 years currently provides an unrivalled opportunity to study demographic trends, to investigate the epidemiology of ill-health, and to examine the effect of providing new health services on morbidity and mortality. These data allow a multidisciplinary approach, integrating insights from the social and behavioural sciences with those gained from biomedical research.

Computing facilities

The Centre operates an IBM 4361 mainframe computer with eight megabytes (MB) of real memory and an on-line storage capacity of 3,000 MB. It is connected to 25 terminals. This system provides the capacity to analyse large data sets and is complemented by over 100 personal computers scattered throughout the Centre.

Diarrhoeal Diseases Information Services Centre (DISC)

DISC provides access to the scientific literature on diarrhoeal diseases, nutrition, population studies, and health in general by means of MEDLINE and POPLINE databases on CD-ROMS, 22,590 books and bound journals, over 10,750 reprints and documents, and subscriptions to 386 current journals. DISC publishes the quarterly Journal of Diarrhoeal Diseases Research, Current Awareness Bulletins, annotated bibliographies, a newsletter (Glimpse), and monographs.

Staff

The Centre currently has over 200 scientific researchers and medical staff from more than ten countries doing research and providing expertise in the many disciplines related to the Centre's areas of research. ■
