

**ABSTRACTS
OF
RESEARCH
PROJECTS**



**CONDUCTED BY
U.S. HISTORICALLY
BLACK COLLEGES
& UNIVERSITIES**



**FUNDED BY
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT**

P11ABC-546
75781

**ABSTRACTS
OF RESEARCH
PROJECTS CONDUCTED
BY HISTORICALLY
BLACK COLLEGES AND
UNIVERSITIES
1984 - 1991**

Prepared for:
**The Center for University Cooperation in Development
The United States Agency for International Development**

Prepared by:
C.C. Weir and J.S. Prince



INTERNATIONAL SCIENCE AND TECHNOLOGY INSTITUTE, INC.
1129 Twentieth Street, NW ■ Suite 800 ■ Washington, DC 20036

Front Cover Photographs

Top Right

Solar box cookers being demonstrated in Sierra Leone. (Abstract 18)

Bottom Left

Aquaculture research investigations in the Dominican Republic. (Abstracts 14 and 15)

TABLE OF CONTENTS

FOREWORD	i
INTRODUCTION	ii
I. AGRICULTURAL-RELATED PROJECTS	1
Agricultural Economics	1
Agronomy	3
Aquaculture	9
Food Storage, Preservation and Preparation	12
Livestock Science	14
Entomology/Pest Management	19
Soil Science	20
SELECTED PROJECT PHOTOGRAPHS	23
II. HEALTH, POPULATION AND NUTRITION-RELATED PROJECTS	31
Parasitic Diseases	31
Schistosomiasis	31
Malaria	35
Trypanosomatina	36
Diarrheal Diseases	41
Pharmaceuticals	45
Other Health	48
APPENDICES	
Table 1. Geographic Location of HBCU A.I.D.-Funded Research Projects.	60
Table 2. Subject-Matter Areas of A.I.D.-Funded Research Projects at HBCUs.	63
LIST OF ACRONYMS	63

FOREWORD

Many developing countries are faced with numerous difficult and even intractable problems in the Health and Agricultural sectors of their economies, from the need to increase food and energy supplies to providing basic health care for their populations. Experience in these countries has made it clear that both basic and applied research are needed to understand these problems, and to provide solutions that are realistic in terms of the host country's capabilities and resources.

The Agency for International Development (A.I.D.) has always supported research that seeks to apply innovative scientific approaches to developing countries' problems. A.I.D.'s emphasis on science and technology goes back many years. In the Agency's earliest days, under the Point IV Program, technical assistance was the focal point of the U.S. foreign aid effort. In more recent years, the development of effective means of family planning has been supported in large measure by A.I.D., together with the fight against smallpox, malaria, and other infectious diseases. A.I.D.-sponsored research has also contributed significantly to development, for example, of the oral rehydration method of controlling diarrheal diseases, perhaps the major killer of children under age five in developing nations.

A.I.D. was a major contributor to the development and adoption of the high-yielding wheat and rice varieties — known as "Green Revolution." This support has taken several forms. A.I.D. continues to contribute to the international agricultural research centers, providing a significant portion of the centers' operating expenses each year.

The Agency continues to encourage the fullest involvement of research scientists from U.S. Universities, as well as those from developing countries. In this connection, the Historically Black Colleges and Universities (HBCUs) have a very special role to play in U.S. international development activities, since the unique perspectives and experiences of these institutions in many ways parallel the experiences of many developing countries. The research efforts of the HBCUs in Human Nutrition, Health, Agricultural Sciences, Rural Development and Natural Resources are sharply focused toward the problems of the disadvantaged and the small farmer. This unique capacity gives the HBCUs a high degree of expertise in this area, in forms that are applicable to international development.

This compendium of abstracts of A.I.D.-funded research projects addresses the above described concerns and constitutes a timely and valuable source of information, not only for A.I.D. professionals, but also for practitioners and research scientists in the developing countries and elsewhere in the world. It is hoped that this special publication will draw attention to the type, scope and major significance of research projects being carried out by HBCUs in the international arena.

Ralph H. Smuckler, Executive Director
Center for University Cooperation
in Development
Agency for International Development
Washington, DC 20523

INTRODUCTION

The Research Grants Program for HBCUs is an important component of A.I.D. strategy through which it responds to Executive Order No. 12677, which directs federal agencies to provide opportunities to HBCUs. The program provides grants not to exceed \$100,000 each to HBCU faculty members on a competitive basis to: 1) conduct research on significant developing country problems; 2) increase HBCU participation in the A.I.D. program; and 3) develop capability in HBCUs to undertake international development activities.

The HBCU research program was initiated in October 1983, primarily through the pioneering efforts of the then Director of A.I.D.'s Office of Research and University Relations (RUR), Dr. Erven Long. The program was created as one way to attract faculty at HBCUs to A.I.D.'s international development activities. Small research projects such as the HBCU research program would better fit the resources available for international work in the generally small HBCUs than would other types of A.I.D. projects, and would facilitate the subsequent involvement of HBCUs in A.I.D. programs, in areas of their demonstrated strength.

In FY 1984, which was the initial funding year of the HBCU research program, 11 projects of less than \$35,000 each were funded after internal-A.I.D. review. Based on the experience of that first year, the size of the program was increased to about \$2,000,000 per year and the funding limit per project was raised ultimately to \$100,000. A formal proposal review system was established, first at the National Science Foundation and later at the National Academy of Sciences. From the beginning of the program in 1983 until May 1991, the HBCU research program was coordinated and managed by Mr. Floyd O'Quinn, former Research Coordinator, RUR, Bureau of Science and Technology, A.I.D.

Through FY 1991, a total of 152 research projects have been funded at a cost of approximately \$13.23 million, and have involved collaborators in 30 different countries and the U.S. Slightly more than half of these projects have been completed. Although publication of scientific articles normally lags behind project completion by one year or longer, approximately 100 scientific articles from these A.I.D.-funded research grants have so far been published, or are in various stages of being published, in reputable international scientific journals.

It might be useful to cite a few examples of the types of A.I.D.-funded research being pursued at some HBCUs. In Health, Meharry Medical College has completed several projects in the molecular biology of trypanosomiasis transmission and may now be one of the few U.S. institutions with substantial expertise in the South American variety of the disease. Morehouse School of Medicine has pursued extensive researches in the transmission of diarrheal diseases. Researchers at several universities have focused on Schistosomiasis, and several of the HBCUs have published papers on this disease. Tuskegee University has completed several projects on food preservation and is becoming a source of knowledge on methods of preserving foods that might work in Africa. Lincoln University plans to focus much of its HBCU research effort on measuring marginal deficiencies of Vitamin A and its effects on health.

Because of the 17 land grant universities among them, the HBCUs have a more extensive history in agriculture research than health. They seem to have a comparative advantage in research dealing with small animals, particularly goats. Tuskegee's expertise and experience on sweet potatoes have resulted in its winning several HBCU research projects using biotechnology to study that crop. Florida A&M researchers are engaged in excellent research on the dynamics of soil organic matter formation in tropical croplands. The University of Arkansas at Pine Bluff has a good reputation in aquacultural research.

In this report, abstracts of 72 completed HBCU research projects are presented. The presentation of these Abstracts involves grouping by major topic, that is, Agriculture or Health/Population and Nutrition (HPN). The abstracts are next subgrouped by the appropriate general research area, e.g., "Parasitic Diseases," "Agronomy," and then by more specific subject matter areas under these general headings, e.g., Schistosomiasis. Also provided are the name of the sponsoring institution and the principal investigator, in that order. Finally, there is a selected listing of reports and/or publications emanating from the research.

The reports and publications cited do not include references to the individual Final Reports of these research projects, which were submitted to A.I.D. on completion of the studies. For those persons interested in more detailed accounts/descriptions of these research projects, copies of the Final Reports can be obtained by contacting the Center for University Cooperation in Development, Bureau of Research and Development, A.I.D., Washington, DC 20523.

SECTION I
AGRICULTURAL-RELATED PROJECTS

AGRICULTURAL ECONOMICS

1. DETERMINANTS OF LOAN DEFAULTS IN RURAL CREDIT PROGRAMS IN GHANA. Prairie View A&M University; Dunson, B.H.

Abstract. Data for this study were collected by sampling both bank files and customers of the rural banks in Ghana. Analysis of loan default data showed that 30.9 percent of all loans were defaulted; 50 percent of all borrowers who defaulted were farmers and 40 percent of all defaulted loans were for the purpose of farming. Loans secured by security other than liens made up 80 percent of all defaulted loans. In addition, variables such as sex, marital status, number of children, educational level, age, and amounts of loan and personal loan all had significant effects on loan delinquency. The results of this study should be useful to banks in developing countries in helping to reduce the rate of loan default, the probability of delinquency and the time of delinquency.

Report

Dunson, B.H. and Dadzi, K.Q., "Promoting the Bank Savings Habit in Ghana." *Journal of Micro Marketing*, Vol. 9:16-23, 1989.

2. ECONOMIC VIABILITY OF THE SLOPING AGRICULTURAL LAND TECHNOLOGY IN THE PHILIPPINES. South Carolina State College; Londhe, S.

Abstract. The purpose of this study was to assess the pattern of adoption of the Sloping Agricultural Land Technology (SALT) among upland farmers in Eastern Visayas, The Philippines. In addition an economic evaluation was made and long-term viability of SALT was determined. It was found that demographic and farm resource characteristics for the adopters and non-adopters of SALT were very similar. Assistance in the form of seeds and technical guidance were primarily motivating factors for accepting SALT. Non-adopters indicated willingness to adopt SALT with similar assistance.

SECTION I

3. QUANTITATIVE ANALYSIS OF THE AKUAFO CHEQUE SYSTEM. Prairie View A&M University; Dunson, B.H.

Abstract. The objectives of this study were to determine which variables had any effect on savings propensity, and whether forced association with a bank had any residual effect on individual savings for cocoa farmers in Ghana participating in the Akufo Cheque Program. The significant conclusions from this study were: 1) farmers have a positive savings propensity; the age of the farmer influences the decision to save and the amount saved, 2) farm size was negatively related to the probability of having a savings account and the amount saved, and 3) previous savings account experience had a positive effect on the amount saved.

Reports

- Dunson, B.H., "Formal Financial Institutions as Savings Mobilizing Conduits in Rural LDCs." *Savings and Development* (Quarterly Review), 1987.
- Dadzie, K.Q. and Dunson, B.H., "A Baseline Study of Farmers' Response to a Bank-based System of Cocoa Purchasing." Report submitted to Ghana Cocoa Board, 1985.

4. SMALL FARM MANAGEMENT AND AGRICULTURAL PRODUCTIVITY IN KENYA. Virginia State University; Joshua, M.

Abstract. This research project was undertaken to investigate the factors and/or circumstances that affect the managerial capacity and hence the agricultural productivity of small holders in the Njoro Division of Kenya. The research project focused on both the internal and external environments of the small farmer. The impact of household structural characteristics on agricultural productivity in the study area was assessed using a mixture of socioeconomic and input-output variables. However, because of the extreme variability of the data bases, much caution needs to be observed in attempting to validate the input-output data. Of the crop data bases the maize and bean data are perhaps of sufficiently good quality that valid conclusions are possible. Thus it was concluded that households with more education tend to be more productive, that formal and informal education are complementary, and that formal additional education had a positive effect on crop production. In addition, extension services played a vital role in explaining farmers' productivity.

5. ASSESSMENT OF SMALL BUSINESS ENTREPRENEURSHIP AMONG URBAN MINORITY POPULATION IN CENTRAL AMERICA. Morgan State University; Mariam, A.G.

Abstract. This project was undertaken to assess the needs, problems and training requirements of black small business entrepreneurs in Limon, Costa Rica. Specifically, it sought to accomplish three interrelated tasks: 1) identify existing problems and issues related to black small business entrepreneurship in Limon; 2) identify existing and anticipated training needs and requirements of black small business entrepreneurs; and 3) provide a set of policy recommendations to enhance the business skills and capabilities of Limon's black small business entrepreneurs. Research methodology included the use of individual interviews with a virtually complete "universe" of small businesses owned and operated by black entrepreneurs in Limon, as well as appropriate focus group discussions. The data clearly demonstrated that the vast majority of black small businesses in Limon can benefit from both technical assistance and credit and loan programs. Results of the study revealed that business training needs include basic skills in bookkeeping, budgeting, record keeping and inventory management. Credit and capital requirements were especially severe; however, amounts needed by small businesses were relatively small.

AGRONOMY

6. FACTORS AFFECTING SYMBIOTIC NITROGEN FIXATION AND YIELD OF COWPEAS. Tuskegee University; Urias, G. and Allen, J.R.

Abstract. The research objectives were to determine the effects of manganese, zinc and phosphorus on the growth of cowpeas at different soil pH levels. The investigations were carried out at Tuskegee University and in Jamaica. Greenhouse experiments using cowpea cultivars showed that application of phosphorus fertilizers considerably increased shoot height and dry weight, as well as the number of nodules per plant root. In field experiments, there were no significant effects of zinc, manganese or phosphorus applications on cowpea yields. Increasing soil pH also decreased the uptake of zinc and manganese by the plants.

SECTION I

Report

Allen, J.R., "Effect of PxMn and PxZn Interactions on the Growth of Southern Peas." Annual Meeting of American Society of Agronomists. Southern Branch. 1985.

7. FATE OF FERTILIZER NITROGEN IN MAIZE-GROUNDNUT CROP ROTATION SYSTEMS IN ZAMBIA. North Carolina A&T State University; Reddy, G.B.

Abstract. A field study was conducted on an acidic soil in Northern Zambia, to determine the fate of fertilizer-N applied to corn. The experiment was designed as a split-plot with two lime levels, 0 and 2 tons per ha., in the main plots, and four N levels, 0, 80, 160 and 240kg. N/ha, in the subplots. In each plot one microplot was established that received the same rates of N as labeled ^{15}N . The nonlabeled main plots were used for grain yields. Results of the experiment showed that: 1) grain and stover yields were increased with increased rates of N; 2) total N uptake was in the order of seed > cobb > leaf > stem; 3) labeled ^{15}N was high in seed and cobb; and 4) recovery of ^{15}N was also quantified in the weeds.

Report

Mapiki, A., Reddy, G.B. and Singh, B.R., "Fate of N-Fertilizer Under Maize in Northern Zambia". *Proceedings of the 82nd Meeting of the American Society of Agronomy*, October 21-26, 1990; San Antonio, Texas.

8. EFFICIENCY OF NITROGEN FIXING BACTERIA UNDER JAMAICAN AND MISSOURI CONDITIONS. Lincoln University; Marsh, D.B.

Abstract. The survival and efficiency of Rhizobia strains were determined, after introduction into Jamaican farming systems, utilizing both conventional and minimum tillage conditions. Field experiments utilizing four locations, two cowpea cultivars (Vita-3 and Mississippi Silver) and four Rhizobia strains (JRC-29, IRC-26, IRC-503B and 32-HI), were conducted in each of the three years from 1985 to 1987. The results indicated that the native strains, JRC-29 and 32-HI, showed nodule occupancy averaging 80 percent and 65.5 percent, respectively, at all locations. Strains IRC-26 and IRC-503B had average nodule occupancy of 17.4 percent and 21.6 percent respectively. The reaction of cowpea cultivars to inocula was similar when growth and development were

measured. Maximum growth and development were obtained by both cultivars when JRC-29 and 32-HI strains were used. The results of the investigations clearly demonstrated that the native strain, JRC-29, and the introduced strain, 32-HI, survived much better than the introduced strains, IRC-26 and IRC-503B. In most locations the competitiveness and survival of 32-HI were comparable to that of JRC-29.

Reports

Marsh, D.B. "The Survival and Efficiency of Selected Nitrogen Fixing Bacteria." *Letters in Applied Mycology*, 1990.

Marsh, D.B., "Production of Specialty Crops for Ethnic Markets in the U.S.A." *Hort Sci.*, 23:628-629, 1987.

9. NITROGEN FIXING EFFICIENCY IN BAMBARA GROUNDNUT.

University of Maryland-Eastern Shore; Wutoh, J.G., Dadson, R. and Brooks, C.R.

Abstract. Research on nitrogen fixation and utilization in bambara groundnut was carried out in Senegal, a dry savanna zone, and Togo, a humid zone, during 1984 and 1985. Several imported and local strains of Rhizobia were evaluated for effectiveness to produce dry matter and seed in bambara groundnut. It was found that the most effective strains were the native rhizobial strains. There were also better nodulation and seed production in Togo than in Senegal. Numerous bambara groundnut germplasm were collected in Togo and Senegal and evaluated for yield and response to nitrogen fertilizer. Although the addition of N-fertilizer suppressed nodulation, it enhanced total dry weight and seed yields. It was recommended that these investigations be extended to on-farm trials to ascertain the applicability of the results and to enable dissemination of information to local farmers.

Reports

Dadson, R. and Brooks, C.R. "Response of Bambara Groundnut (*Voandzeia subterranea*) to Applied Nitrogen in Southern Togo." *Tropical Agriculture* (Trinidad), 66:169-175, 1989.

Dadson, R., Brooks C.R., and Wutoh, J., "Evaluation of Selected Rhizobial Strains Grown in Association with Bambara Groundnut." *Tropical Agriculture* (Trinidad), 65:254-256, 1988.

SECTION I

Brooks, C.R., Dadson, R., and Green, B., "Evaluation of Symbiotic Effectiveness of Elite and Wild Strains of *Bradyrhizobium* in Cultivars of *Voandzeia subterranea*." *Tropical Agriculture* (Trinidad), 65:61-63, 1988.

10. NITROGEN USE EFFICIENCY AND ASSOCIATED NITROGEN FIXATION OF SWEET POTATOES. Tuskegee University; Hill, W.A.

Abstract. Sweet potato genotypes were evaluated for root nitrogen-fixing bacterial associations, which might help to explain the observed ability of sweet potato to sustain production of high yields without nitrogen fertilizer applications. Regression models were developed to quantify the relationships between N-fixing bacterial populations, foliage growth, yield, nitrogenase activity rates and soil and plant N contents.

Reports

Hill, W.A., "Comparative Storage Root and Foliage Yield and N. Concentration of Fertilizer N Independent and Dependent Sweet Potato Cultivars." *Hort. Sci.* (In Press), 1990

Mortley, D.G. and Hill, W.A., "Growth Responses and N Content of Centennial Sweet Potato, Following N Application and Inoculation with *Azospirillum*." *Hort. Sci.* (In Press), 1990.

Hill, W.A., and Adeyeye, S., "Sweet Potato Root and Biomass Production in Oxidic Palenstaffs with and without N. Fertilizers." *Agronomy Journal*, (Accepted for publication), 1990.

Hill, W.A., "Inoculation of Sweet Potatoes with *Azospirillum*." *Hort. Sci.* 22(3):420-422, 1987.

Hill, W.A., "N-use Efficiency and N fixation of Sweet Potato." Eighth International Symposium on Tropical Root Crops, Bangkok, Thailand, 1988.

11. CHEMICAL STUDIES OF GRAIN AMARANTH AND CELOSIA SPECIES. Howard University; Shepard, R.L.

Abstract. Light colored amaranth seeds from 15 imported varieties of *A. hypochondriacus*, *A. cruentus*, *A. hybridus* and *A. candidus* were grown under peasant farmer conditions in Nigeria, with no inputs of fertilizer or pesticides. A local dark-seeded *A. cruentus* variety was included for comparison. Despite erratic rainfall, yields were comparable to conventional cereals, with a range of 1444kg/ha to 4333kg/ha. Chemical analyses of the grain were consistent with

values reported from other investigations. The seeds were high in crude protein, averaging 17 percent. The essential amino acid, lysine, was also high, as were calcium, phosphorus and dietary fiber. It was also concluded that the modes of drying and cleaning seeds were within the reach of low-income small farmers.

Reports

Shepard, R.L., Ologunde, M., Taylor, B., Afolabi, O., et al., "Chemical Evaluation of Grain Amaranth Growing in Nigeria." *J. Food Agric.*, 2:246-51, Nigeria, 1988.

Ayorinde, F.O., Olungunde, M.O., Nana, E.Y., et al., "Determination of Fatty Acid Composition of Amaranth Species." *Journal American Oil Chem. Soc.*, 66:(12), 1812-1814, 1989.

Shepard, R.L., "Amaranth Grain as a Food Source." *New Directions Magazine*, 16:1, 22-27, 1989.

"Some Aspects of the Chemistry and Potentials of Grain Amaranth as Food." Ologunde, M.B., Ph.D. Thesis. Obefemi Awolowo University, 1989.

12. SCREENING GRAIN LEGUME GERmplasm FOR SYMBIOTIC NITROGEN FIXATION AND EFFICIENT RHIZOBIUM STRAINS.
Fort Valley State College; Bhagsari, A.S.

Abstract. The research objectives were to screen and introduce grain legume germplasm and to improve nodulation and nitrogen fixation under the variable soil conditions in the Dominican Republic. The experiments were conducted at Fort Valley State College, Georgia, and in the Dominican Republic, using soybeans, peanuts, pigeon peas, and dry beans as the four main grain legumes. Of the number of grain legumes studied, only soybeans had genotypes that were tolerant to both acid and alkaline conditions. None of the peanut, pigeon pea or dry bean strains showed tolerance of pH stress. Inoculation of soybean and peanut seeds significantly increased nodule numbers and dry weights. The effects of inoculation in pigeon peas and dry beans were variable. Based on the results of the studies, the researcher concluded that inoculation of legume seeds with Rhizobia strains, use of new genotypes, and introduction of new germplasm, will improve the productivity of these crops.

SECTION I

Reports

Bhagsari, A.S., Rengifro, D. and Tejada, L., "Evaluations of Peanut Germplasm under Dominican Republic Conditions." International Congress of Plant Physiology, New Delhi, India, 1988.

Bhagsari, A.S., Rengifro, D. and Tejada, L., "Tolerance of Selected Soybean Germplasm to Acid and Alkali Soils." Annual meetings of American Society of Agronomy, Southern Region, 1988.

13. COMPARATIVE ANALYSIS OF STEADY STATE PROTEIN PROFILES OF DROUGHT-HARDENED AND HEAT HARDENED PHASEOLUS ACUTIFOLIUS (TEPARY BEAN) AND PHASEOLUS VULGARIS (COMMON BEAN). Mississippi State University; Bahadur, R.

Abstract. A better understanding of the biology, physiology, biochemistry and development of environmentally stressed plants is needed if stress-tolerant plants are to be bioengineered. The researcher indicates that characterization and cataloguing of cell proteins is perhaps the first step toward identifying and isolating genes responsible for drought and heat stress-induced proteins. These proteins may be responsible for resistance to both heat and drought stresses. Because the desert-adapted Tepary bean and the heat and drought-susceptible common bean are so closely related, they were selected for research in this model-system study, the overall objective of which was to characterize, catalogue and compare changes in the protein profiles of Tepary and common bean plants, which were subjected to drought and heat stresses. The experiments were carried out at the research facilities of the U.S. Department of Agriculture, Research Service, at Beltsville, Maryland and at Stoneville, Mississippi. The results of the comparative analyses of steady state proteins showed that there were great similarities between the isolated proteins (obtained by using electrophoresis) from the common beans and Tepary beans. This similarity thus precluded the speculation that the greater heat tolerance of Tepary beans could be explained by the presence of unique proteins found in Tepary beans but not in common beans. Alternative explanations for the observed differences in heat stress tolerance could be related to protein turnover rates or differences in the lipid portion of the cell membranes.

AQUACULTURE

14. A FEASIBILITY INVESTIGATION FOR AQUACULTURE IN THE DOMINICAN REPUBLIC. Morehouse College; Bender, J.E.

Abstract. This research project addressed the problem of aquaculture feed production in the Dominican Republic through the development of a high-quality feed with a low-cost technology. The research project successfully developed a potential aquaculture feed product that produced comparable Tilapia and silver carp growth when compared to commercial catfish-feed under laboratory conditions. The aquacultural feed product consisted of a mixed microbial biomass cultured in silage grass clippings and contained 25 percent protein and 43 percent carbohydrate. Since the only growth requirements for this aquatic feed system are water, air, microbes, silage grass and a supply of basic minerals generally found in most soils, this method should have the potential for wide application in most developing countries. A secondary potential use of the silage-microbe mat system was discovered by the researcher during the course of the research. Heavy metals from the water and soil were efficiently transported and stored in the surface mat by motile bacteria. The metals could subsequently be reclaimed by raking the pond and hydrolyzing the sample. It therefore appears that the silage-microbe mat system could have important use in water decontamination.

Reports

- Ekpo, I. and Bender, J.E., "Digestibility of a Commercial Fish Feed, Wet Algae, and Dried Algae by *Tilapia nilotica* and Silver Carp." *Progressive Fish-Culturalist*, 51:83-86, 1989.
- Bender, J.E., Vatcharapijarn, V., and Russell, A., "Fish Feed from Grass Clippings." *Aquacultural Engineering*, 1989.
- Bender, J.E. and Archibold, E.R., "Lead Removal from Contaminated Water by a Mixed Microbial System." *Water Science and Technology*, 21(12):1661-1665. 1989.
- Bender, J.E., "HBCU Researcher Develops Natural Fish Feed." *Front Lines*, A.I.D., p. 7. November 1988.

15. DEVELOPMENT OF FISH FEEDS FOR DOMINICAN REPUBLIC.

Morehouse College; Bender, J.E.

Abstract. The objective of this research project was to investigate the silage microbial mat (SMM) fish feed system as a low-cost practical aquacultural feed, and to assess this system in terms of its potential for field application in developing countries. Field pond results in the Dominican Republic showed that protein from the SMM feed reached levels about 26 percent within about one week of culture and carbohydrate levels of 43 percent indicated efficient photosynthesis of the cyanobacteria. The SMM feed also showed good digestibility and protein availability with Tilapia and silver carp. In addition Tilapia grew more rapidly on SMM than on commercial catfish feed. SMM system dynamics were found to be similar in the laboratory and in Dominican field ponds.

Reports

Bender, J.E., Archibold, E., Vatcharapijarn, Y., Ibeanusi, V., and Gould, J., "Development of a Mixed Microbial Ecosystem for Biotechnology." *American Association for the Advancement of Science*, 1988.

Bender, J.E., Vatacharapijarn, Y., and Archibold, E., "Microbial Production of Nutritional Protein." Amer. Soc. of Microb. Conf., New Orleans, LA, May 1989.

Ekpo, I., "Production and Digestibility of a Mixed Microbial Plankton Raised on Silaged Grass." Ph.D. Thesis. Atlanta University, 1988.

16. EVALUATION OF A NEW ANDROGEN FOR MASS PRODUCTION OF ALL-MALE TILAPIA IN LDCs. University of Arkansas at Pine Bluff; Meriweather, F.

Abstract. Fresh water pond culture of fish (Tilapia) has proven to be an important component of the solution to growing protein shortages in many developing countries. All-male populations of Tilapia are normally preferred over mixed or all-female populations because of the faster growth rate of the males. The research project was designed to test the hypothesis that the sex of Tilapia fish can be altered from female to male by the introduction of an androgen, Mibolerone, into the fish pond. Results indicated that exposing Tilapia fish to Mibolerone immersion flow-through solution, at 0.6 ppm concentration, was a feasible method of eliminating the production of functional females and thereby increasing the size of the resultant crop. Mibolerone

appears to be more potent than other available hormones in producing this desirable sex-reversal in Tilapia.

Reports

- Merriweather, F.H. and Torrans, E.L., "Evaluation of a New Androgen and Procedure to Induce Functional Sex Reversal in Tilapia." The First Asian Fisheries Forum. Asian Fisheries Society, Philippines, pp. 675-78, 1986.
- Torrans, E.L. and Merriweather, F., "Sex Reversal of Tilapia with Mibolerone." World Agricultural Society Annual Meeting, Honolulu, January 4-9, 1988.

FOOD STORAGE, PRESERVATION AND PREPARATION

- 17. THE SOLAR BOX COOKER AND FOOD QUALITY.** Philander Smith College; Hammonds, G.J.

Abstract. The researchers investigated the nutritional and microbial quality of food, cooking times and acceptability of more than 25 foods cooked in solar box cookers (SBCs) in Zambia. The foods were cooked crockpot style. It was found that most foods can be cooked in the solar cookers with no loss in food quality or acceptability but requiring significantly longer cooking times. The results also showed that cooking foods in the SBC maintained the nutrient content of foods as well as or better than other cooking methods. It was further found that the SBC can be used to pasteurize water from local sources that was contaminated with either coliform or E.coli bacteria. Use of the SBC offers an attractive alternative method of cooking, which can contribute to a reduction in the dependency on scarce and expensive fuel sources.

- 18. ANALYSIS OF HEALTH ASPECTS, FOOD ACCEPTABILITY AND ECONOMIC BENEFITS OF THE SOLAR BOX COOKER IN SIERRA LEONE.** Southern University; Carpenter, B.

Abstract. The researcher tested the extent of pathogenic reduction of microorganisms in foods cooked and water pasteurized via the solar box cooker in a Sierra Leonean village environment and determined the acceptability of food cooked in the solar box cooker and the estimated fuel and labor saved. It was found that pathogenic microorganisms can be reduced significantly by cooking

SECTION I

and pasteurizing in a solar box cooker, compared to food cooked in the traditional manner. Fuel savings were also significantly improved.

Report

Carpenter, B., "Technology Transfer of the Solar Box Cooker to Village Environment in Sierra Leone." A W.K. Kellogg Foundation Fellows Symposium, Battle Creek, Michigan. Dec. 1989

19. EVALUATION OF INDIGENOUS FOOD PRESERVATION TECHNIQUES IN GHANA. Tuskegee University; Pace, R.D. and Lu, J.Y.

Abstract. This project identified the major food preservation techniques in use in Ghana and conducted nutritional and microbial evaluations of them. The study also evaluated the adequacy of the food preservation techniques in terms of nutrient quality of the preserved foods and possible public health problems. Dehydration, especially through sun-drying of root crops, vegetables and fish, was the most common form of food preservation used. The most important preserved food was smoked-dried herring. Spoilage during storage was found to be a major problem.

Reports

Lu, J.Y., Pace, R.D. and Plahar, W.A., "Survey of the Microbial Quality of Dry Fish, Cassava and Okra in Ghana." *Journal of Food Protection*, Vol. 51 (8):660-662, 1988.

Lu, J.Y. and Pace, R.D., "Nutritive Composition of Smoke Dried Herrings in Ghana." *Nutrition Reports International*, 38 (2):299-306, 1988.

Pace, R.D., Plahar, W.A., and Lu, J.Y., "Status of Traditional Food Preservation for Selected Ghanaian Foods," *Food Reviews International*, 5(1):1-12, 1989.

20. EVALUATION OF SELECTED STORAGE CONDITIONS FOR THE PREVENTION OF POST-PROCESSING LOSSES AND QUALITY PRESERVATION OF SMOKED HERRINGS. Tuskegee University; Lu, J.Y. and Pace, R.D.

Abstract. Smoked dried herring (*Sardinella spp.*) is by far the most popular fish consumed in large quantities in Ghana. This research project investigated the

relative effectiveness of four simple storage methods for reducing the excessively high post-processing losses of smoked dried herring, which can be as high as 70 percent. The four methods were: 1) frozen storage at -20°C for six months, which served as the control method; 2) storage in polythene bags, with and without desiccant; 3) storage in traditional "Chorkor-style smokers," and 4) use of a modified-smoker storage, designed by Tuskegee University primarily for reducing insect infestations during storage. The results indicated that storage loss was only 4 percent for fish in the modified storage structure, compared to 27 percent in the traditional storage unit. Smoked-dried herring stored in the modified storage structure also had a low microbial load, and a highly acceptable sensory quality; chemical analyses indicated that the product was highly desirable. Smoked-dried herring stored in polythene bags, with and without desiccant, spoiled within one to three months, due to excessively high moisture content and high acid values.

Reports

- Plahar, W.A., Pace, R.D. and Lu, J.Y., "Effect of Storage Condition of the Quality of Smoked Dry Herring (*Sardinella eba*)", *J. Science of Food and Agriculture*. (Accepted for publication. In Press), 1991.
- Lu, J.Y., Pace, R.D., and Plahar, W.A., "Storage Conditions and Microbial Quality of Smoked Dry Herring in Ghana," *J. Food Protection*. Accepted for publication. In press, 1991.

21. POTENTIAL NUTRITIONAL BENEFITS OF DRIED MANGOES.
Tuskegee University; Rankins, J.

Abstract. The main objective of this research project was to develop procedures and standards for producing a high-quality dried mango and to demonstrate its potential for improving diets of malnourished weaning-age children in Senegal. This research demonstrated that solar dried mangoes could be preserved for at least six months with no detrimental effects on nutrients such as carotene and vitamin C, flavor or excessive bacterial growth. The small fibrous mangoes that are traditional in Senegal proved to be less suitable for solar drying than improved varieties. It was also found that only the direct type dryers functioned well on a consistent basis.

SECTION I

Report

Rankins, J., "Palatability and Nutritional Significance of Solar-dried Mangoes for Senegal." *Ecology of Food and Nutrition*, Vol. 23, pp. 131-140, 1989.

22. LOW COST AND PRACTICAL SOLAR FRUIT DRYING SYSTEMS. North Carolina A&T University; Goswani, D.Y.

Abstract. The objectives of the project were to: 1) review/evaluate the economic feasibility and manufacturability of solar drying systems; 2) fabricate and test performance of two systems; and 3) recommend most appropriate systems for LDCs. The main conclusions from the study were: 1) geodesic type structure requires 7 to 8 sunny days to dry grapes, and collects more solar energy than conventional greenhouses; 2) natural air configuration with a ventilator is superior to forced air designs; and 3) the geodesic solar dryer is economical and convenient for developing countries.

Report

Goswani, D.Y., "Simulated and Measured Performance of a Geodesic Dome Solar Fruit Dryer." *Proceedings of the Florence World Energy Research Symposium*. Firenze, Italy, June 1990.

LIVESTOCK SCIENCE

23. STUDY TO IMPROVE QUALITY OF BARBADOS BLACKBELLY SHEEP. Lincoln University; Swartz, H.A.

Abstract. The overall objective of the investigation was to select genetic parameters on which to base breeding of the Barbados Blackbelly hair sheep. Selection of animals was based largely on growth rate and carcass quality evaluations. Due to wide variations in weaning weight, height, length and carcass quality/quantity of the Blackbelly sheep, continuation of selections for prolificacy, weaning weight and carcass quality will be necessary to achieve the goal of establishing a sound base on which to develop breeding programs for the Blackbelly sheep. Carcass quality was excellent overall and the 140 lb. carcasses were not excessively fat (0.2 in. back fat), according to USDA standards. Dressing percentages ranged from 45.7 to 59.3, with an average of

52 percent. Quality grade ranged from average good (8) to prime minus (13). Yield grade ranged from 1.8 to 3.4.

Report

Swartz, H.A. and Alexander, M., "Growth Rate, Lambing Percent and Rate of Gain in Barbados Blackbelly Sheep." *Missouri Academy of Science*, pp. 10-11, 1987.

24. CONFINEMENT REARING OF GUINEA FOWL IN LDCs. Tennessee State University; Vo, K.V.

Abstract. The effects of rearing density and method of rearing on the performance and carcass composition of guinea keet broilers under simulated conditions of developing countries were studied. In addition the optimal levels of protein and energy in rations for guinea keets were determined. It was found that the optimal diet during starting, growing and finishing periods was 23 percent, 19 percent and 17 percent protein respectively, with associated floor space of 360, 540 and 800 sq.cm/bird respectively. An energy level of 3,000 kcal/kg was recommended for starter diet.

Reports

Amadi, A.C., "Dietary Protein Requirement and its Effect on Performance, Carcass Composition and Selected Physiological Characteristics of Guinea Keet Broilers." M.Sc. Thesis. Tennessee State University, 1987.

Osbourne, S.L., "Space Requirement and its Effect on Performance, Carcass Composition and Selected Physiological Characteristics of Guinea Keets." M.Sc. Thesis. Tennessee State University, 1987.

25. DEVELOPMENT OF AN EMBRYO TRANSFER PROGRAM FOR THE JAMAICA-HOPE CATTLE. Lincoln University; Meredith, S. and Synder, D.

Abstract. The two main objectives of the research program were to: 1) determine the effect of various doses of follicle stimulating hormone (FSH) on the release of ova from donor cows and 2) compare the effectiveness of Estrumate and Sychromate B for estrus synchronization in recipient cattle in Jamaica. Embryos were successfully transferred in Jamaica, which resulted in live calves. There was no effect of type of FSH treatment on response. There was no difference in response of cows between Estrumate and Sychromate B.

SECTION I

Success rate varied greatly from large commercial herds, where this procedure was successful, to small herds on subsistence farms, where it was not because of the absence of good herd management.

Report

Meredith, S., "Final Report to the Agency for International Development " March 1989.

26. INCIDENCE AND MANAGEMENT OF INFERTILITY IN CATTLE AND BUFFALOES IN RURAL HARYANA, INDIA. Fort Valley State College; Arora, K.L.

Abstract. The project studied the factors related to low productivity and reproductive efficiency in cattle and buffaloes in rural Haryana, India. The project also investigated suitable ameliorative measures to enhance cattle productivity. The project covered four selected villages, two located in the dry zone and two in the wet zone. In the wet zone the incidence of anestrus was highest, followed by repeat breeding, silent heat, cervicitis and abortions. Similar problems existed in the dry areas. It was found that productivity and reproductive efficiency in cattle and buffaloes were hampered by delayed sexual maturity, anestrus conditions, faulty management practices, malnutrition and lack of organized cattle-breeding operations. Although artificial insemination facilities existed in all four villages surveyed, conception rates were low, due to the poor quality of semen used, inexperienced inseminators and wrongly timed insemination.

Reports

Arora, K.L., "Studies on the Incidence and Reproductive Management of Infertility in Breedable Dairy Animals in Rural Haryana, India," *Proceedings of the 10th International Congress on Reproduction*, Al, Volume 4, pp. 544-546. Dublin, Ireland, 1988.

Yadava, N.K., "A Study on Factors Causing Non-clinical Reproductive Disorders in Breedable Buffaloes/Heifers and Their Ameliorative Measures in Some Villages of Haryana State." M.Sc. Thesis. Haryana Agricultural University, 1988.

27. METABOLIC ASPECTS OF THE LEUCAENA TOXIC MIMOSINE.

Langston University; Fernandez, J.M.

Abstract. The objectives of this research investigation were: 1) to determine mimosine-specific effects on hair fiber and milk production and quality in Angora (mohair) and Alpine (dairy) goats, respectively; and 2) to study the metabolic responses of the goats to subclinical mimosine toxicity. In the first study, short-term mimosine administration resulted in decreased mohair fiber production and plasma total protein concentrations in Angora withers, suggesting a derangement in protein metabolism. These studies also demonstrated that mimosine can directly influence thyroid hormone levels and function. In the second study, mimosine administration for 21 days in early lactating does did not affect milk yield or feed intake; however, the nitrogen content was higher in the milk from mimosine-treated does. The effects of mimosine on lactational performance and possible transfer into the milk are inconclusive and need further study.

Reports

- Fernandez, J.M., Sahlu, T., and Lu, C.D., "Metabolic Aspects of Mimosine Toxicity in Goats," *Proceedings of the International Seminar on Goat Production in the Asian Humid Tropics*, Hat Yai, Thailand May 28, 1991.
- Akinsoyinu, A.O., Fernandez, J.M., and Lu, C.D., "Release of Mimosine, Nitrogen, and Minerals from *Leucaena* Incubated in Sacco in the Rumen of Alpine Goats," *Small Rumen Research*, March, 1991.
- Jacquemet, N., Fernandez, J.M., Sahlu, T. and Lu, C.D., "Mohair Quality and Metabolic Profile of Angora Goats During Acute Mimosine Toxicity," *Journal of Animal Science*; 68 (Suppl.1):400-401, 1990.

28. OPTIMIZING THE UTILIZATION OF CROP RESIDUES BY RUMINANT LIVESTOCK IN WEST AFRICAN SAHEL. Tuskegee University; Louis, S.L. and Solaiman, S.G.

Abstract. This research project was undertaken to investigate the optimal utilization of sorghum stovers by ruminant livestock in Burkina Faso. A series of *in vitro* fermentation experiments using sheep and goats were conducted to evaluate the effects of post-harvest time, moisture content and urea on the nutritional quality of ensiled sorghum stovers. It was found that crude protein was lowest and neutral detergent fibre (NDF) was high in stovers collected four weeks after harvest. However, crude protein increased, whereas NDF and

SECTION I

hemicellulose decreased with addition of urea, and 60 percent moisture resulted in the highest *in vitro* dry matter digestibility. No species effect was observed. *In vivo* digestibility studies showed that ensiling sorghum stovers with urea and the addition of urea did not improve the voluntary feed intake by sheep and goats, which was higher on untreated stovers. Silage produced from a "dirt silo" and from a "concrete silo" were evaluated using cost/benefit analyses. It was found that it was 5½ times less expensive to produce silage using the "dirt silo" method. The quality of silage produced by the two systems was approximately equal.

Reports

Dembele, B., "*In Vitro* Improvement of Sorghum Stover Nutritional Value for Sheep and Goats" M.Sc. Thesis. Tuskegee University, 1990.

29. UTILIZATION OF LOCALLY AVAILABLE LIVESTOCK FEED INGREDIENTS TO IMPROVE PRODUCTION OF GOATS IN HAITI. Florida A&M University; McGowan, C.H.

Abstract. The purpose of the research was to investigate the possibility of improving goat production in Haiti by using agricultural crop residues, crop byproducts, shrubs and forbs found in selected areas; to determine their nutrient composition and make recommendations on their utilization as feeds in goat production. Results showed that the feeds analyzed were generally high in protein, above 10 percent; total digestible nutrients (TDN) also appeared to be high, averaging around 70 percent. Crude fibers were generally higher in grasses and crop residues. Nitrogen-free extract was very low in sugar-cane tops, indicating a need for supplementation.

Report

McGowan, C.H., "Utilization of Crop Residues and Byproducts in Goat Rations." *Proceedings of the 6th Biennial Research Symposium of 1890 Land Grant Universities*, Atlanta, GA, 1985.

ENTOMOLOGY/PEST MANAGEMENT

30. INSECT RESISTANCE AND ALTERNATIVES TO INSECTICIDES
IN RWANDAN GRAIN STORAGE. Selma University; Sriharan, S.

Abstract. The major objectives of the study were to: 1) survey the resistance among three species of stored insects to two insecticides commonly used in Rwanda — Actellic and Phostoxin; 2) test for possible cross-resistance to other insecticides; and 3) consider the use of non-toxic plant extracts (Neem extracts) as possible alternatives to insecticides. Results showed that resistance to Actellic was found in insect populations at warehouses in Nianza and Kupakazo, whereas at certain locations Actellic was still effective. From the results of laboratory and grain storage studies, it was evident that Neem-seed extract, at a concentration of above 0.05 percent, was an effective natural insecticide that adversely affects the survival of both the rice weevil (*Sitophilus oryzae*) and grain borer (*Rhyzophthera dominica*). Neem extracts were also effective in reducing the survival of the F1 generation, even at concentrations as low as 0.001 percent.

Reports

Sriharan, S., "Evaluation of Insect Resistance to Actellic in Rwandan Storage.

Journal of Stored Product Insects. Paper accepted for publication, 1990.

Sriharan, S., "Efficacy of 'Neem-Extract' for Postharvest Protection of Dry Edible Beans, Soft Red Wheat and Sorghum." *Journal of Tropical Agriculture.* Paper accepted for publication, 1990.

31. SYSTEMATICS OF AQUATIC WEEVILS TO ENHANCE
BIOLOGICAL CONTROL OF AQUATIC WEEDS. Florida A&M
University; O'Brien, C.

Abstract. The main objectives of the study were to develop a cladistic analysis and a key to the genera of the New World Stenopelmini (aquatic weevils), Erihniinae, and to revise the species of the genera *Neohydronomus*, *Argentinorynchus* and *Onychylis* to enable the use of selected weevils as potential biological control agents of exotic weeds. As a result of the study, the number of known genera has been doubled from 20 to 40, and approximately 25 new species have been described in published papers. More than 25 new host plant associations were verified in the field in South America. The data are vital to successful biological weed control programs.

SECTION I

Reports

- Wibmer, G. and O'Brien, C., "Additions and Corrections to Annotated Checklists of the Weevils of North America, Central America, West Indies and South America." *Southwest Entomol.* (Suppl.) 13:1-49, 1989.
- O'Brien, C. and Wibmer, G., "Revision of the Neotropical Weevil Genus *Argentinorhynchus Brethes*." *Ann. Entomol. Soc. Amer.*, 82:267-278, 1989.
- O'Brien, C. and Wibmer, G., "Two New South American Species of the Weevil Genus *Argentinorhynchus Brethes*." *Southwest Entomol.*, 14:213-223, 1989.
- O'Brien, C. and Wibmer, G., "Revision of the Neotropical Genus *Neohydronomus Hustache*." *Coleoptera Bulletin*, 13(3):291-304, 1989.
- Wibmer, G. and O'Brien, C., "Two New Neotropical Genera in the Weevil Tribe Stenopelmini." *Southwest Entomol.*, 14(4):395-407, 1989.

SOIL SCIENCE

32. DYNAMICS OF SOIL ORGANIC MATTER FORMATION. Florida A&M University; Hsieh, Y.P.

Abstract. Studies on the dynamics of soil organic matter (O.M.) formation under tillage and no-tillage management were carried out at the Yurimaguas Research Station in the Amazon region of Peru. The research project was implemented in two phases. In the first phase, the researcher developed the theoretical framework for the study, evaluating rate constants for the major processes involved in soil O.M. formation under tillage and no-tillage conditions. In the second phase of the research project, the principal investigator (P.I.) carried out three field experiments to: 1) measure soil organic matter and top soil losses through erosion and runoff; 2) evaluate the effects of temperature, soil moisture and crop type on soil respiration and root respiration in a low and a high input cropping system; and 3) measure the decomposition of crop residues in both high and low input systems using the litter-bag method. The results showed that eroded soil collected in the low-input system contained more organic carbon than the high-input system, indicating that there was more accumulation of O.M. in the low-input systems. Soil and root respiration studies revealed that under low-input cropping systems, soil respiration was affected mainly by the soil moisture and the type of the crop, while under high-input systems, soil respiration was affected mainly by soil moisture alone. Results of crop residue decomposition

rates indicated that most of the crop residues are recycled in soils in a period of less than one year. Thus, the impact of crop residue incorporation in soil is relatively short-termed and is more important for nutrient cycling but less important to the building of soil O.M.

Reports

Hsieh, Y.P., "The Dynamics of Soil Organic Matter Formation in Croplands — Conceptual Analysis." *The Science of the Total Environment*; 81/82:381-390, 1989.

Hsieh, Y.P., "Measurement of Topsoil Erosion by a Litter-bag Method." *Conservation Farming on Hill Slopes*; World Soil and Water Conservation Society, 1990.

Hsieh, Y.P., "A Meshbag Method for Soil Surface Erosion Measurement," *Journal of Soil and Water Conservation*; 1991.

33. POOL SIZE AND TURNOVER TIME OF STABLE SOIL ORGANIC MATTER IN TROPICAL CROPLANDS BY C-13 AND C-14 METHODS. Florida A&M University; Hsieh, Y.P.

Abstract. The researcher used the relatively new carbon-14 (C-14) biomarker technique to identify and quantify the active and stable components of soil organic matter in certain croplands of Belize and correlated the pool size of active soil organic matter of the selected tropical lands with their management and land use history. The method is based on the principle of radiocarbon dating, and the assumption of differential decomposition between the active and stable soil organic carbon in a cropland. According to the researcher, this novel approach can also be used in assessing soil productivity and nutrient cycling of low-input agriculture in tropical regions.

Report

Hsieh, Yuch-Ping, "Identifying the Pool Size and Turnover Time of Stable Soil Organic Matter in Croplands by a C-14 Method," *Proceedings of the 14th International Congress of Soil Science*; Tokyo, Japan, 1990.

SECTION I

34. TOXIC TRACE METALS IN ACID SOILS OF THE HUMID TROPICS. Prairie View A&M University; Brams, E.

Abstract. The objectives of the research were to measure accumulation of toxic trace metals in tissues of food plants in acid soils under lime and no-lime treatments and to measure retention of trace metals in the tissue of animals fed the food plants. No detectable levels of aluminum, cadmium or lead were found in rice and corn seeds and ear leaves under the lime and no-lime treatments. Relatively low to moderate levels of aluminum were found in the seeds of pulses. However, markedly high levels of aluminum were found in endive and lettuce on unlined soils, but zinc deficiencies became evident when lime rates were elevated and/or manure was added.

Reports

Brams, E., "Bioavailability of Toxic Trace Metals in Vegetables from Acid and Limed Soils," *Journal of Environmental Quality*, 1990.

Cavallo, N. and Brams, E., "Toxic Metals in Rice, Corn, and Vegetables on Acid Soils of Puerto Rico," *Plant and Soil*,; p. 231, 1990.



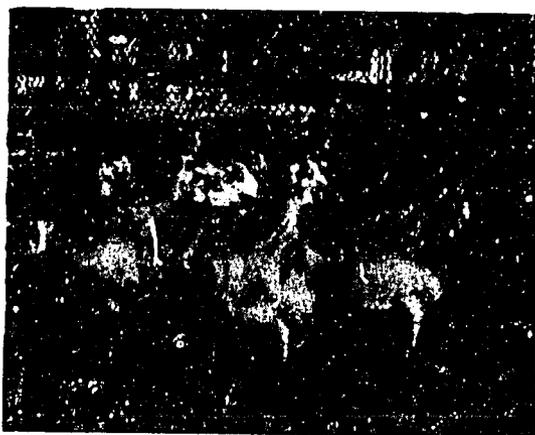
Dr. Donella Wilson, Meharry Medical College, examining chart of parasitized red blood cells in malaria vaccine development experiments.



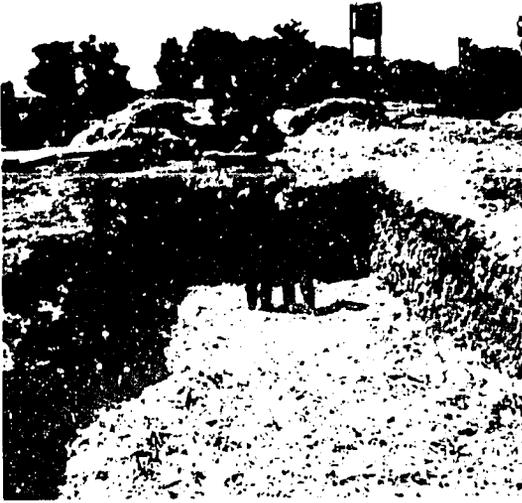
Dr. D. Marsh, of Lincoln University, examines growth of legumes from his biological nitrogen fixation research project in Jamaica. (Abstract 8)



Dr. Raj Bahadur, of Mississippi Valley State University, examines growth of cultivars of soybeans (left), common beans (middle), and tepary beans (right). (Abstract 13)



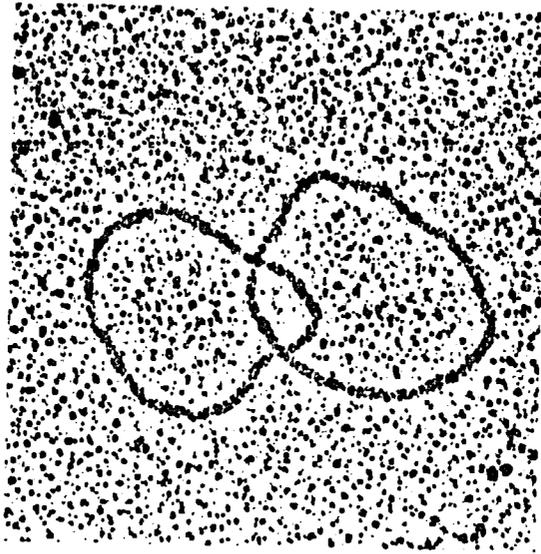
Blackbelly sheep (adult ewes) in the confinement building, Ministry of Agriculture Research Station, Greenland, St. Andrew, Barbados. (Abstract 23)



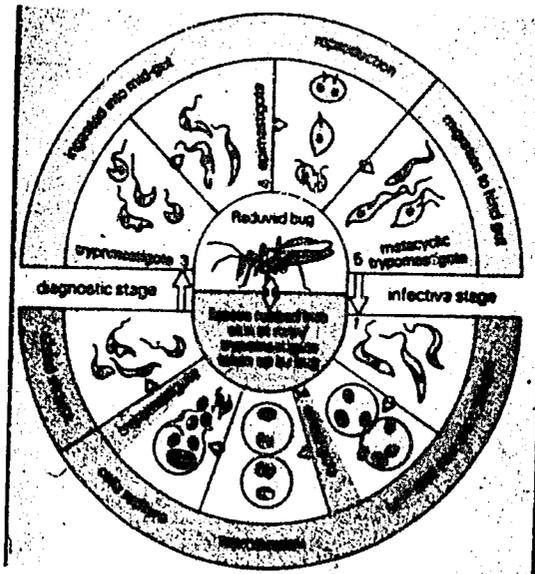
Dr. Suchet Louis, of Tuskegee University, and Dr. Aime Nainogo, of the University of Ouagadougou, stand in a "dirt silo" in Burkina Faso used for the production of silage. (Abstract 28)



Dr. Suchet Louis, of Tuskegee University, demonstrates the use of a mechanical chopper for preparing livestock feed from crop stovers in Burkina Faso. (Abstract 28)



Electromicrograph of a Catenated Dimer of a *T. cruzi* Minicircle DNA. (Abstract 42)



Life Cycle of *T. cruzi*, the infectious Agent of Chagas' Disease. (Abstract 43)



A Child Showing Romana's Sign Indicative of the Chagas' Disease. (Abstract 43)



Meharry Medical College graduate student preparing solutions for poly-acrylamide-gel DNA sequencing. (Abstract 44)



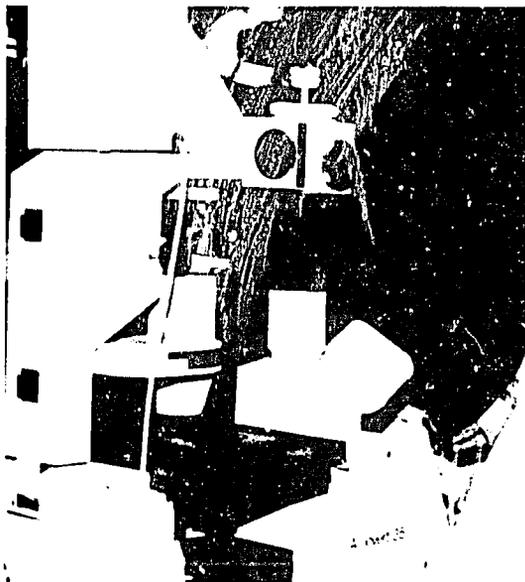
Dr. Manuel Valenzuela of Meharry Medical College carrying out research to characterize the nature of *T.cruzi* kinetoplast networks. (Abstract 44)



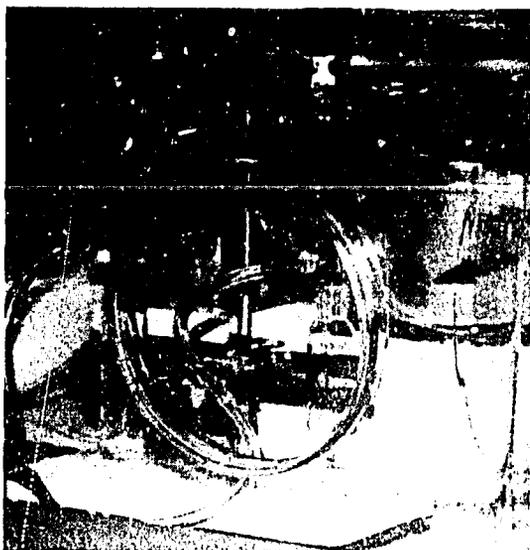
Dr. F. Villata of Meharry Medical College using a computerized densitometer scanner to analyze *T.cruzi* proteins. (Abstract 48)



Meharry Medical College graduate student operating oligonucleotide synthesizer for characterization of *T. cruzi* proteins. (Abstract 48)



Morehouse Medical College technician viewing results of two-dimensional electrophoresis experiments. (Abstract 50)



Equipment used by Dr. Paul Urso, of Morehouse School of Medicine, to study the effect of inhaled benzo(a)pyrene, a product of wood smoke, on mice and their progeny. (Abstract 62)



Morehouse Medical College technician carrying out laboratory studies on the carcinogenic effects of the environmental pollutant benzo(a)pyrene. (Abstract 62)

SECTION II

HEALTH, POPULATION AND NUTRITION-RELATED PROJECTS

PARASITIC DISEASES

Schistosomiasis

35. IMMUNOSUPPRESSION TO BACTERIAL VACCINES IN SCHISTOSOMIASIS. Howard University; Kassim, K.

Abstract. Both the vascular and hepatosplenic forms of schistosomiasis are associated with the development of immunosuppression. But there is as yet no information concerning the possibility that *Schistosoma mansoni* (*S.mansoni*) infection may also result in immunologic unresponsiveness to selected bacterial vaccines. Since the pathogenesis of *S.mansoni* in mice is similar to the clinical course of the disease in humans, it was possible to use the murine model to study the effects of an underlying schistosome infection on cellular and humoral immune responses to certain whole-cell vaccines. These included vaccines against *Salmonella typhimurium*, *Bordetella pertussis*, *Streptococcus pneumoniae* and *Clostridium tetani*. Humoral immune responses were monitored with the measurement of specific IgG and IgM antibodies, phytohemagglutinins, *S.mansoni* soluble egg antigen, and antigenic extracts from the four bacterial vaccines mentioned above. Cellular immune responses were monitored by spleen lymphocyte proliferation. The results conclusively demonstrated that spleen lymphocytes from *S.mansoni*-infected mice were totally unresponsive to stimulation by pertussis antigen and tetanus toxoid. The findings therefore suggest the importance of considering the possibly deleterious effect of high prevalence and incidence of parasitic infections, such as schistosomiasis, on the successful implementation of an immunization program that is designed for the control of whooping cough and tetanus.

Reports

Kassim, K., "Immunosuppression in Schistosomiasis," scheduled to be published in the *Journal of the Royal Society of Tropical Medicine and Hygiene*.

SECTION II

Kassim, K., "Induction of Humoral Immune Response to Bacterial Vaccine in Schistosomiasis," scheduled to be published in the *Journal of the Royal Society of Tropical Medicine and Hygiene*.

36. DEVELOPMENT OF ANTISCHISTOSOMAL COMPOUNDS-PURINE DERIVATIVES. Texas Southern University; Jadhav, A.L.

Abstract. Objectives were to identify structural characteristics of potential inhibitors of the purine salvage enzymes of *Schistosoma mansoni* (*S.mansoni*). Results indicated that C-2 and C-6 substituted purines provided the structural requirements for inhibition of hypoxanthine-guanine phosphoribosyl transferase (HGPRT). Non-purine compounds were found to be inactive and an intact purine ring was determined to be necessary for inhibition of HGPRT.

Report

Jadhav, A.L., "Kinetic Differences Between the Purine Salvage Pathways in Human Red Blood Cells and *S.mansoni*". Abstract presented at Sixth International Congress on Parasitology, Brisbane, Australia, 1986.

37. DEVELOPMENT OF ANTISCHISTOSOMAL AGENTS. Texas Southern University (TSU); Jadhav, A.L.

Abstract. Kinetic characteristics of purine analogs for HGPRT isolated from human red blood cells (RBC) and *S.mansoni* were compared, with the objective of finding potential inhibitors of the enzyme. Since the parasite *S.mansoni* lacks the *de novo* purine bio-synthetic pathway, inhibitors of HGPRT may be potentially valuable in the therapy of schistosomiasis. Partially purified preparations containing an HGPRT were obtained from human RBC and homogenates of *S.mansoni* worms, using ammonium sulfate fractionations. Of the 54 compounds tested, only C-2 and C-6 substituted purine derivatives were found to be active against the enzyme, and an intact purine ring appeared to be necessary for activity against both the human and parasitic type of enzyme. Thus, the C-2 and C-6 substituted purines and their isosteres may provide the structural requirements for potential inhibitors of HGPRT and, possibly, a lead to improved chemotherapy.

Reports

- Jadhav, A.L., and Sirosian, S., "Development of Antischistosomal Agents: Inhibition of Hypoxanthine-Guanine Phosphoribosyl-transferase," *Drug Development Research* (Accepted for publication January 4, 1990).
- Jadhav, A.L. and Sirosian, S., "Structural Requirements for *In Vitro* Inhibitions of Salvage Pathways of *Schistosoma mansoni*". *The Pharmacologist*, 31, 3, 174, 1989.

38. DEVELOPMENT OF THE NATURAL PRODUCT PHYTOLACCA DODECANDRA FOR THE CONTROL OF SCHISTOMIASIS IN DEVELOPING COUNTRIES. Tuskegee University; Jones, W.O., Mamo, E., and Stobaeus, J.K.

Abstract. The research carried out under this project focused on the development of an effective molluscicide capable of controlling the vectors of schistosomiasis, primarily in Africa. Objectives of the research included the testing of several different ways of obtaining active extracts of the berries of *Phytolacca dodecandra* (endod), building on the work already accomplished by a number of other researchers since the discovery, in Ethiopia in 1964, of the molluscicidal effect of this berry. Studies of the toxicity of various extracts of the berry were carried out on fish and on dogs, and a number of suggested objectives for future research, needed further to refine any extraction procedures and to test toxicity for agricultural animals such as goats, were proposed. The extracts were found to be toxic for fish at very low concentrations, and at much higher concentrations, for dogs.

Reports

- Stobaeus, J.K., Heath, G.E., Parkhurst, R.M., Jones, W.O. and Webster, J.E., "A Laboratory Study of the Toxicity of Butanol Extract of Endod (*Phytolacca Dodecandra*) on Two Species of Fresh Water and Two Species of Aquatic Snails," *Veterinary and Human Toxicology*, Vol. 32, No. 3, June 1990, pp. 212-216.
- Parkhurst, R.M., Mthupha, B.M., Liang, Y.S., Bruce, J.I., et al. including Stobaeus, J.K., "The Molluscicidal Activity of *Phytolacca Dodecandra* - 1. Location of the Activating Esterase." *Biochemical and Biophysical Research Communications*, Vol. 158 No. 2, January 31, 1989, pp. 436-439.

39. SCHISTOSOMIASIS: BIOLOGY AND HOST PARASITE RELATIONSHIPS. Morehouse Medical College; Jones, B.R.

Abstract. There is a need for basic information concerning an essential link in the transmission cycle of schistosomiasis (schisto), namely, the miracidium-snail interaction. The overall objective of this research was to study the biology of the nervous system of schisto miracidia and related cercariae, and especially to investigate the putative neurotransmitter substances and enzymes contained in the miracidia. This, it was held, would provide insight on the mechanisms for determining neurotransmitter numbers, types and other related parameters. The research described in this report demonstrated numerous details of the fine structure of sensory nerve endings and other components of the miracidium nervous system previously under-described. In addition, preliminary data from the research revealed that whole mount intact miracidia contained a serotonin-like immunoreactivity distributed throughout the outer epidermal layer of the organism. Other results of this research may be summarized as follows: 1) It has been possible to localize the serotonin component of one of the neurotransmitters in the miracidium; 2) It has been possible to demonstrate biochemically the differences in the activity of the various enzymes in infected versus non-infected snails; and 3) Differences in surface ultra-structure in three species of schisto-vector snails have also been demonstrated. These findings could perhaps open new possibilities for improved chemotherapy in this disease.

Report

A series of papers were incorporated into a chapter of a book entitled *Biodeterioration Research II — General Biodeterioration, Degradation, Microtoxins, Biotoxins and Wood Decay*. Ed., Charles D. O'Rear and Gerald C. Llewellyn. Plenum Press, New York, 1989.

40. THE SERO-EPIDEMIOLOGIC DETERMINATION OF EXPOSURE PATTERNS TO SCHISTOSOME CERCARIAE THROUGH THE DETECTION OF ANTIBODIES TO CERCARIAL PENETRATION. Drew Medical College; Esfandiari, A.

Abstract. The main purpose of this research was to exploit an earlier discovery to the effect that there is an immune response mounted against a cercarial penetration enzyme (elastase) and that this immune response can be quantitatively detected by use of the enzyme-linked immunosorbent assay test (ELISA). The research demonstrated that levels of exposure to *Schistosoma*

mansoni (*S.mansoni*) cercarial elastase could in fact be measured in a cross-sectional study among children from four schools in Central Kenya. One of the schools was located in an area with a high prevalence of *S.mansoni* infection and one in an area where the prevalence was low. Optical densities (OD) to elastase antigen, measured in the high prevalence, high transmission area, were higher than those detected in the low transmission area ($P=0.0001$). Girls also showed higher OD than boys, a finding that was putatively associated with the higher level of domestic chores and more water contact among girls than among boys. Thus the measurement of elastase antibodies against this parasite has potential as an epidemiologic tool.

Report

Several papers are noted as pending, including one entitled "Field Application of Cercarial Elastase Antigen as a Seroepidemiological Tool to Assess Exposure to Schistosomiasis," (submitted to) *The American Journal of Tropical Medicine and Hygiene*.

Malaria

41. PLASMODIAL INDUCTION OF EPSTEIN-BARR VIRUS. Howard University Medical School; Gravelly, S.

Abstract. The objective of the research was to determine whether *Plasmodium falciparum* (*P.falciparum*) induces Epstein-Barr Virus (EBV) activation and increased viral capsid antigen (VCA) in Burkitt's Lymphoma (BL) cell lines and whether the parasite thus enhances proliferation of rapidly dividing BL cells. Research findings indicated that *P.falciparum* increased the expression of VCA in one of the BL cell lines but not in others. In addition it was found that *P.falciparum*-infected RBCs exhibited significantly increased DNA synthesis. However, the effect of this on the latent EBV genome in Raji-3 cells remains to be determined. The work may shed further light on the epidemiology of BL.

Report

"Induction of Epstein Barr Virus by Plasmodium Falciparum." Abstract presented at Ninth International Congress of Infectious and Parasitic Diseases, Munich, July 20-26, 1986.

Trypanosomatina

42. REPLICATION OF TRYPANOSOME KINETOPLAST DNA. Meharry Medical College; Valenzuela, M.S.

Abstract. It was posited that a rational approach to a therapeutic solution for trypanosomiasis could come from an understanding of some of the intrinsic biological features common to all trypanosomes. Kinetoplast DNA, a unique but vital component in these parasites, appears to be amenable to this approach since it is already known to be the target of several drugs developed for this purpose, especially *berenil*. In this research, therefore, the organization of kinetoplast DNA replication was investigated, and mechanisms by which certain drugs might interfere with this process were studied. Results of the research led to the isolation of catenated dimers that could be considered putative DNA intermediates in the replication of *Trypanosoma cruzi* (*T. cruzi*) minicircle DNA. It was also found that in this process, when *berenil* was exhibited, it led to a massive accumulation of replicative intermediates in *T. cruzi*, but in loss of bacterial plasmids. These results suggest that the mechanism of *berenil* interference with the replication of this parasite may not merely be the result of preferential binding to the adenosine triphosphate-rich regions in minicircle DNA. Instead, other enzymatic components may also be affected.

Reports

Ikpeazu, E. V., and Valenzuela, M.S., "A Specific Deletion Caused by Insertion of Poly (dA), Poly (dT) in pBR322 DNA." *Plasmid* 21, 247, 1989.

Ikpeazu, E.V. and Valenzuela, M.S., "Construction of Recombinant Plasmids Containing Berenil-Target Sequences". NIH Centennial MBRM-Symposium, 1987.

43. TRYPANOSOMA CRUZI (T. CRUZI) MEMBRANE COMPONENTS INVOLVED IN THE FIRST STEPS OF PARASITE-HOST CELL ASSOCIATION. Meharry Medical College; Villalta, F.

Abstract. The principal objective of this project was to identify which of the membrane components present on the cell surface of *T. cruzi* mediate the interaction between *T. cruzi* trypomastigotes and their host cells. A novel strategy was used to develop and characterize two types of *T. cruzi* trypomastigote clones (highly and weakly infective) that might reveal the parasite ligand mediating the interaction with the host cell. The hypothesis to be tested

was based on the fact that the attachment of *T. cruzi* trypomastigotes involves the interaction between the membrane of the parasite and the host cell. The PI therefore felt that by studying the cell surface protein patterns of the parasite membrane, and the binding of cell surface components of highly and weakly infective trypomastigotes, he might be able to characterize the parasite molecule, present on the parasite cell surface, that mediates its attachment to the host cell. This work resulted in the discovery of an 83kDa glycoprotein found to be universally present on *T. cruzi* trypomastigotes as an adhesion molecule that attaches the parasite to rat heart muscle cells. It was also determined that the 83kDa glycoprotein is recognized by antibodies produced against the cell surface of both insect- and blood-derived trypomastigotes, when analyzed by Western blot. It was also found that antibodies produced during the course of a human infection, but not sera from uninfected individuals, could also recognize this molecule by Western blot. The work perhaps achieves another step toward development of a molecular vaccine against *T. cruzi*.

Reports

- Lima, M.F. and Villalta, F., "*T. cruzi* Trypomastigotes Cloned Differentially Express a Parasite Cell Adhesion Molecule," *Molecular and Biochemical Parasitology*, 33:159-170, 1989.
- Lima, M.F. and Villalta, F., "Host Cell Attachment by *T. cruzi*: Identification of an Adhesion Molecule." *Biochemical and Biophysical Research Communications*, 155:256-262, 1988.

44. CHARACTERIZATION OF *TRYPANOSOMA CRUZI* (*T. CRUZI*) KINETOPLAST NETWORKS. Meharry Medical College; Valenzuela, M.S.

Abstract. The project, described here, built on information obtained from an earlier one funded under the HBCU Research Grant Program and concentrated on efforts to determine the nature of the kinetoplast networks and the way in which the DNA within these networks is organized. Research results showed that the mentioned network appears to be provided mostly by the minicircles, since maxicircles can be removed without affecting the network structure. Perhaps the most important aspect of the kinetoplast networks, it was found, is that they must also contain protein components that most likely play an important part in the replication and segregation of these structures. In addition, a procedure previously used in this laboratory to obtain HeLa nucleoids was adapted to isolate the kinetoplast DNA networks from *T. cruzi* cells. Protein

SECTION II

analysis by PAGE/sodium dodecyl sulfate (SDS) electrophoresis was used for further analysis of these proteins. This analysis revealed a unique pattern of protein bands and uncovered two novel putative replicative DNA intermediates. The work bears on improved chemotherapy in Chagas' Disease.

Report

Valenzuela, M.S., Bardhan, S., Kristanami, M.R.S. and Siddiqui, K.A.I., "Putative Intermediates in the Replication of *T. cruzi* Kinetoplast Minicircle DNA, Catenated Dimers and Knotted DNA Structures." *Biochemical and Biophysics Research Communications*, Vol. 174, pp. 958-968.

45. TRYPANOSOMA CRUZI RECEPTORS FOR HUMAN TRANSFERRIN AND THEIR ROLE. Meharry Medical College; Lima, M.F. and Villalta, F.

Abstract. This research grant was designed to define the role of a host iron-binding protein in *Trypanosoma cruzi* (*T. cruzi*) multiplication and development. Research results showed that *T. cruzi* amastigotes present receptors for human fibronectin. In the presence of physiologic concentrations of this protein, these receptors increase the binding to and uptake of amastigotes by both murine macrophages and human monocytes. Demonstrated macrophage-monocyte interactions with *T. cruzi* amastigotes play an important role in the immunomodulation of the host response to *T. cruzi*. Further research in this substantive area might produce a better understanding of these processes and facilitate an appropriate immunological manipulation against *T. cruzi* infection in favor of the hosts.

Reports

Lima, M.F. and Villalta, F., "Trypanosome *cruzi* Receptors for Human Transferrin and Their Role." *Molecular and Biochemical Parasitology*, Vol. 38:245-252, pp. 245-252, 1989.

Noisin, E. and Villalta, F., "Fibronectin Increases *T. cruzi* Binding to and Uptake by Murine-Macrophages and Human Monocytes." *Infection and Immunity*, 57:1030-1034, 1989.

Lima, M.F. and Villalta, F., "Membrane Receptors for Human Transferrin in Intracellular Forms of *Trypanosoma cruzi*." Joint Meeting of the American Society for Cell Biology and the American Society for Biochemistry and

PARASITIC DISEASES — TRYPANOSOMATINA

Molecular Biology. Abstract 4373. San Francisco, CA. *Journal of Cell Biology*, 107:788a. 1989.

46. CHARACTERIZATION OF TRYPANOSOME NON-HISTONE CHROMOSOMAL PROTEINS. Meharry Medical College; Bhorjee, J.S.

Abstract. This project is the fourth in a series of research projects, under the HBCU Research Grant Program, which have been awarded to the same laboratory at the Meharry Medical College, Division of Biomedical Sciences. All of these projects have been concerned with investigation of Latin American trypanosomiasis, or Chagas' Disease. In addition, all have the same long-term goals, namely, to acquire a better understanding of the molecular biology of *T. cruzi* and its interaction with mammalian host cells, because information of this type is necessary in order to develop new concepts of chemotherapy against *T. cruzi* and related parasites. The major objective of this research was to develop reliable methods for isolation of nuclear chromatin from different life-cycle forms of *Trypanosoma brucei* (*T. brucei*) and to characterize the nucleosomic structures of chromatins isolated from the procyclic (*T. b. rhodesiense*) and the bloodstream forms of *T. brucei*. Another objective was the isolation and characterization of the high mobility group (HMG) chromosomal proteins from *T. brucei*. The research showed that the chromatins from two different life cycle stages of *T. brucei* are different; and, in addition, a low molecular weight histone H1-like protein in *T. brucei* chromatins was identified.

Report

Kochar, V.K., Mwasi, L.M. and Bhorjee, J.S., "*Trypanosoma Brucei*: Isolation of Nuclei, Characterization of Chromatin Sub-unit Structure and Evidence for the Presence of Histone H1-Like Protein." *Experimental Parasitology* (in press).

47. TRYPANOSOMA CRUZI (T. CRUZI) BINDING TO MAMMALIAN CELLS. Meharry Medical College; Villalta, F.

Abstract. Previous work by this investigator and others has shown that *T. cruzi* trypomastigotes attach to and penetrate mammalian host cell membranes to multiply intracellularly and disseminate in the body. Thus, an understanding of how the parasite attaches to mammalian host cells is critical to the development of effective means to prevent the infection, e.g., by means of a molecular

SECTION II

vaccine. Previous work in this laboratory has identified an 83kDa band, present on the cell surface of invasive trypomastigotes, which binds to heart myoblasts in a ligand-receptor manner, appears to mediate the attachment of trypomastigotes to host cells, and is more expressed in highly than weakly infective trypomastigote clones. The work described here shows that this trypomastigote 83kDa glycoprotein is composed of four comparable glycoproteins, with different isoelectric points, three of which bind to heart myoblasts. Partial purification of these glycoproteins has been accomplished, and the PI has shown that they may inhibit the attachment of the parasite to heart myoblasts either by preemption of the cell receptors or through stimulation of antibody formulation. But the details of these putative mechanisms remain to be identified and explained.

Reports

Villalta, F., Lima, M.F. and Zhou, L., "Purification of *Trypanosoma Cruzi* Surface Proteins Involved in Adhesion to Host Cells." *Biochemical and Biophysical Research Communications*, Vol. 172, No. 2, 1990, 925-931. In addition, results arising from this grant were presented at several scientific meetings.

48. TRYPANOSOMA CRUZI AMASTIGOTE SURFACE PROTEINS. Meharry Medical College; Villalta, F.

Abstract. The purpose of this research was to isolate surface proteins from *T. cruzi* amastigotes that stimulate lymphocytes to proliferate, and to characterize these proteins and the surface protein epitopes that may interact with lymphocytes in organs of the infected host. As a result of this research, the PI succeeded in purifying a glycoprotein of relative molecular weight 60kDa that was found to be present on the surface of *T. cruzi* trypomastigotes; and its ability to prime and stimulate the proliferation of murine T cells was studied. It was found that the 60kDa trypomastigote surface glycoprotein of isoelectric point 4.2 was the most abundant protein among all those that were chromatofocused. Furthermore, this protein was recognized by antibodies produced during human infection and was found to be able, specifically, to activate primed lymphocytes. From this and other findings it was concluded that the human cell mounts a protective immune response against this surface protein, leading to increased trypomastigote uptake and killing by macrophages. In addition, it was found that this surface glycoprotein is developmentally regulated in the cell cycle of the parasite since it is not present in the earliest parasitic forms (epimastigotes).

Thus, these surface molecules could be potential targets of immunologic attack by the host, another move toward the molecular vaccine approach to controlling this disease.

Reports

Villalta, F., Lima, M.F., Howard, S.A., Zhou, L. and Ruiz-Ruano, A., "A Developmentally Regulated *Trypanosoma Cruzi* 60kDa Surface Glycoprotein is Capable of Priming and Activating Lymphocytes." Submitted to *Journal of Immunology*.

In addition, results arising from this grant were presented at several scientific meetings.

DIARRHEAL DISEASES

49. REFORMULATION OF TABLET ALTERNATIVE FOR HOME ORAL REHYDRATION THERAPY IN TROPICAL CLIMATES.

Charles R. Drew University; King, R.C.

Abstract. Oral rehydration therapy (ORT) is recognized as a cost-effective means of providing electrolyte replenishment in diarrheal diseases and, thereby, reducing infant and child mortality. For various reasons, oral rehydration salt (ORS) solutions, especially when prepared in rural homes in developing countries, may provide a concentration of electrolytes that is grossly different from that which was intended. This can cause serious side effects. The objective of this research project, therefore, was to prepare and evaluate standard and alternative ORS formulations as a preliminary step to developing a suitable ORS tablet alternative for enhanced shelf life, increased accuracy and economy, for routine home use and ORT in developing countries. Research findings indicated that no single group emerged as an outstanding candidate for a tablet formulation; however, none could be ruled unsuitable and it was considered that all existing formulation problems were solvable. However, it was also concluded that more experiments needed to be performed for conclusive results and before a truly suitable tablet could be developed.

50. IDENTIFICATION OF MAMMALIAN TARGET CELL MOLECULES INVOLVED IN ATTACHMENT AND STIMULATION OF ATTACK BY *ENTAMOEBA HISTOLYTICA* (*E.HISTOLYTICA*). Morehouse College of Medicine; Bailey, G.E.

Abstract. The etiology of amoebiasis, a human tissue invasive disease caused by the protozoan parasite *Entamoeba histolytica* (*E.histolytica*), is not understood. The development of immunological or chemotherapeutic means of prevention of the disease requires greater knowledge of the molecules involved in the attack-stimulating interaction between the parasite and the human host cells. The research conducted under this A.I.D. grant was the first to be directed toward the identification of mammalian cell surface molecules that might trigger attack by the amoeba. It was hoped that the information obtained would provide the basis for procedures to investigate the molecular mechanism of target cell attack by *E.histolytica*, as well as for immunological methods that could be used to aid the search for a vaccine against amoebiasis. The objectives of the research project were essentially achieved by application of state-of-the-art molecular biology and related disciplines. Thus, using human RBCs as a mammalian target cell model, it was determined that the mammalian target cell surface molecules responsible for stimulating parasite attack are lipids (glycosphingolipids and negatively charged phospholipids). Furthermore, it was found that the phospholipid, phosphatidylserine present in the RBC membranes, and digalactyl diacylglyceride, a plant lipid that may bind to *E.histolytica* via a galactose-sensitive lectin, could stimulate attack almost as effectively as whole target cells.

Reports

- Bailey, G.B., Day, D.B., Nokkaew, C. and Harper, C.C., "Stimulation by Target Cell Membrane Lipid of Actin Polymerization and Phagocytosis by *Entamoeba histolytica*." *Infection and Immunity*, August 1987, pp. 1848-1853.
- Bailey, G., Nudelman, E., Day, D., Harper, C. and Gilmour, J., "The Specificity of Glycosphingolipid Recognition by *Entamoeba histolytica*". *Infection and Immunology*, 1989.
- Bailey, G., Nudelman, E., Day, D. and Gilmour, J., "Use of Non-Cellular Models to Study the Interaction of *E.histolytica* with Mammalian Cells." Presented at the Eleventh International Seminar on Amoebiasis, 1989.

51. ROLE OF THE INTESTINAL MUCOUS BLANKET IN SECRETORY DIARRHEA, INTESTINAL AMEBIASIS AND THE ABSORPTION OF ORAL REPLACEMENT FLUIDS. Morehouse School of Medicine; Leitch, G.J.

Abstract. There are non-immune gastrointestinal defense mechanisms that aid in the prevention of or amelioration of infectious gastrointestinal disease. One such system is the intestinal mucous blanket. But the mechanism by which the mucous blanket fulfills this role is not clearly understood. The methodology of this research was based on the assumption that for *Entamoeba histolytica* (*E.histolytica*) trophozoites to invade the intestinal mucosa they must first survive the environment of the intestinal lumen, and then be able to penetrate the mucous blanket. It is known that the luminal fluid is rich in organic anions; but, in previous research in this laboratory it was found that among these anions, only ammonium decreased viability of *E.histolytica*. Results of the research indicated that the mucous blanket and associated epithelial layers of the intestines form a mucosal microclimate that may have a pH, and ammonia (NH₃) concentration, significantly different from those of the luminal fluid of the intestines. Furthermore, the mucous blanket pH, and NH₃ concentrations, were found to be important variables in determining whether or not *E.histolytica* trophozoites become invasive or remain commensal. It is therefore believed that these results justify the conclusion that pathogenicity of the indicated organisms in the human gut is directly related to ammonia concentration and pH, both of the luminal fluid and the mucous blanket. This information could be of value in improving therapy of this disease.

Refereed Publications

- Leitch, Gordon J., "Possible Roles of Large Bowel Lumen and Mucous Blanket Solutes and *Entamoeba histolytica* Trophozoite Invasion," *Archives of Investigative Medicine* (Mex.), In press.
- Leitch, G.J., "Luminal and Mucosal Microclimate H⁺ and NH₃ Concentrations as Potential Factors in *Entamoeba histolytica* Trophozoite Invasion." Abstract presented at the Meeting of the Gastroenterology Research Group, May 10-13, 1987.

SECTION II

52. THE ROLE OF HOST NUTRITION IN THE PATHOGENESIS OF INTESTINAL AMEBIASIS. Morehouse Medical College; Leitch, G.J.

Abstract. The principal objectives of this project were to study the relationship between host diet and the course of experimental amebiasis, and to determine how diet effected large bowel solutes, which in turn affect *E.histolytica* trophozoite viability and virulence. Gerbils and hamsters were maintained for ten weeks on controlled diets, and diets deficient in nicotinic acid or protein, or high in fiber. However, in spite of many efforts there was no reliable evidence of intestinal amebiasis in either species, on any of the diets used. As a result of the above experimental "aberration," it was decided to study the effect of different dietary regimens on gerbils infected with *Giardia lamblia* (*G.lamblia*) with and without high-fiber diets. Results of the research indicated that high-fiber diets afforded protection against infection with *G.lamblia* in gerbils. In addition, infected gerbils maintained on a low protein diet for ten weeks exhibited significantly greater enteropooling and steatorrhea than did infected animals maintained on the "control" diet. Thus, high fiber was protective against infection of gerbils with *G.lamblia* cysts; and a low-protein diet caused significantly greater evidence of infection with *G.lamblia* as compared with "control" animals on a normal diet. This information could be useful both in prevention and therapy of this disease.

Reports

- Leitch, G.J., "Osmoregulation in *Entamoeba histolytica*." *Archives of Investigative Medicine* (Mexico). (In Press).
- Leitch, G.J., Visvesvara, G.S., Wahlquist, S.P. and Harmon, C.T., "Dietary Fiber Reduces Intestinal Infection by *Giardia lamblia*." *Federation Proc.* 3:A647, 1989.
- Leitch, G.J., "Osmoregulation in *Entamoeba histolytica*". XI International Seminar on Amebiasis. Mexico City, November 15-17, 1989.

53. PREPARATION OF MONOCLONAL ANTIBODIES TO DETECT AND ISOLATE *ENTAMOEBIA HISTOLYTICA* MEMBRANE ANTIGENS ESSENTIAL FOR ATTACK UPON MAMMALIAN CELLS. Morehouse School of Medicine; Bailey, G.B.

Abstract. The principal objective of this project was to prepare monoclonal antibodies against *E.histolytica* surface membrane antigens that inhibited attachment and parasite attack among mammalian target cells. This strategy was

designed to identify antigens that were involved in the parasite attack mechanism and that might be useful for the development of a molecular vaccine against amebiasis. The project objectives were achieved, and over 20 monoclonal antibodies (MAbs) against *E.histolytica* were detected in three fusion experiments. In addition, from these 20 MAbs five were isolated that bound to the surface of *E.histolytica* and also inhibited target cell attachment. These MAbs have been partially characterized and one has been found to be an Igm, and two are Igg 2a, immunoglobulins. In addition, the conclusion was reached that all of the surface active MAbs recognized the same putative *E.histolytica* antigen and proved highly specific for it.

Report

Nokkaew, C., Aloisio, C.H. and Bailey, G.B., "An Anti-*Entamoeba histolytica* Monoclonal Antibody That Blocks Target Stimulated Amoeba Actin Polymerization." American Society of Parasitology, 63rd Annual Meeting, Abstract 84, 1988.

PHARMACEUTICALS

54. THE PHARMACOKINETICS OF RIFAMPIN IN A SELECTED POPULATION IN INDONESIA: IMPLICATIONS FOR THE COST-EFFECTIVENESS OF THERAPY. Drew University of Medicine and Science, International Health Institute; King, R.C.

Abstract. Rifampin is an antibiotic that is accepted worldwide as the drug of choice to treat tuberculosis. Research on rifampin use was initiated in Indonesia because of a reported increase in the number of tuberculosis patients experiencing drug-induced hepatotoxicity while on rifampin therapy. But the peak blood levels of rifampin reported in the literature are based largely on research with Caucasian subjects. Thus, the purpose of the present research was to expand the original work to include Indonesian subjects and to derive implications about suitable rifampin dosage. To this end, pharmacokinetic measures, such as half-life, elimination rate constant and total body clearance, were instituted following ingestion of a dose of 300mg of rifampin. After a suitable interval for complete clearance of the drug from the subjects' blood, the same subjects received the recommended dose of 600mg and the same tests were carried out. The central findings of this study included clear experimental evidence that there was no obvious difference (other than the presence or

SECTION II

absence of tuberculosis) between the two study groups. Results are clear that rifampin is eliminated at a slower rate following the administration of 600mg doses than following dosages of 300mg. In addition, and most importantly, the peak serum concentration for Indonesians was three times higher than the reported values for non-Indonesian populations receiving the same doses. Consequently the significant study conclusion was reached that it might be possible to treat Indonesian patients suffering from tuberculosis with considerably lower doses of rifampin than are being used at the present time.

55. THE USE OF TRADITIONAL AND MODERN MEDICINES FOR THE SAME ILLNESSES IN SELECTED POPULATIONS IN ZAIRE.

Charles R. Drew University of Medicine and Science, International Health Institute; King, R.C. and Mulumba, B.

Abstract. Populations in developing countries often use Western (modern) medicine as well as traditional indigenous medicine for the same illness. The conjunctive use of both of these types of medicament could lead to non-productive and/or toxic interaction between the two. The research described in this project focused on examining the demographic and social behavioral factors that may be relevant to this situation, such as the degree to which both systems are accessed for the same self-identified health problem, the nature of medicines consumed, perceived seriousness of the illness, and reasons for the choice of mixed services; and the cost and distance required to obtain them. The work was carried out in six southern regions of Zaire chosen in such a way that they encompassed both traditional and Western health care systems, sufficient sample size and representation of a good ethnic mix at the same time that they were reasonably accessible to the research team. Results showed that residents of these Zaire areas had some knowledge about the two systems of medicaments available to them and used both systems, frequently at the same time. Further research is recommended by the PI in order to examine the matter more fully from a pharmacologic point of view and to develop appropriate information education and communication (IE&C) inputs to ameliorate the undesirable "mixing" of medicaments described.

56. PHYTOCHEMICAL SCREENING OF SOLANUM SPECIES INDIGENOUS TO JAMAICA. Florida A&M University College of Pharmacy; Lamba, S.S. and Lunan, H.N.

Abstract. A close structural similarity exists between some steroidal alkaloids derived from *Solanum* species and corresponding nitrogen-free sterols such as *diosgenin*. The latter compound is used in the synthesis of some steroidal drugs,

including oral contraceptives, but the process is very expensive; hence the need for a cheaper substitute. The research was based on the fact that the literature showed that a different and cheaper precursor for such steroidal drugs, namely solasodine, might be found in the *Solanum* species in Jamaica. A series of extracts of these botanicals was screened for the presence of the desired alkaloids. It was found that the solasodine content of *S.torvum* in fruits, leaves and flowering tops was sufficient to render it quite competitive as the source of this important putative steroidal drug precursor.

Report

Lamba, S.S. and Buch, K.Y., "Estimation of Glycoalkaloids as Solasodines in *Solanum torvum* Indigenous to Jamaica." *International Journal of Experimental Botany*, 49(1/2):35-39, III-1989.

57. ETHNOPHARMACOLOGIC RESEARCH: DISCOVERING NEW PROTOTYPE DRUGS THAT WILL BE USEFUL IN THE CLINIC.

Xavier University of Louisiana, College of Pharmacy; Ochillo, R.F.

Abstract. The immediate goal of this investigation was to isolate and characterize both from a pharmacologic and toxicologic point of view the components, particularly the muscle relaxant components, of an African arrow poison of plant origin obtained in Kenya. In addition, this type of work was considered important to serve as an initial phase of the establishment of a laboratory devoted to the study of African folk medicine. The work was originally intended to be carried out in Swaziland in collaboration with the professor of chemistry at that institution. However, in the event, the samples of arrow poison were obtained in Kenya and there is no evidence of any particular collaboration with any institution or professional in the substantive area of pharmacognosy in Kenya, or any other country outside the United States. All the poisons were highly lethal and it does not appear that the work resulted in any new findings of significance in the area of pharmacodynamics of these poisons.

SECTION II

58. THE INFLUENCE OF STORAGE UNDER TROPICAL CONDITIONS ON THE *IN VITRO* AVAILABILITY OF CERTAIN DRUGS FROM TABLETS. Florida A&M University, College of Pharmacy and Pharmaceutical Sciences; Asker, A.F.

Abstract. The problem of tablet aging with accompanying changes in stability, disintegration time and dissolution rate has received increasing attention, especially in the tropics. Although the chemical stability of drugs, in tablet dosage forms, has been studied extensively, the problem of the effect of storage conditions on the rate of dissolution and related characteristics of the stored tablets has been given less consideration. Although it was originally intended to study five or six different drugs in tablet form, it appears that only neomycin sulfate was investigated. The samples were examined under four different storage conditions (relative humidities of 90 percent and 35 percent respectively at 40 degrees Celsius for both groups). It appears, however, that only six tablets were used for each "sample" and it is not possible, from the data given, to determine the total number of tablets studied. The conclusion was reached that higher humidity appeared to be an important factor contributing to the physical and chemical instability of neomycin sulfate tablets.

OTHER HEALTH

59. NATIONAL SURVEY OF THE PREVALENCE AND RISK FACTORS OF GLAUCOMA IN ST. LUCIA, WEST INDIES. Howard University; Mason, R.P.

Abstract. From data obtained in the United States, glaucoma appears to be much more common and severe in blacks than in whites. In St. Lucia, professional opinion holds that the disease is even more common than in the United States. Since glaucoma is a chronic disease, it lends itself to prevalence studies. St. Lucia, being small and geographically accessible, presents an ideal population for a comprehensive epidemiologic study of this disease, including a risk factor analysis in individuals 30 years of age and older. There were four major purposes in the research project, as follows: 1) measure the age-specific prevalence of chronic open angle glaucoma (OAG) and ocular hypertension (OH) in a black population-based sample, age 30 and older; 2) determine age-specific relationships between intra-ocular pressure and glaucomatous visual field loss; 3) examine the role played by potential risk factors, such as hypertension, increased intra-ocular pressure, family history of OAG, and tobacco and alcohol consumption; 4) train an existing cadre of ophthalmic nurses as glaucoma

diagnosticians, and provide practical training in field epidemiology for St. Lucia Ministry of Health counterparts. The prevalence sample of 1,679 individuals underwent a screening exam for glaucoma and, of those screened, 513 were referred for further examination and treatment. Of these, 205 individuals met the criteria of diagnosis of glaucoma, giving a prevalence rate of about 12 percent in the total sample examined. This is about eight to nine times the prevalence rate for this disease in the United States. The work has, however, already contributed materially to our knowledge of the epidemiology of this disease, especially as it may affect black populations.

Report

Mason, R.P., Kosoko, O., Martoni, J., Cowan, C.L. Jr., Wilson, M.R., et al., "National Survey of the Prevalence and Risk Factors of Glaucoma in St. Lucia, West Indies-Part I, Prevalence Findings". *Ophthalmology*, Vol. 96, No. 9, pp. 136-3-68, 1989.

60. FROM DEMONSTRATION TO GENERAL PROGRAM: THE COMPANIGANJ HEALTH CARE DELIVERY EXPERIMENT IN RURAL BANGLADESH. Morgan State University; Amin, R.

Abstract. This study was based on the results of the Companiganj Pilot Health Project (CPHP), which operated in Bangladesh from 1973 to 1980, and the subsequent existing government rural health program in the same geographic area, which followed after the CPHP was completed. Objectives included study of the data on utilization of traditional and modern health services, preferred patterns of disease treatment received, and actual patterns of diseases, knowledge, accessibility and utilization of oral rehydration therapy, extended immunization and causes of child mortality. The second group of objectives was to observe the effects of the comprehensive health program on some of these parameters. A central finding of this study was that an overwhelming majority of the rural population used modern allopathic medical practitioners even though the latter were informally trained and without any medical degrees. It was also found that these practitioners were used to an increasing extent during the time in which the CPHP was in existence as compared with afterwards. This was interpreted as arising from the improved level of health services provided at the project health centers during the time of the existence of the CPHP, as compared with the situation later. In short, improved health services appear to have led to improved health service coverage and increased confidence in the services on the part of potential clients. This applied research project enhanced knowledge of the relationship between health service quality, coverage and acceptability.

SECTION II

Report

Amin, R., Chowdhury, S.A., Kamal, G.N. and Chowdhury, J., "Community Health Services and Health Care Utilization in Rural Bangladesh," *Social Science and Medicine*, Vol. 29, No. 12., pp. 1343-1349, 1989.

61. A STUDY OF THE DIFFUSION OF AN INNOVATION IN THE HEALTH CARE SYSTEM IN BOTSWANA. Tennessee State University; Linn, J.G.

Abstract. In the early 1970s, the Ministry of Health (MOH) of the government of Botswana (GOB) began a concerted effort to increase emphasis on delivery of preventive rather than primarily curative health services, especially for the rural and peri-urban population of the country. In order to achieve this objective, the MOH decided to increase its pool of nurses qualified to work in the primary health care system throughout the country. This resulted in the Botswana Maternal Child Health Family Planning Training Project, which was implemented by an A.I.D. contract with the Meharry Medical College in Nashville, Tennessee. The period of implementation was for May 1973 to September 1978 and the major objective was to train over 400 nurses by means of an eight week refresher course emphasizing integrated public health, maternal and child health and family planning. The purpose of the present research was to determine if the innovative nursing practices taught during the refresher course were widely implemented in the country and how this may have happened. In order to address this matter in more depth, the general hypothesis was proposed that "the attributes of nursing practice innovations will be more important predictors of the nursing practice innovations than the socioeconomic characteristics, personality variables and communication behaviors of the individuals who adopt them," a question of the process by which the innovative training, provided by the Meharry contract, was diffused among the trainees. The methodology was basically that of an interview survey of some 600 nurses, of whom 425 completed their interviews. Approximately 22 percent of these indicated that they had participated in the mentioned refresher training provided through the Meharry contract. The data obtained from the survey were presented in a series of 22 tables, accompanying explanatory narratives, and analysis. From this information it was concluded that, by and large, the nursing staff trained in the Meharry/Botswana Project have continued the practices they were taught. Furthermore, it was concluded that this desirable result has been replicated and sustained among a considerable proportion of the GOB/MOH nurses now at work on MOH programs in the country, although some

deficiencies were noted, especially in relation to postnatal care (PNC) and the insufficient number of nurses trained in midwifery.

Reports

- Linn, J.G., Monnig, R.L., Fako, T.T. and Gilpin, P., "Promoting Safe Motherhood in Southern Africa: Prenatal Nursing Practices in Botswana." Submitted for publication to the *Journal of Health and Social Policy*.
- Linn, J.G. and Monnig, R.L., "Prenatal Care Utilization in Botswana." APHA Annual Conference, October 19-22, 1989.
- Linn, J.G., Monnig, R.L., and Fako, T.T., forthcoming, "Postnatal Care Utilization in Botswana." APHA Annual Conference, November 10-13, 1991, Atlanta, Georgia.

62. CHANGES IN T-LYMPHOCYTES OF PROGENY AND MOTHERS AFTER EXPOSURE TO BENZO(A)PYRENE DURING PREGNANCY (MID-GESTATION). Morehouse School of Medicine; Urso, P.

Abstract. Benzo(a)pyrene (BP), a ubiquitous environmental pollutant, is teratogenic, mutagenic and a potent carcinogen. Urbanization, industrialization and continued use of wood fuel for cooking and other household purposes in developing countries may lead to alarming increases in BP in the atmosphere, both inside and outside the home. The research described in this project follows that carried out in other studies, in which it was found that a severe postnatal suppression of humeral immunity and cell mediated immunity (CMI) developed in pregnant mice following intraperitoneal injection with 150ug of BP per gram of body weight. Furthermore, this effect seemed to persist for the greater part of the animal's life span. Because the response against tumors involves primarily CMI, and because this was found to be related to changes in the T cells of fetal livers and spleens, and in the thymus, it was decided further to analyze changes in these cells and subsets, in progeny and mothers. Specifically, the objectives were: 1) to determine changes in T helper (Th) cells, cytotoxic T lymphocytes and T suppressors, after gestational exposure to BP; and 2) to assess the influence of the maternal environment on the development of progeny immunity. Results of the research showed a marked disorientation of T-cells and subsets that persisted for at least four weeks postnatally in the progeny of BP-exposed mothers. Likewise, the spleen cells of BP-exposed progeny were relatively ineffective in resisting *in vivo* growth of transferred tumor cells. The work provides necessary information to support efforts to reduce BP exposure, especially in pregnant mothers and their children.

SECTION II

Report

Urso, P., Ryan, M.C. and Bennett, J.S., "Changes in Peripheral Blood Cells in Mice after Infection with Benzo(a)pyrene During Pregnancy." *Immunopharmacology and Immunotoxicology*, 10(2), 179-193 (1988).

63. BELIEFS AND ATTITUDES TOWARD INFANT MORTALITY AND MODERN HEALTH CARE CENTERS IN EAST CAMEROON.
Jackson State University; Prater, G.S., Azevedo, M. and Lantum, D.

Abstract. The research carried out under this project focused on possible hidden cultural beliefs and attitudes associated with death, especially with infant mortality, and the extent to which these beliefs/attitudes may prevent (or encourage) parents in the use of modern health care centers provided by the Cameroon Government, in a rural province of that country. Other objectives of the research were to suggest alternatives that might encourage use of such centers and to obtain data on the accuracy of reporting infant morbidity and mortality. Methodology was that of a knowledge, attitudes, and practices study using samples of opinion leaders (focus groups) and a cross-sectional sample of more than 200 individuals living in the studied villages. The report concludes with a series of 19 recommendations, a small sample of which may be summarized as follows: 1) A careful but deliberate campaign, by locally rooted individuals, to change people's perceptions of the causality, and especially the mode of transmission of diseases, should be undertaken; 2) Culture-oriented training should be provided for all university medical, nurse and social work students before they are posted throughout the country; 3) Agreement by public health physicians on a basic drug list to provide appropriate treatment of prevalent illnesses at affordable costs is essential; 4) Careful study and knowledge of cultural values and attitudes should be carried out before projects are designed and implemented by health care providers and administrators; and 5) Continued careful assessment and monitoring of the role and power of the traditional healers and midwives, and their training, should be considered as "supplements" to the introduction of "modern medical practices."

64. THE USE OF MATERNAL ARM CIRCUMFERENCE FOR PREDICTING PERINATAL AND INFANT MORTALITY. Charles R. Drew Post Graduate Medical School; Osei-Boama, T., Krasovec, K. and Huffman, S.L.

Abstract. The objectives of the study were as follows: 1) Determine the relationship between arm circumference and other conventional methods of

measuring nutritional status of pregnant women; 2) Analyze pre-pregnancy weight, height and weight changes during pregnancy, weight for height at different stages of pregnancy, and arm circumference in pregnant women, in terms of predicting pregnancy outcomes; and 3) Compare the sensitivity, specificity and predictive value of arm circumference with other conventional measures of nutritional status in attempting to predict the risk of perinatal and infant mortality. The results of this research disproved most of the hypotheses advanced and pointed to the conclusion that analysis of residuals and logistic regressions both confirm that any excessive infant mortality in the sample cannot be predicted by maternal arm circumference, at any stage of pregnancy. However, such negative findings may not necessarily prove useless and, in fact, there were other findings that merit future research. For example, weight for height, and arm circumference, were shown to behave differently during pregnancy. Longitudinal studies on developing country women are needed to replicate this finding and to determine whether these patterns are consistent for varying levels of pre-pregnant nutritional status. In addition, a threshold level of arm circumference under which women do not have, or cannot utilize, fat stores needs to be explored. Many other possibly fruitful areas for related research can be suggested by a careful study of this lengthy "magnum opus". In any event, the information obtained from this research can be of use in nutrition programs for mothers in developing countries.

65. FUNCTIONAL PROPERTIES OF IMMUNE CELLS AFTER ONTOGENIC EXPOSURE TO BENZO(A)PYRENE. Morehouse Medical College; Urso, P.

Abstract. In previous research funded under this program, it was found that a ubiquitous toxicant, BP, is a potent carcinogen and strongly suppresses humoral and cell-mediated immunity in mice. After *in utero* exposure, an increase in sensitivity for tumorigenesis and immune suppression, was observed. In addition there was a marked alteration from normal in the number and type of the T cells in the fetal liver, spleen and peripheral blood. The principal objectives of this research, therefore, were to determine how exposure to BP modifies the differentiative potential that affects interactions among T cells, between T cells, B cells and macrophages, and the functional capacity of other immunocompetent cells, e.g., natural killer (NK) cells. The results of this research indicated that BP evokes suppressive uncommon T cell pathway(s), which may explain deficiencies in other cellular immune parameters such as NK cell activity. However, it was noted that the extreme complexity of the immune system, particularly during its developmental stages, requires much further work for precise identification of the forces at work producing these striking modifications

SECTION II

from normal in the whole T cell lineage. If this can be done, it will provide important groundwork for establishing therapeutic measures that may improve health conditions not only for the poor in developing countries, exposed to excessive amounts of BP and other pollutants, but also for the population of many industrialized countries.

Reports

- Urso, P., "Augmenter and Suppressor Activity by Murine Fetal Liver Cells: Modulation by Benzo(a)pyrene." *Immunologic Investigation*, 1989.
- Urso, P., Cobb, J.R. and Gilmour, J.R., "Serologic and Immunofluorescence Detection of LYT and L3T4 Surface Antigens on Thymic and Fetal Liver Cells of Benzo(a)pyrene-Exposed Mice." *Immunopharmacology*, 1989.

66. MODEL FOR THE IN-VITRO GENERATION OF HUMAN EPIDERMAL AUTOGRAFTS FOR POTENTIAL USE IN TREATMENT OF SICKLE CELL LEG ULCERS. Howard University Medical School; Reindorf, C.A. and Walker-Jones, D.

Abstract. Leg ulcerations in patients with sickle cell disease tend to occur in areas of the skin that have poor or marginal blood supply and a very thin layer of subcutaneous tissue. Minor trauma to one of these areas therefore frequently leads to ulceration. This is an especially significant problem in some of the developing countries of Africa where the disease is fairly common, and leads to a serious negative impact on the human infrastructure in the affected population. Surgical management of these leg ulcers has been attended by a high recurrence rate and repeated efforts at skin grafting. To circumvent this problem it was proposed to culture epidermal cells from the patient's own skin. This was to be accomplished by development of a system to culture autologous cells using various forms of bovine type I collagen foams and sponges. A major aim of the project was to assess the best of these matrices for epidermal cell growth. Another major objective of the study was the development of a culture procedure for rapid generation of differentiating human epidermal cells and accessory melanocytes, on collagen-proteoglycan biomatrices. To this end, certain epidermal cells were cultured on basement layer-derived Matrigel (a patented matrix that became available only toward the end of 1986). The research presents evidence that viable adult epidermal cells, apparently derived from layers below the stratum granulosum, readily attached to a membrane-derived matrix, Matrigel, which also supported some degree of differentiation of these cells in a low-serum medium. However, there was a problem of cell sloughing and some degree of degeneration. Thus, although the work showed that on

Matrigel there is a tendency for cells to develop some of the histotypic characteristics of intact skin, there were problems that could not be dealt with definitively within the terms of reference of this research project.

Reports

Walker-Jones, D.G., Reindorf, C.A., Massac, E. Jr., Adekile, A.D., et al., "Generation of Differentiating Human Epidermal Cells on Basement Membrane Matrigel: Potential for Use as Autografts in Recurrent Ulcerative Lesions." *Materials Research Society Symposium Proceedings*, Vol. 110, pp. 393-397, 1989.

This work on Matrigel has also been cited in *Science* (November 11, 1988, p. 886).

67. FAMILY NUCLEATION AND FERTILITY CHANGE IN TROPICAL AFRICA: PERSPECTIVES ON DEMOGRAPHIC TRANSITION THEORY WITH FOCUS GROUP EXPLORATIONS. Atlanta University, Department of Sociology; Attah, E.P.

Abstract. This research addresses the question, "What are the prospect(s) for fertility decline in tropical Africa?" In demographic transition theory, it is posited, a question remains about the factors and social structure that are involved. Among these, nucleation of family life seems to play a key part; and within this general parameter, the change from a system of extended families, toward emphasis on the conjugal unit, emerges as a consequence of the ongoing transformation of the pattern of African life from subsistence farming to wage work ("proletarianization") and of the concomitant migration, urbanization, penetration of western habits and values, etc. Because of this ongoing flux, it is stated, Africa offers a unique opportunity to carry out research on these issues. The methodology proposed included use of the focus group technique in attempting to define and compile some of the components of the natural history of fertility transition in Cross River State, Nigeria, between 1984 and early 1985. Seven such groups of urban residents (five male and two female) and two groups of residents of nearby villages (one male and one female) were involved in the study. Findings from this research indicated that nucleation of family life emerged as a key institutional link between wider shifts in social structure on the one hand, and changes in fertility-related behaviors and attitudes on the other. The main reason for this shift was determined to be the accompanying shifts in the "cost of children" and in "the status of women within the family unit." These alterations in family structure, and all the other effects noted above, are considered to be major causative factors in the changes

SECTION II

in fertility behavior in the studied communities. This conclusion provides a strong argument for the effect of a number of complex factors on family structure and as major determinants of fertility practices and rates.

Report

"Family Nucleation and Fertility Change in Tropical Africa: Background to the Demographic Transition." 1985 Meetings of the Population Association of America, April 1985. [Abstracted in *Population Index* 51, 3 (Fall 1985)].

68. EFFICACY OF A GONADOTROPIN-RELEASING HORMONE AGONIST AS A MALE CONTRACEPTIVE. Morehouse Medical College; Mann, D.R.

Abstract. Published reports suggest that testosterone (T) supplementation to maintain ejaculatory response interferes with the induction of azoospermia in monkeys treated with a gonadotropin-releasing hormone (GnRh) agonist (Ag). These findings have major implications relative to the possible use of GnRh analogues as male contraceptives in humans. Consequently, it was considered important to reevaluate the effect of Ag administration alone, and in combination with androgen therapy, on spermatogenesis in monkeys. A second purpose of the study was to determine the potential fertilizing capacity of sperm from Ag-treated oligospermic male monkeys. This part of the study was prompted by the possibility that sperm appearing normal in morphology and motility, from these oligospermic animals, may be functionally infertile. The research protocol included the following: 1) surgical implantation of mini pumps and testosterone-containing capsules; 2) measurement of the net surface charge on sperm, measured indirectly, subsequent to attachment of positively charged colloidal ions to the surface of the sperm; and 3) carrying out a hamster ovum penetration test on the sperm of all animals, prior to treatment and during the oligospermic phase of Ag treatment. It was concluded that combined GnRh analog and T therapy may be a viable option as a male contraceptive. Data from this study also suggest that azoospermia may not be essential. Instead, the human male who is oligospermic as a result of Ag administration may already be functionally azoospermic.

Report

Mann, D.R., Adams, S.R., Gould, K.G., et al., "An Evaluation of the Possible Direct Effects of Gonadotropin-Releasing Hormone Analogues on the

Monkey (*Macacca Mulatta*) Testis." *Journal of Reproductive Fertility* (1989), (In press).

69. DIRECT GONADAL EFFECTS OF GONADOTROPIN-RELEASING HORMONE ANALOGUES IN PRIMATES. Morehouse School of Medicine; Mann, D.R.

Abstract. This project follows a previous one on the same general subject — male contraception (see Abstract 34). From this prior project, data suggest that it may be possible to achieve male contraception with GnRh analogues while ameliorating the side effect of loss of libido. However, it is now considered important to have a clear understanding of the mechanism(s) of GnRh analog-induced male infertility in primates. In the present study 18 adult rhesus monkeys were used in both *in vivo* and *in vitro* experiments, each animal serving as its own "control." The *in vivo* experiments were carried out by means of both acute and 44-week (chronic) infusion of a GnRh agonist or antagonist into the testicular artery, and measurement of serum testosterone concentrations in the testicular vein. *In vitro* experiments were carried out by examining the effect of GnRh agonist or antagonist treatment on testosterone production from monkey testicular interstitial cells. Neither the *in vivo* nor *in vitro* evidence from this research supports the hypothesis that GnRh analogues directly altered testicular steroidogenesis in primates. But it was concluded that it is possible that more "chronic" treatment with one of the analogues could have altered either basal testosterone secretion or the response of the cells to human chorionic gonadotropins (HCG). Primarily, the importance of the research is that it has characterized, to a degree not yet available, the mechanisms by which GnRh analogues (agonists or antagonists) may induce azoospermia without directly altering testicular steroidal genesis. This characteristic of a putative male contraceptive would be essential if it were to be used for human fertility control.

Reports

Mann, D.R., Gould, K.G., Collins, D.C. and Wallen, K., "Blockade of Neonatal Activation of the Pituitary-Testicular Axis: Effect on Peripubertal Luteinizing Hormone and Testosterone Secretion and on Testicular Development in Male Monkeys." *Journal of Clinical Endocrinology and Metabolism*, 68:600, 1989.

Mann, D.R., Adams, S.R. et al., "An Evaluation of the Possible Direct Effects of Gonadotropin-Releasing Hormone Analogues on the Monkey (*Macacca mulatta*) Testis." *Journal of Reproductive Fertility*, 85:89, 1989.

70. NUTRITIVE VALUE OF LEAFY GREEN VEGETABLES IN SELECTED LOCATIONS IN BELIZE. Lincoln University; Nordstrom, J.W.

Abstract. Home gardening has been encouraged as a way to increase nutrient intake in Belize and to lower expenditures on food, estimated at 40 to 50 percent of family income. Green leafy vegetables are a prime choice for the home garden, but information on nutrient content and availability is lacking for many of these plants. Such data, if available, would be useful for encouraging the selection and harvesting of appropriate plants for maximum nutritional impact. The research carried out under this project focused on apparent nutrition deficiencies among children in several Districts in Belize. A survey of children 1 to 14 years old living in rural areas of Cayo and Toledo was carried out to provide data on food intake and nutritional status. Results showed marginal to deficient intakes of energy, Vitamins A and C, riboflavin, calcium, iron and zinc. There were related clinical findings, and retarded growth was common in children 4 to 13 years old. It was concluded that if children ate more fruits and vegetables, especially leafy green plants that can be grown in gardens, as well as those that grow in the wild, it might help prevent vitamin and mineral deficiencies that may contribute to retarded growth of children in Belize.

71. NUTRIENT ANALYSIS OF UNCULTIVATED VEGETATION IN BURKINA FASO. Lincoln University; Kirchhofer, W.A.

Abstract. Uncultivated vegetation is a major food item consumed with the staple grains, millet and sorghum, in rural Burkina Faso, West Africa. Knowledge of the nutrient composition of this wild vegetation would provide a basis for evaluating the ability of the diet to meet the nutritional needs of the population. Nutrient analyses of Burkina's uncultivated vegetation was the goal of this research. Samples of the edible uncultivated vegetation were collected and classified from four distinct agricultural regions of Burkina Faso. The samples were analyzed for crude protein (total nitrogen), amino-acid profile, crude fat (ether extract), moisture and ash. Carbohydrate and energy values were calculated. The results of the proximate analyses on a dry weight basis were 23 percent crude protein, 2 percent fat, 11 percent ash, 56 percent carbohydrate and 8 percent moisture. The mean energy value of a 100 gram sample was 270 kcal. The amino acid analyses showed comparable levels of the amino acids as cultivated green vegetation. Further research is necessary on the digestibility and bioavailability of the nutrients in order to assess the nutritional contribution of these traditional food plants.

72. INFLUENCES OF REHABILITATION INTERVENTIONS ON MALNUTRITION OUTCOMES IN 12 TO 35-MONTH-OLDS IN JAMAICA. Tuskegee University; Rankins, J.

Abstract. Protein energy malnutrition is a major public health problem among pre-school children in Jamaica. Some interventions have been employed in an attempt to rehabilitate such children, but economic realities require planners to be able to identify the most cost-effective method for this purpose. Accordingly, the main objective of this study was to compare the effectiveness of three different nutritional interventions in combatting protein malnutrition in Jamaican children: 1) supplementary family income; 2) nutrition education; and 3) container gardening. A total of 2,873 children between the ages of 12 to 35 months, living in three selected villages, were used in this study. The results of the two-year study showed that the mean weight gain of children in the nutrition education intervention was significantly higher (<0.01) than the mean gains in their respective age groups of those who received container gardening or supplementary family income interventions. However, most of this difference in weight gain occurred during the first six months of the enrollment in the intervention programs. Although the experimental design did not include appropriate controls, the researcher concluded that nutrition education *per se* was directly responsible for the observed differences in weight gain between the experimental groups. This conclusion was based on the known homogeneity of the various experimental groups with respect to other common intervening demographic variables.

Table 1. GEOGRAPHIC LOCATION OF HBCU A.I.D.-FUNDED RESEARCH ACTIVITIES

INSTITUTION	A A M U	A U	D R E W	F A M U	F V S C	H U	J S U	L U	M C	M S U	N C A T	P S C	P V A M	S C S C	S U	S E U	T S U	T U	U A P B	U M E S	V S U	X U
COUNTRY																						
AFRICA																						
Botswana																						
Burkina Faso																						
Cameroon																						
Ghana																						
Kenya																						
Nigeria																						
Rwanda																						
Senegal																						
Sierra Leone																						
Zaire																						
Zambia																						
ASIA/NEAR EAST																						
Bangladesh																						
India																						
Indonesia																						
Phillipines																						
LATIN AMERICA/CARIBBEAN																						
Barbados																						
Belize																						
Costa Rica																						
Dominican Republic																						
Haiti																						
Jamaica																						
Peru																						
Saint Lucia																						

Insert Reduced Table 1

Table 2. SUBJECT AREAS OF A.I.D.-FUNDED RESEARCH

INSTITUTION	A A M U	A U	D R E W	F A M U	F V S C	H U	J S U	L A N G	L U	M C	M M	M C	M S U	M V S U	N C A T	P S C	P V A M	S C S C	S E U	S U	T S U	T U	T x S U	U A P B	U M E S	V S J	X U	
Agricultural Economics																												
Agronomy																												
Aqua-Culture																												
Food Preservation and Storage																												
Livestock Science																												
Entomology																												
Soil Science																												
Parasitic Diseases																												
Diarrheal Diseases																												
Pharmaceuticals																												
Other Health																												

ACRONYMS

AAMU	Alabama A&M University
Ag	Agonist
A.I.D.	Agency for International Development
AU	Atlanta University
BL	Burkitt's Lymphoma
BP	Benza(a)pyrene
CMI	Cell mediated immunity
CPHP	Companiganj Pilot Health Project
C-14	Carbon-14
Drew	Drew Post Graduate School
EBV	Epstein-Barr Virus
ELISA	Enzyme-linked immunosorbent assay test
FAMU	Florida A&M University
FSH	Follicle stimulating hormone
FVSC	Fort Valley State College
GnRh	Gonadotropin-releasing hormone
GOB	Government of Botswana
HBCUs	Historically Black Colleges and Universities
HCG	Human chorionic gonadotropins
HGPRT	Hypoxanthine-guanine phosphoribosyl transferase
HMG	High Mobility Group
HPN	Health/Population and Nutrition
HU	Howard University
IE&C	Information education and communication
JSU	Jackson State University
LANG	Langston University
LU	Lincoln University
MAB	Monoclonal antibody
M.C	Morehouse College
MM	Meharry Medical
MMC	Morehouse Medical College
MOH	Ministry of Health
MSU	Morgan State University
NCAT	North Carolina A&T University
NDF	Nneutral detergent fibre
NK	Natural killer
OAG	Open angle glaucoma

Previous Page Blank

ACRONYMS (Continued)

OD	Optical densities
OH	Ocular hypertension
OM	Organic matter
ORS	Oral rehydration salt
ORT	Oral rehydration therapy
PI	Principal investigator
PNC	Postnatal care
PSC	Philander Smith College
PVAM	Prairie View A&M University
RBC	Red blood cells
RUR	A.I.D.'s Office of Research and University Relations
SALT	Sloping Agricultural Land Technology
SBC	Solar box cookers
SCSC	South Carolina State College
SDS	Sodium dodecyl sulfate
SEU	Selma University
SMM	Silage microbial mat
SU	Southern University
T	Testosterone
TDN	Total digestible nutrients
Th	T helper
TSU	Tennessee State University
TU	Tuskegee University
TxSU	Texas Southern University
UAPB	University of Arkansas, Pine Bluff
UMES	University of Maryland, Eastern Shore
VCA	Viral capsid antigen
VSU	Virginia State University
XU	Xavier University

Back Cover Photograph

Rwandan scientist, Edouard Nizeyimana, at work in the OPROVIA Post-harvest Research Laboratory, Kigali, Rwanda. (Abstract 30)