

III.

John E. Fogarty International Center for Advanced Study in the Health Sciences

INTRODUCTION

The John E. Fogarty International Center for Advanced Study in the Health Sciences (FIC) promotes and supports scientific research and training internationally to reduce disparities in global health. It has been a critical component of the National Institutes of Health (NIH) international research effort since 1968, when it was established by Executive Order and congressional action. The idea of a Center at the NIH with the responsibility to advance health through international scientific cooperation was conceived by Congressman John E. Fogarty of Rhode Island, in whose memory the Center is named. Congressman Fogarty understood that “just as disease knows no boundaries, so also the benefits of medical research and indeed research itself can know no boundaries.” Thus he envisioned a center at the NIH “dedicated to international collaboration and the health of mankind.”

FIC is carrying this vision into the 21st century, responding to today’s critical global health challenges and working to make the results of scientific discovery available to all peoples in all parts of the world. To this end, the Center has assumed a leadership role in formulating and implementing biomedical research and policy. While supporting the conduct of needed research in priority global health areas, FIC develops human capital and builds research capacity in the poorest nations of the world where the need is greatest. Conscious of the fact that the poorest of the world’s population bear the greatest burden of illness and premature death, the Center supports an ambitious program aimed at redressing these inequities through international research and training programs, research grants, and fellowships.

In the United States, health disparities are evident within and among population groups. Genetic and environmental factors, nutrition, access to health education and services, behavior, and other factors are im-

plicated in varying degrees as contributors to these disparities. Research advances made abroad can have a positive impact on U.S. populations through (a) improvements in health education or counseling strategies; (b) development of diagnostics, drugs, or intervention technologies for diseases present in the United States and abroad; or (c) identification of new avenues of research that ultimately lead to health care interventions. In addition, basic knowledge gained through research studies conducted abroad contributes to the scientific foundation on which U.S. and international medical studies are built.

Adapting research advances in biomedicine to populations at home and abroad requires a continuing commitment to basic science, as well as rigorous clinical and applied studies. FIC is forging collaborations with a range of domestic and international partners in international research and training to pursue three core objectives:

1. to accelerate the pace of discovery and its application by enabling scientists worldwide to share conceptual insights, analytic methods, data sets, patient cohorts, or special environments;
2. to engage and assist both young and established U.S. scientists to address scientific challenges related to global health; and
3. to help develop a cadre of highly capable young foreign investigators positioned to cooperate with U.S. scientists in areas of the world that, because of geography, population structure, or disease burdens, provide unique opportunities to understand disease pathogenesis, anticipate disease trends, or develop interventions.

These objectives form the basis for current FIC research and training programs related to areas such as human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), emerging infectious diseases, maternal and child health, population research and demographic science, medical informatics, and environ-

mental and occupational health. Research grants awarded to teams of U.S. and foreign investigators are creating partnerships that enable scientists worldwide to share insights and methods. Fellowships to young U.S. scientists are encouraging the pursuit of productive international research careers. Initiatives in health and economic development, bioethics, molecular genetics and genomics, tobacco research and control, and nutrition are on the drawing board. The challenges are great, but with partners at the NIH, other agencies of the U.S. Government involved in international health, academia, and national and international nongovernmental foundations and research organizations, FIC is working to bring the necessary resources to bear, using the vast promise of biotechnology and information sharing to find practicable solutions.

AIDS INTERNATIONAL TRAINING AND RESEARCH PROGRAM

Through the AIDS International Training and Research Program (AITRP), FIC sponsors U.S. schools of medicine and public health to provide training for foreign scientists from developing countries through a variety of training options. The training is designed (a) to increase the capacity of developing countries to deal with the AIDS epidemic through epidemiologic research, clinical trials, and other prevention programs; (b) to support collaborative HIV/AIDS-related research by U.S. and foreign scientists in the epidemiology, diagnosis, treatment, and prevention of AIDS; and (c) to stimulate cooperation and sharing of research knowledge among scientists combating AIDS worldwide.

An expert panel of extramural scientists conducted a comprehensive review of AITRP in October 1996. In response to the panel’s recommendations, FIC focused AITRP on training scientists and health professionals for the prevention of HIV infection by using

TABLE III-1.**AIDS International Training and Research Program, Fiscal Year 1999**

Principal Investigators/Institutions	Major Collaborating Countries
Dr. Salim Abdool Karim Columbia University New York, N.Y.	Botswana, Namibia, South Africa
Dr. Adaora A. Adimora University of North Carolina, Chapel Hill Chapel Hill, N.C.	Cameroon, China, Malawi
Dr. Chris Beyrer Johns Hopkins University Baltimore, Md.	Brazil, Dominican Republic, Ethiopia, Haiti, India, Malawi, Malaysia, South Africa, Thailand, Uganda
Dr. William A. Blattner University of Maryland Baltimore, Md.	Barbados, Brazil, Jamaica, Trinidad and Tobago
Dr. Jack A. DeHovitz State University of New York Brooklyn, N.Y.	Armenia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Poland
Dr. Carlos del Rio Emory University Atlanta, Ga.	Georgia, Mexico, Vietnam
Dr. Roger Detels University of California, Los Angeles Los Angeles, Calif.	Cambodia, China, India, Mexico, Myanmar, Vietnam
Dr. Max Essex Harvard University Boston, Mass.	Botswana, Senegal, Tanzania, Thailand
Dr. John L. Fahey University of California, Los Angeles Los Angeles, Calif.	Brazil, China, India, Mexico, Thailand, Vietnam
Dr. Lee H. Harrison University of Pittsburgh Pittsburgh, Pa.	Brazil
Dr. Warren D. Johnson, Jr. Cornell University Medical College New York, N.Y.	Brazil, Haiti
Dr. Joan Kreiss University of Washington Seattle, Wash.	Kenya, Mozambique, Peru, Thailand
Dr. Kenneth Mayer Brown University Providence, R.I.	Indonesia, Philippines
Dr. Michael H. Merson Yale University New Haven, Conn.	Russia
Dr. Arthur L. Reingold University of California, Berkeley Berkeley, Calif.	Botswana, Brazil, Côte d'Ivoire, Thailand, Vietnam, Zimbabwe
Dr. Gail Shor-Posner University of Miami Miami, Fla.	Brazil, Colombia, Dominican Republic, Guyana, Honduras, Jamaica, Zambia
Dr. Gwendolyn B. Scott University of Miami Miami, Fla.	Brazil, Haiti, Romania, Zambia
Dr. Sten H. Vermund University of Alabama Birmingham, Ala.	Bangladesh, Mongolia, Pakistan, Zambia
Dr. Christopher Whalen Case Western Reserve University Cleveland, Ohio	Uganda

combined biomedical and behavioral approaches. The panel's recommendations to emphasize multidisciplinary intervention research training to prevent infection with HIV were incorporated into the Request for Applications for the recompetition of AITRP in 1998, which resulted in six new grants and eight competing renewals. These awards were made possible by collaborative funding from the National Institute on Drug Abuse (NIDA), the National Institute of Dental and Craniofacial Research (NIDCR), the National Institute of Mental Health (NIMH), and the NIH Office of AIDS Research. In fiscal year 1999 (FY 99), AITRP operated 21 programs through 17 institutions (Table III-1).

Since the inception of AITRP, more than 2,000 scientists from more than 100 countries and territories have received training in the United States. In addition, about 700 courses have been conducted in 65 countries. These courses provided short-term training for approximately 46,500 students and health professionals. AITRP now constitutes the single largest global training program for HIV and AIDS research. One indicator of progress is the success of the Program in generating scientific findings and resulting publications. In FY 99, FIC trainees authored or coauthored more than 100 research reports that were published in prominent scientific journals. Key areas of emphasis are presented here.

Reduction of Mother-to-Child HIV Transmission

Researchers trained under and supported by AITRP at Johns Hopkins University, Baltimore, Maryland, and Case Western Reserve University, Cleveland, Ohio, were the principal foreign collaborators on a study in Uganda that was funded by the National Institute of Allergy and Infectious Diseases (NIAID) through the HIV Network (HIVNET) Program. In this study, administration of single doses of the antiretroviral drug nevirapine to HIV-infected mothers and their newborn infants reduced HIV transmission by one-half compared with transmission after zidovudine (AZT) therapy. Because AZT is 70 times more expensive than nevirapine and because a single dose of nevirapine at birth is much easier to administer than the multidose regimen of AZT, nevirapine offers the best alternative to reduce mother-to-infant HIV transmission in developing coun-

tries. AITRP-affiliated scientists are continuing to collaborate on follow-up studies to determine the ability of nevirapine to reduce HIV transmission associated with breast-feeding.

Community-Based Behavioral Interventions to Reduce Sexual HIV Transmission

AITRP trainees and investigators from China, India, Peru, Russia, and Uganda are the principal foreign collaborators on a number of NIMH-funded studies to determine whether peer education based on popular opinion leaders can reduce HIV transmission in these five countries. The studies are supported by cooperative agreements with the University of California, Los Angeles; Yale University, New Haven, Connecticut; Johns Hopkins University, Baltimore; and the University of California, San Francisco.

HIV Transmission Associated With Drug-Trafficking Routes

Scientists from Johns Hopkins University, Baltimore, and five former AITRP fellows from China and India showed that mapping heroin-trafficking routes helped to predict increased transmission of human immunodeficiency virus type 1 (HIV-1) in the "Golden Triangle" region of Laos, Myanmar, and Thailand, a well-known heroin-producing area. Using information from the narcotics-control literature, published studies on HIV prevalence, and information from key informants, the study linked four main trafficking routes in this area with increased HIV infection, by subtype, among intravenous drug users in towns and cities along these routes. The investigators identified "self-testing" of drugs as a probable mode of cross-border transmission of HIV. In this self-testing, drugs and drug paraphernalia are shared by the local drug traffickers.

Vitamin A, Other Micronutrients, and HIV Infection in Children

Through ongoing studies by scientists at Johns Hopkins University, Baltimore, and Harvard University, Cambridge, Massachusetts, AITRP continued to sponsor research on nutritional supplementation, including vitamin A and other micronutrients, as an approach to decreasing mother-to-child transmission of HIV. During FY 99, FIC and

the National Institute of Child Health and Human Development (NICHD) continued to support ongoing studies of HIV-infected mothers in Malawi and Tanzania. Results to date have demonstrated that micronutrients, including vitamin A, do not reduce HIV transmission from infected mothers to their children. Another joint FIC-NICHD study, in Uganda, is testing whether nutritional supplementation to children born of HIV-infected mothers forestalls clinical problems in infants who are seropositive for HIV.

Research has also been conducted on the potential role of micronutrient supplementation as a prophylactic and therapeutic measure for persons infected with HIV. Together with scientists at Muhimbili University College of the Health Sciences, Dar es Salaam, Tanzania, scientists at Harvard University conducted an interventional trial to measure the effects of multivitamin supplements on birth outcomes in HIV-infected women. They found that daily doses of multivitamins decreased the risk of fetal death, low birth weight, and preterm birth and resulted in a significant increase in the number of T cells in HIV-infected mothers. T cells are essential for the control of virus levels in infected persons. These investigators also demonstrated that vitamin A reduced mortality in HIV-infected children after hospitalization for pneumonia.

HIV Transmission and Disease Progression

In conjunction with NIAID, FIC is supporting studies in Malawi to determine whether vitamin A supplementation combined with standard therapies for tuberculosis is more effective in improving health outcomes than standard tuberculosis therapy alone.

In a collaborative study cosponsored by FIC, researchers at the Ministry of Health and Makerere University, Kampala, Uganda, and the Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, are working with scientists at Case Western Reserve University, Cleveland, to develop practical and affordable prevention measures to reduce the burden of tuberculosis in HIV-infected adults who were positive for purified protein derivative. The findings indicate that a 3- to 6-month course of prophylactic treatment for tuberculosis in a study population of HIV-infected adults sig-

nificantly reduced the risk of active infection and transmission.

A community-based study in Uganda was carried out by AITRP trainees from Uganda, through Case Western Reserve University, Johns Hopkins University, Baltimore, and Columbia University, New York City, New York. This research was designed to determine whether aggressive prevention of sexually transmitted diseases would reduce the burden of HIV in a well-defined population. The results showed that community-wide prophylactic therapy for sexually transmitted diseases does not reduce heterosexual transmission of HIV. From data in this study, the investigators documented the role of low HIV viral load and circumcision as significant factors in reducing the risk of sexual transmission of HIV.

Vaccine Development

FIC trainees continued to monitor HIV variants and provide epidemiologic data required for the development of candidate vaccines and the design and evaluation of trials of vaccine efficacy. AITRP has established a core of highly trained clinical and epidemiologic investigators in regions of the world that may become sites for international testing of HIV vaccine candidates. These scientists are positioned to support research on other HIV interventions, such as antiviral treatments, antibiotics, microbicides, and programs to modify high-risk behaviors. This support has been put in place through close collaboration with the NIAID HIVNET Program, which has established a baseline of epidemiologic data and cohorts of volunteers for future efficacy trials of vaccine and other agents.

TUBERCULOSIS INTERNATIONAL TRAINING AND RESEARCH PROGRAM

In FY 99, FIC provided funding for competing supplemental awards under the Tuberculosis International Training and Research Program, a collaborative program with NIAID, CDC, and the U.S. Agency for International Development. In the first review cycle, seven awards were made to U.S. universities and institutions as supplements to existing grants under AITRP or the International Training and Research Program in Emerging Infectious Diseases (ITREID) (Table III-2), to extend existing research invest-

TABLE III-2.**Tuberculosis International Training and Research Program, Fiscal Year 1999**

Program Directors/Institutions	Major Collaborating Countries
Dr. Christopher Beyrer Johns Hopkins University Baltimore, Md.	Brazil, Haiti, India, Peru, South Africa
Dr. Warren D. Johnson, Jr. Cornell University Medical College New York, N.Y.	Brazil, Haiti, Peru
Dr. Salim Abdool Karim Columbia University New York, N.Y.	South Africa
Dr. Dale Morse Wadsworth Center New York State Department of Health Albany, N.Y.	Armenia, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Poland, Russia
Dr. Lee Riley University of California School of Public Health Berkeley, Calif.	Bolivia, Brazil, El Salvador, Guatemala, Mexico, Peru
Dr. Gail Shor-Posner University of Miami School of Medicine Miami, Fla.	Dominican Republic, Honduras
Dr. Christopher Whalen Case Western Reserve University Cleveland, Ohio	Malawi, Mexico, South Africa, Uganda

ments in these areas. The supplements aim to build health research efforts and public health capacity globally to better respond to the threat posed by tuberculosis in general and by multidrug-resistant tuberculosis in particular. Long-term objectives include the following:

- strengthening laboratory infrastructure in support of future tuberculosis surveillance and research;
- building public health capacity for surveillance and clinical trials of promising new interventions and therapies for tuberculosis; and
- enhancing the capability of developing countries to manage programs and conduct operational research related to prevention and control of the disease.

These awards are designed (a) to prepare current and future generations of researchers and public health workers around the world to confront the global tuberculosis epidemic and (b) to establish and maintain centers for clinical research in and treatment and prevention of tuberculosis, all of which will play a major role in the fight against the reemergence and continuing spread of this disease.

INTERNATIONAL COOPERATIVE BIODIVERSITY GROUPS

The contraction of natural habitats and, in particular, the destruction of species-rich tropical rainforests will have profound economic, social, and scientific consequences. In partnership with NIH research Institutes and other Federal agencies, FIC leads an interagency effort to promote economic development and ecological conservation through drug-discovery research on natural products. This initiative supports development of interdisciplinary research and building of research capacity through collaboration of U.S. institutions with institutions in developing countries to study important biological resources indigenous to the developing countries.

International Cooperative Biodiversity Groups (ICBGs) were established in FY 94 to discover new therapeutic agents for a broad range of human diseases and agricultural applications. The research areas include cancer, AIDS, Alzheimer's disease, drug addiction, contraception, cardiovascular disorders, central nervous system disorders, bacterial and viral diseases, obesity and diabetes, tuberculosis, malaria, and leishmaniasis. Agents are derived from natural

products found in numerous species of plants, fungi, and insects. Integrated into the research efforts are strategies to preserve biological diversity by developing knowledge for resource management and opportunities for local economic benefits from commercial development of discoveries. The projects supported by this program include the following:

- screening and description of biologically active organisms;
- study of the chemistry of natural products;
- research on traditional medicines and practices related to their use in indigenous cultures;
- comparison of modes of drug-discovery research; and
- training and career development for scientists from cooperating nations.

The three principal sponsors of the ICBG program—the NIH, the National Science Foundation, and the Foreign Agricultural Service of the U.S. Department of Agriculture—jointly announced six new awards under this program in FY 98. Participating NIH Institutes, in addition to FIC, are the National Cancer Institute (NCI), the National Heart, Lung, and Blood Institute (NHLBI), NIAID, NIDA, and NIMH. Each of the seven active ICBGs, including one continuing award, comprises diverse private and public institutions, including universities, pharmaceutical companies, and environmental organizations in 12 foreign countries (Table III-3). The cooperating organizations in an ICBG are linked by novel contractual agreements that address issues such as sharing of intellectual property and any financial benefits among the organizations and with conservation and community interests in the host country.

Since 1994, more than 6,800 species of plants, animals, and micro-organisms have been analyzed, yielding more than 260 compounds with biological activity in relevant therapeutic areas. Active lead compounds against malaria, leishmaniasis, tuberculosis, infectious bacteria, and agriculturally important fungi are in development. For each ICBG, preserved specimens are obtained and stored in at least one institution in the source country and one in the United States. Information on these specimens is recorded in geographic information systems and other computer databases in each country.

TABLE III-3.**International Cooperative Biodiversity Groups, Fiscal Year 1999**

Principal Investigators/ U.S. Institutions	Source Countries	Foreign Collaborating Investigators/Institutions	Domestic Collaborating Investigators/Institutions
Dr. Brent Berlin University of Georgia Athens, Ga.	Mexico	Dr. Luis Garcia-Barrios Dr. Mario Gonzalez El Colegio de la Frontera Sur San Cristóbal de las Casas Chiapas Dr. Robert Nash Molecular Nature, Ltd. Wales	Dr. Eloise Ann Berlin Dr. David Puett University of Georgia
Dr. Phyllis Coley Smithsonian Tropical Research Institute Panama City, Panama	Panama	Dr. Mahabir Gupta University of Panama Panama City Dr. Eduardo Ortega-Barria Gorgas Memorial Hospital Panama City	Dr. Todd Capson Dr. Don Windsor STRI Dr. Leslie Harrison Monsanto Co. Dr. Tom Kursar University of Utah
Dr. David Kingston Virginia Polytechnic and State University Blacksburg, Va.	Madagascar	Dr. Rabodo Andriantsiferana Center for Natural Products Research Antananarivo	Dr. Sol Forenza Bristol-Myers Squibb Pharmaceutical Research Institute
	Suriname	Mr. Stan Malone Conservation International Suriname Paramaribo Dr. Jan Wisse Bedrijf Geneesmiddelen Voorzienig Paramaribo	Dr. B. Cliff Gerwick Dow Elanco Agrosociences Dr. James Miller Missouri Botanical Garden Dr. Russell Mittermeier Conservation International
Dr. Walter Lewis Washington University St. Louis, Mo.	Peru	Dr. Gerardo Lamas San Marcos National University of Peru Lima Mr. Cesar Sarasara Confederation of Amazonian Nationalities of Peru Lima Dr. Abraham Vaisberg Peruvian Cayetano Heredia University Lima	Dr. Margaret Wideman Monsanto-Searle Pharmaceutical Research
Dr. Brian Schuster Walter Reed Army Institute of Research Washington, D.C.	Cameroon	Dr. Johnson Ayafor University of Dschang Dschang	Dr. Francisco Dallmeier Dr. Elizabeth Losos Smithsonian Institution
	Nigeria	Dr. Iwe Paul Akubue University of Nigeria/INTERCEDD Nsukka	Dr. Joan Jackson Dr. Wilbur Milhous Walter Reed Army Institute of Research
	United States	Dr. Maurice Iwu Bioresources Development and Conservation Washington, D.C./Nsukka, Nigeria	
Dr. Djaja Soejarto University of Illinois Chicago, Ill.	Laos	Dr. Boun Hoong Southavong Research Institute for Medicinal Plants Vientiane	Dr. John Pezzuto University of Illinois
	United Kingdom	Dr. Melanie O'Neill Glaxo Wellcome United Kingdom	
	Vietnam	Dr. Li Thi Xuan National Center for Natural Sciences and Technology Hanoi	

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TABLE III-3. (Continued)**International Cooperative Biodiversity Groups, Fiscal Year 1999**

Principal Investigators/ U.S. Institutions	Source Countries	Foreign Collaborating Investigators/Institutions	Domestic Collaborating Investigators/Institutions
Dr. Barbara Timmermann University of Arizona Tucson, Ariz.	Argentina	Dr. Enrique Suarez National Institute for Agricultural Technology	Dr. Scott Franzblau Louisiana State University
	Chile	Ms. Gloria Montenegro Catholic University of Chile Santiago	Dr. Barbara Hutchinson University of Arizona
	Mexico	Dr. Robert Bye Dr. Rachel Mata National Autonomous University of Mexico	Dr. William Maiese American Home Products

ICBG trainees include technicians, faculty, and graduate, postgraduate, and postdoctoral students. Training includes long-term study and work in degree programs, as well as short technical courses and workshops in biodiversity inventory, ethnobiology, chemistry, informatics, and intellectual property. Since 1994, more than 1,400 individuals from 12 countries have received or are receiving training through ICBGs. This training involves numerous exchanges between universities and pharmaceutical companies in the United States and universities in the host countries.

Other efforts to build research capacity include equipment transfers to collaborators in the developing countries, both through government funding and directly from commercial partners. Commonly transferred laboratory equipment includes that related to the preparation, extraction, storage, and microbiological screening of specimens and the isolation and identification of chemical constituents. Equipment purchases include herbarium storage cases, computers, software, and field equipment to aid with description and management of biodiversity. Efforts to develop local infrastructure include the purchase of vehicles, renovation of laboratories and herbaria, and support of a medical clinic.

FOGARTY INTERNATIONAL RESEARCH COLLABORATION AWARD

To foster research partnerships between U.S. scientists and their colleagues in regions of the world that provide new scientific opportunities, FIC established the Fogarty International Research Collaboration Award (FIRCA) in FY 92. These small research grants were designed to support collaborative ties

with Latin America and the Caribbean and Central and Eastern Europe, including Russia and the Newly Independent States of the Former Soviet Union (NIS). In FY 94, regional eligibility was expanded to include the countries of Africa; Asia (except Japan, Singapore, South Korea, and Taiwan); the Middle East; and the Pacific Ocean islands (except Australia and New Zealand). In FY 99, there were 109 active projects: 67 non-competitive continuing awards and 42 new awards, including 5 competitive continuing awards (Table III-4).

Through the FIRCA program, funds are provided to purchase supplies, materials, and small equipment for the foreign collaborator's laboratory and to provide travel support for cooperative international studies (up to 25% of the grant award). These grants of \$32,000 per year for up to 3 years are awarded competitively. A stipend of \$5,000 is allowed for the foreign collaborator. U.S. participants must be the principal investigators of an ongoing NIH research project grant during at least the 1st year of the award period.

FIRCAs support a broad range of international cooperative research in areas such as neuroscience, immunology, emerging and reemerging infectious diseases, pharmacological therapeutics, genetics, and women's health issues. Examples of FIRCA projects undertaken in FY 99 are presented here.

Collaborations between a scientist at the University of Washington, Seattle, and colleagues at the University of Chile, Santiago, and the National Institute of Oncology, Budapest, Hungary, are focused on seeking possible mutations responsible for inherited breast cancer in Chile and Hungary. These studies have important implications for effective genetic testing and for cancer pre-

TABLE III-4.

Fogarty International Research Collaboration Awards by Region and Country, Fiscal Year 1999

Region/Country	No.
Europe, Russia, and NIS^a	
Russia	25
Hungary	5
Czech Republic	4
Poland	4
Slovenia	4
Croatia	3
Slovakia	3
Estonia	2
Belarus	1
Germany	1
Ukraine	1
Latin America and the Caribbean	
Argentina	14
Mexico	7
Brazil	6
Chile	2
Bolivia	1
Colombia	1
Jamaica	1
Trinidad and Tobago	1
Uruguay	1
Africa	
Kenya	2
Cameroon	1
Senegal	1
South Africa	1
Uganda	1
Zimbabwe	1
Asia, India, and Middle East	
China	6
Israel	4
India	2
Bangladesh	1
Fiji	1
Pakistan	1
TOTAL	109

^aNIS = Newly Independent States of the Former Soviet Union.

vention and treatment. Breast cancer is a major cause of death among women around the world. Of all breast cancer worldwide,

5%–10% is inherited because of mutations in the BRCA1 and BRCA2 genes. These complex genes are involved in the pathways responsible for orchestrating tumor suppression to prevent cancer, including repair of DNA damaged by mutation. Because women with mutations in BRCA1 or BRCA2 genes are at extremely high risk of both breast and ovarian cancer, it is important to know if there are genetic or environmental factors that modify these risks.

A FIRCA-funded team of researchers from Yale University, New Haven, Connecticut, and the University of Zagreb, Croatia, is using the blueprint information provided by genes to examine the function of transfer RNA (tRNA) in the process of building the diverse proteins from amino acids—the major structural and working components of the body. The investigators have provided major insights into how tRNAs are created and assigned to various tasks. This research provides the basis for the design of specific blockers of protein building, information that may have application in human and animal disorders and diseases.

Scientists at Vanderbilt University, Nashville, Tennessee, working with scientists at the Institute of Chemistry in Tallinn, Estonia, are studying sea corals, the richest known source of prostaglandins, to learn how these hormones are produced. Preliminary findings suggest avenues for development of new anti-inflammatory compounds that are more effective and have fewer side effects than those currently in use. Prostaglandins function as key hormones in cancer and in human inflammatory diseases, including asthma. Little is known, however, about how the body produces these components.

Investigators from the University of Washington, Seattle, Tel Aviv University, Israel, and Bethlehem University, Palestine, are collaborating on mapping and cloning the genes responsible for different types of inherited deafness (progressive and early-onset) in families from Israel and Palestine, where incidence of preverbal deafness is among the highest in the world. In the past 1½ years, they have identified a gene for deafness and have found critical mutations in another deafness gene. Hearing loss has an enormous personal and economic impact around the world. Genetic studies such as these may someday enable more effective

tive treatment of both inherited and environmentally caused hearing loss.

An international team of scientists from the Cleveland Clinic, Ohio, and the Cancer Research Institute, Moscow, Russia, determined additional effects of defects in p53 on a cell's normal response to stress. Each cell of the body contains p53, a tumor-suppressor protein that is responsible for orchestrating protective responses to stressors such as exposure to radiation or lack of oxygen and other nutrients. Incorrect functioning of this protein may cause the development of a number of different kinds of cancers. Information on different p53 defects and their consequences is important for development of new cancer therapies and more appropriate selection of therapies for individual patients.

FIRCA-funded collaborators from the University of Alabama, Birmingham, and the University of the Republic of Montevideo, Uruguay, are investigating the role of nitric oxide in tissue inflammation. They discovered that this gas plays both protective and destructive roles in tissue damage due to inflammation and defined the conditions for both actions. In addition, they found that carbon dioxide, considered to be a nonreactive gas, plays a negative role in tissue injury. This finding has important implications for the clinical care of patients on mechanical ventilators, because carbon dioxide in the tissues often rises to high levels in these patients as a byproduct of the gas combinations used for oxygen delivery to the lungs. The molecule nitric oxide is the first gas shown to be an active signal molecule in tissues of bodily components such as blood vessels, the nervous system, and the immune system.

AIDS-FOGARTY INTERNATIONAL RESEARCH COLLABORATION AWARD

In addition to FIRCAs, small collaborative grants are available to U.S. principal investigators who have NIH grants for international collaborative projects related to HIV/AIDS. The HIV/AIDS and Related Illnesses FIRCA (AIDS-FIRCA) provides up to \$32,000 per year for a maximum of 3 years. Regional eligibility is not limited. In FY 99, FIC made 30 AIDS-FIRCAs: 22 noncompetitive continuations and 8 competing awards, including 1 competitive continuation (Table III-5). An

TABLE III-5.

AIDS-Fogarty International Research Collaboration Awards by Region and Country, Fiscal Year 1999

Region/Country or Area	No.
Europe, Russia, and NIS^a	
United Kingdom	4
Germany	2
Poland	2
Czech Republic	1
France	1
Hungary	1
Italy	1
Russia	1
Latin America and the Caribbean	
Peru	2
Argentina	1
Belize	1
Brazil	1
Panama	1
Africa	
Zimbabwe	2
Botswana	1
The Gambia	1
Malawi	1
South Africa	1
Asia, India, and Middle East	
India	2
Vietnam	1
Taiwan	1
North America	
Canada	1
TOTAL	30

^aNIS = Newly Independent States of the Former Soviet Union.

example of an accomplishment under the AIDS-FIRCA program is presented here.

HIV belongs to a class of viruses known as retroviruses, which must undergo an assembly process to become active and virulent. Investigators at the University of Alabama, Birmingham, and the Institute of Chemical Technology, Prague, Czech Republic, are using a related monkey retrovirus to study the enzymes (proteinases) involved in the process of retroviral maturation. These studies are providing clues on how to abort the virus assembly process by elucidating ways in which the proteinase might be either maintained in an inactive form or prematurely activated. The results of these studies may lead to the design of novel inhibitors of the proteolytic activation process and may have broad implications for other retroviral assembly systems, including those of HIV. These findings also are helping in the identification of potential targets for discovery of anti-HIV drugs.

TABLE III-6.**International Training and Research Program in Environmental and Occupational Health, Fiscal Year 1999**

Principal Investigators U.S. Institutions		Collaborating Countries/Institutions		Activity Focus		
Dr. David Carpenter	University at Albany State University of New York Rensselaer, N.Y.	Czech Republic	Masaryk University National Institute of Public Health (Center for Industrial Hygiene)	Air pollution Hazardous waste management Industrial hygiene Environmental and occupational health policy		
		Hungary	Balaton Limnological Institute Hungarian Academy of Sciences National Institute of Hygiene			
		Poland	Institute of Occupational Medicine and Environmental Health			
		Romania Ukraine	Institute of Hygiene Bucovinian State Medical Academy			
Dr. Luz Claudio	Mt. Sinai School of Medicine New York, N.Y.	Mexico	National Institute of Public Health Pan American Center for Human Ecology and Health Pan American Center for Sanitary Engineering	Air pollution Heavy-metal poisoning Pesticide poisoning Epidemiology Occupational and environmental medicine Environmental monitoring Application of molecular biology to environmental health		
Dr. Steven Markowitz	Queens College Flushing, N.Y.				Brazil	Federal University of Parana University Hospital of Clementino Fraga Filho
					Chile	Chilean Security Association National Institute of Public Health University of Concepción Medical School
Dr. Thomas Cook	University of Iowa Iowa City, Iowa	Czech Republic Hungary Romania Slovakia Slovenia	National Institute of Public Health University Medical School Institute of Public Health Institute of Preventive and Clinical Medicine Nova Gorica Polytechnic	Environmental epidemiology Exposure assessment Acute and chronic respiratory diseases Ergonomics Pesticides Agricultural and rural environmental exposures		
Dr. George Delclos Dr. Sarah Felkner	University of Texas Houston, Tex.	Colombia Costa Rica Mexico Venezuela	Universidad Pontificia Javeriana Caja Costarricense de Seguro Social Centro de Educacion y Investigacion en Salud de Seguro Social Universidad Nacional Autonoma de Mexico Universidad de Carabobo Centro de Estudios en Salud de los Trabajadores Universidad Central de Venezuela Universidad Centro-Occidental	Occupational and environmental epidemiology Environmental science Industrial ergonomics and safety		
Dr. Douglas Dockery	Harvard School of Public Health Boston, Mass.	China	Anhui Medical University Beijing Medical University First Hospital of Shanghai Textile Industry Liaong Provincial Public Health and Anti-Epidemic Station Nanjing Medical University	Environmental epidemiology Environmental engineering Occupational health		
Dr. John Froines	University of California Los Angeles, Calif.	Mexico	Autonomous University of Baja Autonomous University of San Luis Potosí CINVESTAV National Autonomous University of Mexico National Institute of Public Health Technical Institute of Monterrey	Air and water pollution Epidemiology Ergonomics Industrial hygiene Injury prevention Occupational medicine Pollution prevention and toxicology		
Dr. Ian Greaves	University of Minnesota Minneapolis, Minn.	Philippines	University of the Philippines College of Public Health	Occupational health Environmental epidemiology Risk assessment and communication Air and water pollution		
Dr. Ellen Silbergeld	University of Maryland Baltimore, Md.					

TABLE III-6. (Continued)**International Training and Research Program in Environmental and Occupational Health, Fiscal Year 1999**

Principal Investigators U.S. Institutions		Collaborating Countries/Institutions		Activity Focus
Dr. Daniel Hryhorczuk	University of Illinois Chicago, Ill.	Belarus	Minsk Institute of Radiation Medicine Research Institute of Oncology and Medical Radiology	Epidemiology Exposure assessment
		Lithuania	Vilnius Gediminas Technical University	
		Ukraine	Kiev Research Institute Ministry of Environmental Protection Ministry of Health	
Dr. Matthew Keifer	University of Washington Seattle, Wash.	Costa Rica	Universidad Nacional	Clinical medicine Industrial hygiene Toxicology Epidemiology Occupational health nursing
		Ecuador	Corporation para el Desarrollo de la Produccion y el Medio Ambiente Laboral	
		Mexico	National Institute of Public Health	
		Nicaragua	Ministry of Health	
		Thailand	Burapha University	
Vietnam	Khon Kaen University Hanoi Medical College			
Dr. Dana Loomis	University of North Carolina Chapel Hill, N.C.	Brazil	Bahia Institute for Collective Health Federal University of Bahia	Environmental exposure assessment Environmental/occupational epidemiology Occupational health
Dr. Evangelos Petropoulos	Michigan State University East Lansing, Mich.	Bulgaria	Bulgarian Academy of Sciences Institute of Inorganic Chemistry Medical University of Sofia National Center of Infectious and Parasitic Diseases National Center of Hygiene, Medical Ecology, and Nutrition	Environmental toxicology Industrial hygiene Occupational health and safety Food safety and toxicology Environmental epidemiology Environmental sociology Environmental engineering
		Romania	National Romanian Academy of Sciences	
Dr. Thomas Robins	University of Michigan School of Public Health Ann Arbor, Mich.	Botswana	Ministry of Health	Occupational medicine Industrial hygiene Air and water pollution Toxicology Occupational epidemiology
		Lesotho	Department of Health	
		South Africa	Cape Technikon Natal Technikon National Center for Occupational Health University of Cape Town University of Natal	
Zimbabwe	National Society Security Authority			
Dr. Kirk Smith	University of California Berkeley, Calif.	China	Institute of Environmental Health and Engineering	Environmental health Epidemiology Air pollution Toxicology
		India	Institute of Occupational Medicine University of Madras	

INTERNATIONAL TRAINING AND RESEARCH PROGRAM IN ENVIRONMENTAL AND OCCUPATIONAL HEALTH

In FY 95, FIC cooperated with the NIH's National Institute of Environmental Health Sciences (NIEHS) and CDC's National Institute for Occupational Safety and Health (NIOSH) to develop an International Training and Research Program in Environmental and Occupational Health. This Program supports training and research in general environmental health and occupational health for scientists from developing countries and emerging democracies.

The Program helps to increase national

capacity to identify and address health risks related to air, water, and land pollution, environmental change and degradation, and dangers to workers. It fosters cooperative research with regions of the world having relatively high contamination levels that present opportunities (a) to study the effects of environmental agents and occupational dangers on human health and (b) to develop new interventions.

In FY 95, seven awards were made to U.S. universities, including schools of medicine and public health. Areas of research and training that are addressed include studies of the biological effects of environmental contaminants; epidemiology of environmental-

and work-related diseases; and investigation of the relationships between environmental changes and the rise of infectious diseases. Trainees include health scientists, clinicians, epidemiologists, toxicologists, engineers, industrial hygienists, chemists, and allied health workers.

In FY 96, an additional five awards were made with increased support from NIEHS and NIOSH and from a new partner—the National Center for Environmental Health, CDC. Projects funded in FY 96 include training and research in occupational medicine; epidemiology and health; environmental toxicology and assessment of exposure to environmental agents; industrial hygiene;

air and water pollution; and biomedical engineering.

One additional award was made in September 1997 for studies related to environmental epidemiology, air and water pollution, and risk assessment. The number of collaborating countries in this Program is now 27. In January 1999, the U.S. Environmental Protection Agency joined the Program. Some research and program accomplishments in FY 99 (Table III-6) are presented here.

Scientists at the Harvard School of Public Health, Boston, Massachusetts, in collaboration with Chinese researchers at the Peking Union Medical College and the Chinese Academy of Medical Science, Beijing, are using the fluorescence in situ hybridization technique in a pilot project to explore a possible association between occupational exposure to pesticides and male reproductive outcomes.

Investigators from the University at Albany, State University of New York, and the Institute of Hygiene, Public Health, Health Services, and Management, Bucharest, Romania, are working with an Indian Health Service Clinic at Akwesasne, a Mohawk Indian reservation on the New York-Canadian border, to document an elevation in hypothyroidism, especially among older Mohawk women. In addition, cofunded by the U.S. Environmental Protection Agency, they are conducting a community health assessment of indoor air pollutants at Akwesasne, to determine the prevalence of respiratory diseases in the reservation's population.

INTERNATIONAL TRAINING AND RESEARCH PROGRAM IN POPULATION AND HEALTH

In FY 95, in cooperation with NICHD, FIC developed the International Training and Research Program in Population and Health, to support training and research programs in population-related sciences for scientists and health professionals from developing countries. The Program enhances domestic population research programs by enabling NIH grant recipients to extend the geographic base of their work internationally. The National Institute on Aging joined the Program in January 1999.

In FY 95, grants were awarded to seven U.S. universities, including schools of medicine and public health, to collaborate with

institutions abroad in training and research activities in population-related sciences. These grants, including research partnerships in 20 countries, continued in FY 99 (Table III-7). Funded projects cover training and research in basic reproductive biology and immunology; development and evaluation of contraceptives; epidemiology of reproduction; and social, demographic, and behavioral factors that influence population dynamics.

Investigators at the University of Pennsylvania, Philadelphia, in collaboration with a scientist from the University of Chile, Santiago, are studying human granulosa cell acute regulatory protein expression and translation under the control of insulin-like growth factor 1 and insulin. This study is determining the mechanisms by which these factors control steroidogenesis. The molecular understanding of the regulation of steroidogenesis will have an impact on the field of reproductive endocrinology and could lead to the development of new contraceptive agents.

A researcher at the Institute for Population and Social Research, Mahidol University, Salaya, Thailand, is collaborating with investigators at the University of North Carolina, Chapel Hill, on a project funded by the National Aeronautics and Space Administration. The study is examining the effects of biophysical and human dimensions on changes in land use in northeast Thailand. The Thai researcher, who earned a doctoral degree as a trainee in the International Training and Research Program in Population and Health at the University of North Carolina, also is working on an NICHD-funded study of the demographic and social responses to social change in Nang Rong, Thailand.

INTERNATIONAL TRAINING AND RESEARCH PROGRAM IN EMERGING INFECTIOUS DISEASES

In FY 97, in collaboration with NIAID, FIC made 13 awards to U.S. universities under ITREID, which expands NIH research training efforts in the study of emerging infectious diseases. NIDCR also contributed resources to this Program. The long-term objective is to train teams of scientists in regions of the world that provide unique opportunities to understand the fundamental biology, epidemiology, and control of emerg-

ing microbial diseases. The Program focuses on research training in the changing patterns of infectious diseases, including genetic evolution, geographic spread, social factors such as economic development and land use, and control and prevention measures. Funded projects address emerging and reemerging viruses, parasitic infections, bacterial and rickettsial diseases, and related issues such as microbial resistance to drugs. This Program aims to strengthen the capacity of scientists to understand and respond to disease outbreaks more effectively in the 30 collaborating countries and globally (Table III-8). Some research highlights in ITREID for FY 99 are presented here.

Scientists at the Uniformed Services University of the Health Sciences, Bethesda, Maryland, and their colleagues at the Institute of Tropical Medicine, Manaus, Brazil, held a workshop and a series of training sessions and courses in support of initial efforts to use remote sensing and global information systems in malaria control. Research and training efforts are focused on the Amazonas State, the rainforest region of the Amazon River headwaters. Training efforts included the following:

- training sessions in remote sensing and global information systems, epidemiology of emerging and reemerging infectious disease, and vector blood-meal identification;
- workshop on Requirements for a Clinical Microbiology Laboratory: An Assessment;
- technology transfer training on Molecular Genetic Techniques in Malaria for Description of New Strains of Chloroquine Resistant *P. vivax* (*Plasmodium vivax*); and
- 1-week training course on Remote Sensing and Global Information Systems for Malaria Control—Computer Laboratory Aspects.

Investigators at the University of Virginia, Charlottesville, and scientists at the University of Ghana Medical School, Accra, are collaborating on the epidemiology of needle-stick injuries, and are developing sharps disposal boxes for use in Ghana's immunization programs. The World Health Organization and the United Nations Children's Fund are considering adapting this pilot project for use in other developing countries.

Researchers at Johns Hopkins University, Baltimore, Maryland, in collaboration with scientists from the Universidad Peruana Cayetano Heredia and Asociación Benefica

TABLE III-7.**International Training and Research Program in Population and Health, Fiscal Year 1999**

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions	Activity Focus	
Dr. Linda Adair	University of North Carolina Chapel Hill, N.C.	China Philippines Thailand	Chinese Academy of Preventive Medicine University of San Carlos Mahidol University	Health nutrition Reproduction Contraception
Dr. P. Michael Conn	Oregon Health Sciences University Beaverton, Ore.	Chile Mexico	Universidad de Chile Universidad de Concepción Instituto de Histología y Patología Hospital ABC Hospital General de Mexico Hospital Juarez Instituto Mexicano del Seguro Social UNAM	Reproductive biology Neuroendocrinology and nonhuman primates
Dr. Frank French	University of North Carolina Chapel Hill, N.C.	Brazil Chile China India Kenya	Escola Paulista de Medicina Instituto Chileno de Medicina Reproductiva Shanghai Institute of Biochemistry Shanghai Institute of Planned Parenthood Research All India Institute of Medical Sciences National Institute of Immunology Institute of Primate Research	Reproductive biology Fertilization and implantation Reproductive neuroendocrinology Regulation of sperm maturation
Dr. John Herr	University of Virginia Charlottesville, Va.	China India	Peking Union Medical College Calcutta University Hindu University Indian Institute of Chemical Biology Indian Institute of Science Institute for Reproduction Research National Institute of Immunology Punjab University	Reproductive biology Contraceptive vaccine development Vaccine immunogens Recombinant/synthetic proteins and peptides
Dr. David Lam	University of Michigan Ann Arbor, Mich.	China Nepal Thailand Vietnam	Tibet Provincial Statistics Tibet University Yunnan Statistical Office Tribhuvan University Chulalongkorn University Khon Kaen University Mahidol University Center of Social Sciences in Health Institute for Economic Research Institute of Sociology	Social and cultural determinants of fertility Demography Family planning
Dr. Jerome Strauss	University of Pennsylvania Philadelphia, Pa.	Argentina Chile Mexico Uruguay	Instituto de Biología y Medicina Experimental University of Chile Instituto Nacional de Perinatología Universidad de la Republica Facultad de Medicina	Reproductive biology Molecular endocrinology Gametogenesis and fertilization Embryo development and implantation
Dr. Tukufu Zuberi	University of Pennsylvania Philadelphia, Pa.	Bangladesh Ethiopia Ghana Kenya Lesotho Malawi Mexico South Africa Uganda Zimbabwe	International Center for Diarrheal Diseases Research Addis Ababa University Navrongo Health Research Center Africa Population Policy Research Center University of Nairobi University of Lesotho University of Malawi University of Guadalajara University of Natal University of Pretoria Makerere University University of Zimbabwe	Social and behavioral migration Health and survival Fertility and economic status Fertility and mortality

Proyectos en Informatica, Salud, Medicina, y Agricultura, Lima, Peru, developed a new porcine model in cysticercosis for the detection of immunologic protection that al-

lows assessment of vaccine efficacy. This research team also developed a rapid and reliable method for detecting tuberculosis, to be used by health officers in developing coun-

tries. This test, called the microscopic observation broth drug-susceptibility assay, can detect tiny amounts of the tuberculosis bacteria in sputum samples from patients with-

TABLE III-8.**International Training and Research Program in Emerging Infectious Diseases, Fiscal Year 1999**

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions		Activity Focus
Dr. Robert Gilman	Johns Hopkins University Baltimore, Md.	Peru	AB PRISMA Hospital Apoya Iquitos Hospital del Niño Hospital Dos de Mayo Neurological Hospital Universidad Peruana Cayetano Heredia	Malaria Tropical medicine Epidemiology Molecular microbiology Parasitic and enteric infections
Dr. Richard Guerrant	University of Virginia Charlottesville, Va.	Brazil China Ghana India Mexico Philippines	Federal University of Ceará University de Rio Grande do Norte University of Santa Catarina Anhui Medical University Kumasi Medical School University of Ghana Medical School Jawaharlal Nehru University National Institute of Reference Diagnostics and Epidemiology University of Manila	Clinical tropical medicine Geographic and international medicine Enteric infections
Dr. Warren Johnson	Cornell University Medical College New York, N.Y.	Brazil Haiti	Federal University of Bahia Federal University of Rio de Janeiro Oswaldo Cruz Institute Group Haitian Etude Sarcoma Kaposi Infection Opportunistic Centre (National Institute for Laboratory Research)	Malaria Epidemiology Virology Bacterial and protozoal diseases Microbial resistance to drugs
Dr. James Kazura	Case Western Reserve University Cleveland, Ohio	Kenya Papua New Guinea	Institute of Primate Research Kenya Medical Research Institute University of Nairobi Institute of Medical Research	Malaria Vector-borne diseases Genetic epidemiology Molecular pathogenesis
Dr. Larry Laughlin	Uniformed Services University of the Health Sciences Bethesda, Md.	Belize Brazil Peru	Ministry of Health Instituto de Medicina Tropicales Manaus Instituto Nacional Saludad Ministry of Health, Ancash and Cusco Regions Universidad Peruana Cayetano Heredia Universidad San Marcos	Malaria Molecular epidemiology Tropical medicine Microbiology and immunology
Dr. Myron Levine	University of Maryland Baltimore, Md.	Chile Georgia Mali	Ministry of Health University of Chile Tbilisi State Medical University National School of Medicine	Malaria Molecular epidemiology Clinical vaccinology Electronic surveillance methods
Dr. Dale Morse	New York State Department of Health Albany, N.Y.	Armenia Czech Republic Georgia Hungary Kazakhstan Latvia Lithuania Poland Russia	Yerevan State Medical University Charles University National Institute of Public Health AIDS Clinical Immunology Centre National Centre for Disease Control National Center for Epidemiology St. Lazlo Hospital Kazakhstan Tuberculosis Center Clinical Hospital of Infectious Disease Communicable Disease Center AIDS Center of Lithuania National Institute of Hygiene Russian Academy of Medical Sciences	Epidemiology Tuberculosis Clinical medicine Biomedical and laboratory sciences
Dr. Lee Riley	University of California, Berkeley Berkeley, Calif.	Bolivia Brazil Ecuador Guatemala Mexico Nicaragua Peru	University Mayor de San Andres Adolfo Lutz Institute Escola Paulista de Medicina Federal University of Rio de Janeiro Oswaldo Cruz Institute Instituto Ecuatoriano de Seguro Social Instituto de Nutricion de Centro America y Panama Universidad Autonoma de Guerrero Centro Nacional de Diagnostico y Referencia Peruvian-American Interchange Society	Hepatitis C Multidrug resistance Drug-resistant infections Bacterial and enteric diseases

TABLE III-8. (Continued)**International Training and Research Program in Emerging Infectious Diseases, Fiscal Year 1999**

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions		Activity Focus
Dr. Peter Small	Stanford University School of Medicine Stanford, Calif.	Mexico	Instituto Nacional de Diagnostico y Referencia Epidemiologica Ministry of Education Universidad Nacional Autonoma de Mexico	Tuberculosis Enteric infections Emerging pathogens
Dr. Andrew Spielman	Harvard School of Public Health Boston, Mass.	Brazil Ethiopia	São Paulo Federal Medical School Tigray Health Bureau	Malaria Tuberculosis Epidemiology Tropical medicine
Dr. Ken Stuart	University of Washington Seattle, Wash.	India Indonesia Kenya Mexico Pakistan Venezuela	Jawaharlal Nehru University Bogor Agricultural University University of Nairobi UNAM, CINVESTAV-IPN Model Family Clinic Universidad Central de Venezuela	Malaria Hepatitis C Viral pathogens Molecular biology
Dr. Terrie Taylor	Michigan State University East Lansing, Mich.	Malawi South Africa	University of Malawi College of Medicine University of Natal Medical School	Malaria Chemical pathology Parasitic biochemistry Entomology Epidemiology
Dr. David Walker	University of Texas School of Medicine Galveston, Tex.	Mexico Peru	Universidad Autonoma de Yucatán General Epidemiology Office Instituto Nacional de Salud	Rickettsiology Pathology Mammalogy Entomology

TABLE III-9.**Actions for Building Capacity in Support of International Collaboration in Infectious Disease Research Program, Fiscal Year 1999**

Principal Investigator	U.S. Institution	Collaborating Countries/Institutions		Activity Focus
Dr. Barry Beaty	Colorado State University Fort Collins, Colo.	Mexico	CINVESTAV-IPN Universidad de Nuevo León Universidad de Yucatán	Dengue Dengue hemorrhagic fever Molecular and population genetics of vectors Vector-borne diseases
Dr. John Beier	Tulane University New Orleans, La.	Kenya	International Centre of Insect Physiology and Ecology Kenya Medical Research Institute Ministry of Health (Division of Vector-Borne Diseases)	Malaria Medical entomology Vector ecology and behavior Population genetics
Dr. Robert Gilman	Johns Hopkins University Baltimore, Md.	Peru	AB PRISMA Universidad Peruana Cayetano Heredia	Parasitic diseases Epidemiology Cysticercosis
Dr. Richard Guerrant	University of Virginia Charlottesville, Va.	Brazil	Federal University of Ceará	Enteric infections Malnutrition Epidemiology
Dr. Gregory Mertz	University of New Mexico Albuquerque, N.M.	Chile	Catholic University Ministry of Health University of Chile	Hantaviruses Molecular virology Epidemiology Ecology
Dr. Peter Small	Stanford University Stanford, Calif.	Mexico	Instituto Nacional de la Nutricion Instituto Nacional de Salud Publica	Tuberculosis Molecular epidemiology Bacterial resistance

TABLE III-10.**Scholars-in-Residence Awards by Country and Area, Fiscal Years 1969–1999^a**

Country	Americas		Europe		Asia/Oceania		Middle East		Africa	
	No. of Awards	Country	No. of Awards	Country	No. of Awards	Country	No. of Awards	Country	No. of Awards	
United States	61	United Kingdom	21	Japan	15	Israel	36	Nigeria	1	
Canada	3	Sweden	20	Australia	6					
Brazil	2	Germany	15	India	6					
Chile	1	Italy	10	China	2					
Mexico	1	France	8	Taiwan	1					
Peru	1	Switzerland	4							
		Denmark	2							
		Finland	2							
		Norway	2							
		Poland	2							
		Russia	2							
		Austria	1							
		Belgium	1							
		Hungary	1							
		The Netherlands	1							
Total	69		92		30		36		1	
%	30		40		13		16		<1	

^aTotal of 228 awards.

in 9 days, instead of the 3- to 4-week period required by traditional culture methods. Characteristic strings and tangles of tuberculosis bacterial growth can be observed in inexpensive liquid media through a simple light microscope. This method can also be used to determine whether a particular strain of tuberculosis is resistant to any drug, without the use of radioactive isotopes or fluorescent indicators.

ACTIONS FOR BUILDING CAPACITY IN SUPPORT OF THE ICIDR PROGRAM

In FY 99, FIC developed the Actions for Building Capacity (ABC) in Support of the International Collaboration in Infectious Disease Research (ICIDR) Program; the ICIDR Program is funded by NIAID. The purpose of the ABC Program is to stimulate high-quality training to support current and future collaborative training-related research on infectious diseases that are predominantly endemic in or that affect people living in tropical countries. The Program will provide training opportunities for foreign investigators, thus building research capacity and strengthening foreign and U.S. cooperation in research on tropical infectious diseases. ICIDR research focuses on protozoan and helminthic infections; mycobacterial diseases; bacterial and viral enteric infec-

tions, including hepatitis C and E; and fulminant hepatitis of unknown cause. Studies of arboviral infections and other tropical viral infections are specifically encouraged. In FY 99, six awards were made to U.S. universities to include training in medical entomology, vector ecology and behavior, malnutrition, and molecular and population genetics of vectors and bacterial resistance (Table III-9).

SCHOLARS-IN-RESIDENCE PROGRAM

The Scholars-in-Residence Program was established with the creation of FIC in 1968. The Executive Order creating FIC mandates "the assembly of scientists and others in the biomedical, behavioral, and related fields for discussion, study, and research relating to the development of health sciences internationally." The Program was designed to bring outstanding scholars to the NIH to promote advanced study in the health sciences. It has pursued two objectives: (1) to enhance the intellectual milieu at the NIH through the interactions of scholars and intramural scientists and (2) to conduct advanced studies of importance to biomedicine and international health.

Since 1969, 228 scientists, including several Nobel laureates, have participated in the Program (Table III-10). Most Fogarty

Scholars have come from Germany, Israel, Italy, Japan, Sweden, the United Kingdom, and the United States. Scholars have worked in a wide range of scientific disciplines. Increasing numbers have pursued studies in molecular genetics, neurobiology, immunology, and developmental biology. Selected research accomplishments in FY 99 are described here.

A Fogarty Scholar from Israel's Weizmann Institute of Science, Rehovot, continued to study factors that control the establishment of synapses between nerve cells during development. Neurotrophins have been identified that mediate the formation of functional synapses between neurons. Although such studies are exploratory, they may have broad application in future research on nerve regeneration.

A Fogarty Scholar from the University of Naples, Italy, continued his studies on developing new approaches for the treatment of thyroid carcinomas. He has designed a molecule consisting of a bacterial toxin and a specific antibody that can recognize and selectively kill the thyroid tumor cells. The research on thyroid carcinoma was accomplished in Italy, and the work to develop a hybrid molecule containing the bacterial toxin makes use of the expertise at the NIH. This joint research by the laboratory in Italy

and the NIH scientists will continue after the investigator returns to Italy.

A Fogarty Scholar from the Shionogi Institute for Medical Science, Osaka, Japan, conducted research on new drugs for the treatment of HIV. One of the limitations of the drugs used to treat HIV is that the virus rapidly develops resistance through mutation. As a result of this investigator's new concept for minimizing the occurrence of resistance, a prototype anti-HIV drug was developed and clinical trials were initiated at Beth Israel Hospital, Boston, Massachusetts; Johns Hopkins University Hospital, Baltimore; and San Francisco Hospital, California.

A Fogarty Scholar from the Massachusetts Institute of Technology, Cambridge, conducted research on the role of nitric oxide as a risk factor for human cancers. The research focuses on gene mutations and chemical modifications of DNA induced by exposure to nitric oxide and its derivatives, which are produced by white blood cells that accumulate in chronic infections and in inflammations such as those associated with chronic hepatitis. Such DNA changes can lead to cellular and molecular mechanisms that result in carcinogenesis.

SENIOR INTERNATIONAL FELLOWSHIP PROGRAM

The Senior International Fellowship Program was established in 1975 to provide opportunities for mid- and senior-career-level U.S. scientists to undertake biomedical research studies at foreign institutions. Since the inception of the Program, more than 856 U.S. scientists have undertaken fellowships abroad, mainly in Western Europe. In FY 99, Senior International Fellowship Awards supported 16 investigators to undertake projects in 11 countries (Table III-11). Examples of the work supported by the Senior International Fellowship Program are presented here.

A collaboration between a scientist from the University of Virginia, Charlottesville, and scientists at Oxford University, England, addressed the important question of whether the collagen-related peptide can serve as an adhesive substrate for platelets flowing in blood. They found that, contrary to the results of earlier work, very rapid and significant adhesion occurred, suggesting involvement of a collagen receptor in adhe-

sion and showing that collagen-related peptide can support rapid platelet adhesion under flow conditions. The scientists also analyzed the effects of shear forces, acting alone in the absence of an adhesive substrate like collagen, for their ability to activate signaling pathways in platelets and found that low shear forces caused the tyrosine phosphorylation of several proteins. These studies provided important information on blood clotting and cardiovascular diseases.

An investigator from the University of Washington, Seattle, collaborated with an investigator at the Technische Universität, Munich, Germany, on designing new technologies for identifying bacteria that cannot be cultured by standard techniques. They studied complex microbial communities and used gene-sequencing techniques to establish phylogenetic relationships among these bacteria. Using the derived sequence data, the investigators designed fluorescence-labeled gene probes for in situ characterization and identification of the unknown organisms. Protozoa that are known to be human pathogens contain symbiotic bacteria that served as model organisms for application of these new identification techniques. From a clinical standpoint, the data from these studies suggest that certain of these bacteria are also human pathogens. From an evolutionary standpoint, the relationship of protozoal hosts and bacterial symbionts is reminiscent of the origins of mitochondria and other intracellular organelles and provides insights into the mechanisms by which eukaryotic cells evolved.

INTERNATIONAL RESEARCH FELLOWSHIP PROGRAM

The International Research Fellowship (IRF) Program, established in 1958, is the oldest FIC program, predating the establishment of FIC. Over its history, the IRF Program has accomplished its initial objective of helping to rebuild the science base in many European institutions after World War II and has contributed to the development of global research capacity in the biomedical sciences. In FY 95, the Program was restructured to emphasize research training for scientists from low- and middle-income countries. The Program has proved to be effective in enabling U.S. universities to benefit from an

TABLE III-11.

Senior International Fellowship Awards by Region and Country, Fiscal Year 1999

Region/Country	No.
Europe	
United Kingdom	3
France	2
Switzerland	2
Denmark	1
Germany	1
Greece	1
Asia, India, and Middle East	
New Zealand	2
Australia	1
Israel	1
Japan	1
Turkey	1
TOTAL	16

TABLE III-12.

International Research Fellowship Awards by Region and Country, Fiscal Year 1999

Region/Country	No.
Central and Eastern Europe	
Poland	5
Czech Republic	2
Bulgaria	1
Georgia	1
Greece	1
Hungary	1
Romania	1
Latin America	
Chile	2
Mexico	1
Asia and Middle East	
Bangladesh	1
Turkey	1
Africa	
South Africa	2
TOTAL	19

international talent pool of postdoctoral researchers. Of equal importance, the scientific partnerships established have frequently extended beyond the duration of the award. Since its inception more than 40 years ago, more than 3,000 foreign scientists have been trained through the IRF Program.

Because of the steady expansion of FIC programs that provide postdoctoral research experiences in the United States for scientists from low- and middle-income countries, as well as opportunities for research collaboration under the FIRCA program, FIC will no longer accept new applications for the IRF

TABLE III-13.**Minority International Research Training Grants, Fiscal Year 1999**

Principal Investigators	U.S. Institutions	Collaborating Countries
Dr. Winston Anderson	Howard University Washington, D.C.	Cameroon, Ethiopia, France, Germany, Ghana, Italy, Jamaica, Mali, Namibia, Nigeria, Sweden, Switzerland
Dr. Ernestine Baker	University of Maryland Baltimore, Md.	England
Ms. Carol Bender	University of Arizona Tucson, Ariz.	Argentina, Australia, Brazil, Canada, Chile, Costa Rica, Czech Republic, England, France, Germany, Italy, Japan, Mexico, the Netherlands, Scotland, South Africa, Spain, Sweden
Dr. William Boto	City College of City University of New York New York, N.Y.	Uganda
Dr. Isabella Finklestein	Clark Atlanta University Atlanta, Ga.	Finland
Dr. John Karen Frei	Barry University Miami, Fla.	Argentina, Italy, Jamaica
Dr. Osman M. Galal	University of California Los Angeles, Calif.	Chile, Egypt, Indonesia, Israel, Kenya, Philippines, Thailand, Uganda, Vietnam
Dr. Robert Glew	University of New Mexico Albuquerque, N.M.	Nigeria
Dr. George Hillyer	University of Puerto Rico San Juan, P.R.	Australia, England, Ireland, Scotland, Spain
Dr. Pauline Jolly	University of Alabama Birmingham, Ala.	Bangladesh, Ghana, Guatemala, Jamaica, Peru, Trinidad and Tobago
Dr. Ora Lockley	Albany State University Albany, N.Y.	Canada, Germany
Dr. Steven Lopez	University of California Los Angeles, Calif.	Mexico
Dr. Betsy Lozoff	University of Michigan Ann Arbor, Mich.	Chile, China, Costa Rica, India, South Africa
Dr. B. J. McElmurry	University of Illinois Chicago, Ill.	Botswana, Brazil, Chile, Colombia, Malawi, Thailand
Dr. Susan Opava	California Polytechnic State University San Luis Obispo, Calif.	Czech Republic, England, France, Germany, Guatemala, Spain
Dr. Charles L. Ortiz	University of California Santa Cruz, Calif.	Argentina, Mexico
Dr. E. A. Petropoulos	Michigan State University East Lansing, Mich.	Brazil, Bulgaria, Chile, Jamaica, Mexico, Philippines, Spain, Thailand
Dr. Robert S. Pozos	San Diego State University San Diego, Calif.	Canada, Finland, Germany, Italy, Mexico
Dr. Eloy Rodriguez	Cornell University Ithaca, N.Y.	Venezuela
Dr. Raymond F. Sis	Texas A&M University College Station, Tex.	Dominican Republic, Mexico
Dr. Thomas B. Smith	San Francisco State University San Francisco, Calif.	Cameroon, Mexico
Dr. George B. Stefano	College at Old Westbury State University of New York	China, France, Italy
Dr. Marilyn Sutton-Haywood	Johnson C. Smith University Charlotte, N.C.	Australia
Dr. Kim Tan	Winston-Salem State University Winston-Salem, N.C.	Finland, Singapore
Dr. Isai T. Urasa	Hampton University Hampton, Va.	Kenya, Tanzania
Dr. Louis P. Villarreal	University of California Irvine, Calif.	Kenya, Mexico, Spain
Dr. Bruce H. Weber	California State University Fullerton, Calif.	Argentina, England, Mexico, Thailand
Dr. Michelle Williams	University of Washington Seattle, Wash.	Ecuador, Peru, South Africa, Zimbabwe
Dr. Saul Winegrad	University of Pennsylvania Philadelphia, Pa.	Belgium, France, Ghana, Japan, Scotland

TABLE III-14.**International Training in Medical Informatics Program, Fiscal Year 1999**

Program Directors	U.S. Institutions	Collaborating Countries
Dr. Marianna Baum	University of Miami School of Medicine Miami, Fla.	Zambia
Dr. Michael Bennish	New England Medical Center Hospitals Boston, Mass.	South Africa Zambia
Dr. Timothy De Ver Dye ^a	University of Rochester Rochester, N.Y.	Costa Rica
Dr. Taha El Tahir Taha	Johns Hopkins University Baltimore, Md.	Malawi
Dr. Cynthia Gadda	University of Pittsburgh Pittsburgh, Pa.	Nigeria
Dr. Ann Kimball	University of Washington Seattle, Wash.	Peru
Dr. Frances Mather	Tulane School of Public Health and Tropical Medicine New Orleans, La.	Mali
Dr. Daniel McGee	Loyola University Medical Center Maywood, Ill.	Jamaica Nigeria
Dr. Lucila Ohno-Machado	Brigham and Women's Hospital Boston, Mass.	Brazil
Dr. William Tierney	Regenstrief Institute Indianapolis, Ind.	Kenya

^aNew grant in fiscal year 1999.

Program. Investigators who hold fellowships under this Program will continue to be supported for the duration of the fellowship projects. In FY 99, the IRF Program supported 19 postdoctoral researchers from 12 countries (Table III-12).

MINORITY INTERNATIONAL RESEARCH TRAINING PROGRAM

In cooperation with the NIH Office of Research on Minority Health, FIC established the Minority International Research Training (MIRT) Program in FY 93 to provide international educational and research training opportunities to minorities underrepresented in the scientific professions. Training grants are provided to U.S. colleges and universities to stimulate students to pursue biomedical research careers through international experiences. Support is also provided for faculty members to conduct collaborative international research and to serve as mentors to students abroad.

The MIRT Program is intended to cultivate qualities of leadership by broadening intel-

lectual and cultural horizons. The Program strives to ensure equal opportunity by creating and expanding programs for minority students and scientists to study abroad. An additional objective is to help ensure that the full diversity of the U.S. student population is represented abroad by young diplomats of science.

The MIRT Program incorporates consortium awards that include partnerships between minority and majority institutions. Long-term objectives of these consortia are to increase cooperation between minority and majority institutions and to strengthen an important educational pipeline by exposing students who attend 2- and 4-year minority institutions to major research universities.

In FY 99, 29 MIRT programs at colleges and universities throughout the United States sent students abroad for training. An additional 44 colleges and universities participated as members of consortia. MIRT programs spanned more than 50 countries (Table III-13). Since implementation of the

MIRT Program, more than 1,500 students and faculty have participated. Minority students and faculty who are not associated with grantee institutions or consortia may apply to participate in a particular international research program. In FY 99, 260 minority students were trained in MIRT programs (67% undergraduates; 16% graduate students; and 16% faculty). Of these trainees, 35% were African Americans, 46% were Hispanic Americans, 7.3% were Native Americans, and 7.3% were Asians or Pacific Islanders. In FY 99, 17 MIRT awards were made in response to a new competition. Examples of MIRT projects are presented here.

Four students from California Polytechnic State University, San Luis Obispo, worked with scientists at the Institute of Experimental Medicine, Prague, Czech Republic, on various neuroelectrophysiological projects. They attended a joint meeting of the Czech Physiological Society and United Kingdom Physiological Societies, where they heard presentations by distinguished Czech and British scientists.

Five students from Barry University, an institution serving Hispanics in Miami, Florida, worked at the University of the West Indies in Kingston, Jamaica, on projects including the following:

- bio-organic chemical synthesis of insecticidal rotenoids of plants (tropical legumes);
- synthesis of intermediate derivatives of kuaniamines that are isolated from oceanic animals and that have antiviral and antitumor properties;
- synthesis of derivatives of kuaniamines that could be tested as detection agents in fluorescent tissue diagnostics and magnetic resonance imaging of cancer cells; and
- isolation of active chemicals from medicinal plants that are converted by fungi to insecticidal and antiviral activities.

Four students from Winston-Salem State University, one of the historically black colleges and universities (HBCUs) in North Carolina, worked at the University of Singapore. They screened soil bacteria for antifungal compounds and examined the biochemical and genetic properties of bacterial enzymes required to produce these compounds.

INTERNATIONAL TRAINING IN MEDICAL INFORMATICS PROGRAM

In FY 98, in collaboration with NIAID and the National Library of Medicine (NLM), FIC developed the International Training in Medical Informatics (ITMI) Program to address the gap between developed and developing countries in the area of modern information technologies. The Program is designed to assist scientists in developing countries and their U.S. collaborators in addressing local and global health needs through improved access to scientific and clinical information on health threats and through improved research and surveillance capabilities.

The goals of the Program are threefold:

1. to improve the informatics capacity of institutions in developing countries, to advance research and health surveillance activities by providing informatics training for local researchers in the context of a high-quality international biomedical research endeavor;

2. to provide targeted short-term training in informatics and related disciplines at U.S. institutions and in the home country, to develop and disseminate locally adapted knowledge of informatics technologies; and

3. to expand and improve ongoing collaborative research between scientists in the United States and developing countries in the prevention, control, and treatment of diseases of public health relevance in the home country.

The first competition of this Program focused on training scientists from sub-Saharan Africa. Four 4-year awards were made in FY 98 for training in Kenya, Malawi, South Africa, and Zambia. The second competition, in FY 99, added projects in Africa and Latin America. Six additional awards were made, expanding the Program to include projects in Brazil, Costa Rica, Jamaica, Mali, Nigeria, and Peru (Table III-14). Examples of training supported by the ITMI Program are presented here.

The ITMI Program at New England Medical Center, Boston, Massachusetts, sponsored a conference and workshops in Durban, South Africa. The event, entitled The Internet and Telemedicine in African Health Care and Education, was held on July 19–24, 1999, at the University of Natal School of Medicine. The ITMI Program was able to

provide full or partial funding for 38 participants from 13 sub-Saharan countries.

The ITMI group at the University of Miami, Florida, investigated the impact of technological advances on their HIV-related, in-country training and research and multisite international studies. Using annual performance reports from the last 4 years, the investigators compared changes in program outcome measures since the inception of the ITMI Program. They found that availability, access, and training in computer informatics have stimulated more collaborative, multisite, international projects and have built the capacity for increased in-country professional training with a broad scope.

INTERNATIONAL MATERNAL AND CHILD HEALTH RESEARCH AND TRAINING PROGRAM

FIC established the International Maternal and Child Health Research and Training Program in FY 99 to enable U.S. institutions to support training-related research on maternal and child health issues that are predominantly endemic in or that affect people living in developing nations. This Program is designed for the following purposes:

- to increase expertise of scientists in developing countries in biomedical, behavioral, and prevention research related to maternal and child health;

- to support collaborative training in biomedical and behavioral research related to maternal and child health by U.S. and foreign scientists; and

- to establish or strengthen biomedical and behavioral research in maternal and child health and prevention centers of excellence in the home countries of trainees.

In FY 99, awards were made to seven U.S. institutions with foreign collaborations in Bangladesh, Brazil, Cameroon, Chile, China, the Dominican Republic, Ghana, Guatemala, Mexico, Peru, South Africa, Tanzania, and Zambia.

INTERNATIONAL RESEARCH SCIENTIST DEVELOPMENT AWARD

FIC established the International Research Scientist Development Award program in FY 99 to encourage U.S. postdoctoral biomedical scientists who are in the formative stages of their careers to continue research

in, or extend their research experience to, developing countries. The program provides the awardee with a period of mentored research as part of a strong, established collaboration between a U.S. sponsor and a leading scientist in a developing country, at an internationally recognized research institution. After this experience, the awardee will be able to pursue an independent and productive international research career involving ongoing collaboration with scientists in developing countries, to more effectively pursue research relevant to stemming a major global health problem. In FY 99, four awards were made to individuals pursuing infectious disease research in Cameroon, Haiti, Mexico, and Uganda.

INTERNATIONAL RELATIONS

FIC promotes international collaboration among scientists through development and administration of international agreements and policy initiatives and through facilitation of information exchange and establishment of informal mechanisms of cooperation. FIC serves as the NIH focal point for the U.S. Department of State and international components of other Federal agencies, international organizations, and foreign governments, as well as other partners, including nongovernmental organizations.

Central and Eastern Europe

Beginning in 1989, coinciding with the end of the Cold War, the Department of State and its counterparts in various Central and Eastern European countries set aside funds to promote scientific and technological collaboration among U.S. and Central and Eastern European scientists. FY 98 marked the end of several of these joint board programs with Central and Eastern European countries, including Croatia, the Czech Republic, Hungary, Poland, Slovakia, and Slovenia. To facilitate the transition to more traditional sources of research support, the Department of State organized delegations of U.S. science and technology agencies to visit a number of these countries in FY 98 and again in FY 99. The purpose of the visits was to exchange information with counterpart organizations and scientists on opportunities for support of scientific and technology-related research and training. In FY 99, FIC represented the NIH in visits to Hungary and Slovakia. FIC will continue to assist in the monitoring

and follow-up of awards in the biomedical research area during the final phases of the research supported by these joint funds and to provide information on various opportunities available through the NIH.

Egypt

Under a U.S.-Egypt Science and Technology Agreement signed in 1995, the U.S. Department of State and the Ministry of Higher Education and Scientific Research in Egypt provide funds for activities of the U.S.-Egypt Joint Science and Technology Board. FIC represented the U.S. Department of Health and Human Services (DHHS) in the May 1999 U.S.-Egypt Board meeting in Cairo, when six U.S.-Egypt Biotechnology Project Development Travel Awards were approved for funding. The travel awards are aimed at building collaboration in health-related biotechnology research and development by the United States and Egypt. At this meeting, the board agreed to support two grantsmanship workshops in FY 00 that will be organized by FIC.

India

In FY 99, FIC completed negotiations on behalf of the NIH with the Indian Council of Medical Research for a Joint Statement on HIV/STD Prevention Research. This agreement will serve to promote new collaboration between U.S. and Indian scientists in the field of HIV/AIDS research, including behavioral research, biomedical research, vaccine development and testing, and research related to STD (sexually transmitted disease). Institutes at the NIH participating in this Joint Statement include NIAID, NICHD, NIDA, NIMH, FIC, and the NIH Office of AIDS Research. In addition, under the U.S.-India Fund, FIC continues to administer a number of grants for collaborative research by teams of U.S. and Indian scientists. No new awards were made in FY 99.

Israel

The FIC Director serves as technical advisor to the U.S.-Israel Science and Technology Commission, which was established in 1994 to promote cooperative science and technology activities that benefit the high-technology commercial sectors of both countries. The commission's objectives include the promotion of joint projects and increased development in agriculture, environment,

energy, information, medical biotechnology, and telecommunications. The commission also encourages increased scientific exchange and is interested in assisting, where appropriate, in the adaptation of military technology for civilian uses.

Japan

To increase the benefits of international exchange with Japan, FIC, the National Science Foundation, and the Department of Agriculture continued to support the Summer Institute Program in Japan, in FY 99. This program provides opportunities for U.S. doctoral candidates to gain exposure to the Japanese research environment, language, and culture, with the expectation that participants will establish professional associations that will later assist scientific collaboration. FIC supported 10 predoctoral life science students in FY 99, its 8th year of participation in the Summer Institute. Host institutions in Japan include universities and government and industrial research laboratories. FIC also works with the Japan Society for the Promotion of Science and the Japanese Science and Technology Agency to encourage U.S. scientists to apply for short- and long-term postdoctoral fellowships to conduct studies in laboratories of Japanese government research institutes and public corporations.

Lebanon

During a visit to Lebanon in 1998, the U.S. Secretary of Health and Human Services visited the American University of Beirut, where she announced that the NIH would offer two positions in the Visiting Fellow Program at the NIH to the university faculty, for biomedical and behavioral research. Preliminary discussions to implement this program took place in March and April 1999 with officials of the American University of Beirut and the Minister of Health of Lebanon, respectively, during their visits to the NIH.

Mexico

The Pan American Fellowship is part of the U.S.-Mexico Cooperative Biomedical and Behavioral Research Program. Pan American Fellows conduct research in NIH intramural laboratories and are supported jointly by NIH laboratories and the National Commission for Scientific and Technological Re-

search of Mexico. Eight new fellows began work at the NIH in FY 99, and one fellowship, begun in FY 98, was renewed for an additional year. Areas of research include cancer, neuroscience, infectious diseases, tuberculosis, genetics, and metabolic disorders.

Russia

The NIH participates in two committees under the U.S.-Russia Joint Commission on Economic and Technological Cooperation. FIC coordinates NIH efforts under both the Health Committee and the Science Committee. Within the Health Committee, NHLBI, NICHD, NIDA, and the National Institute on Alcohol Abuse and Alcoholism have collaborated with Russian counterparts in activities addressing priority issues related to public health research, including prevention of cardiovascular disease, drug and alcohol abuse, and maternal and child health. In FY 99, collaborations continued in the areas of micronutrients, mental health, and biomedical communications, under the leadership of NIDCR, NIMH, and NLM, respectively. NIH activities on the Science Committee have occurred largely through efforts with the U.S. Civilian Research and Development Foundation (CRDF). In addition, in FY 99, a new joint working group established under the Science Committee explored mutual interests and opportunities in infectious disease research, with representation by NIAID and FIC.

Finally, at the initiative of the U.S. Department of State and the U.S. Department of Defense and as part of a broad-based effort of engagement of Russian (and other NIS) former biotechnology scientists, a pilot DHHS Biotechnology Engagement Program was developed in FY 99 to support public health-oriented collaborative research projects and research training in infectious diseases. The Program will include DHHS partners, the NIH, CDC, the U.S. Food and Drug Administration, and the multilateral International Science and Technology Center, while integrating other public health assistance efforts involving the Russian Ministry of Health, the Academies of Sciences and Medical Sciences, and other NIS biomedical research institutions.

South Africa

FIC serves as the NIH focal point for coordi-

nation of medical research activities under the Gore-Mbeki Binational Commission and works to provide information to South African researchers and institutions on an array of opportunities for joint research efforts. The Health Working Group of the Gore-Mbeki Binational Commission met in Pretoria, South Africa, in February 1999, to discuss ongoing joint activities and new opportunities for joint efforts.

During a meeting with the President of the University of Cape Town, the U.S. Secretary of Health and Human Services promised to assist in the placement of scientists from the university at the NIH through the NIH Visiting Program. One postdoctoral fellow is participating in this Program, hosted by the Laboratory of Parasitic Diseases, NIAID. Her research interests include malaria genetics and vaccines.

Spain

In FY 99, the U.S.-Spain Joint Science and Technology Board granted a second round of awards under the new U.S.-Spain Joint Science and Technology Fund. FIC coordinated the review of approximately 85 applications in the life sciences, and 20 awards were made at the joint board meeting in Madrid, in April 1999.

Ukraine

FIC has represented the NIH in the U.S.-Ukraine Science and Technology Working Group of the Gore-Kuchma Commission since its first meeting in November 1996. Within the framework of the interagency working group's objectives is the promotion of cooperation in science and technology, including biomedical research, through facilitation primarily by CRDF and the Science and Technology Center of Ukraine. In addition, the working group provides a forum for ongoing exchange and dissemination of information on programs in the United States and Ukraine, research capabilities, government priorities, and opportunities for collaboration. NCI, NIEHS, NIMH, and FIC have been the primary contributors to this forum. Areas of collaboration have focused on long-term health effects related to the 1986 nuclear power plant accident in Chernobyl.

MULTILATERAL ACTIVITIES

Multilateral Initiative on Malaria

In FY 99, FIC assumed the role of Secretariat for the Multilateral Initiative on Malaria (MIM), an alliance of organizations and individuals committed to advancing malaria research and control efforts. FIC will build on the work begun by the Wellcome Trust, the first MIM Secretariat, and will continue MIM's leadership role in addressing and coordinating efforts in scientific research against malaria in countries where it is endemic.

European Union

In December 1997, the U.S. Department of State and the European Union signed the European Union-U.S. Science and Technology Agreement. Since that time, the United States and the European Union have organized two international meetings entitled New Vistas in Trans-Atlantic Scientific Cooperation, one in 1998 and a second in 1999. The purpose of the meetings was to promote cooperation between scientists in the United States and the European Union. FIC participated in negotiation of the agreement and organization of the conferences and is continuing to work with the NIH and NIH-funded scientists to develop new programs in science and technology.

U.S. Civilian Research and Development Foundation

CRDF is a nonprofit, private foundation established in August 1995 by the U.S. Government to facilitate scientific and technical cooperation in the civilian sector between the United States and NIS. The NIH contributed \$1.3 million in FY 96 through FY 97 and \$3 million in FY 99, a total of \$4.3 million, to CRDF to develop a Biomedical and Behavioral Sciences Program to support collaborative research projects between NIH-supported U.S. investigators and their colleagues in NIS. The U.S. Department of Defense, CRDF, and the government of Ukraine supplemented these funds. In FY 96, CRDF provided 20 awards for travel and workshops to enable U.S. and NIS researchers to meet and develop joint proposals for the CRDF Competitive Grants Program. Workshop topics included emerging and reemerging infectious diseases, hypertension, clinical psychiatry, aging, and alcohol abuse. At least 80% of each award

directly supported NIS team expenses, including salary, travel, equipment, and supplies. The NIS partners included 34 in Russia, 5 in Ukraine, 3 in Georgia, and 1 in Kazakhstan.

In addition, six NIH Institutes or Centers extended additional funding of nearly \$300,000 to support several unfunded but meritorious proposals or to supplement existing CRDF awards. Under a special initiative, CRDF also received additional funding from the U.S. Department of State to support meritorious proposals involving former defense scientists in Kazakhstan. Major achievements of the CRDF Biomedical and Behavioral Sciences Program are scheduled to be reviewed at a symposium in Moscow, Russia, in May 2000.

Human Frontier Science Program

The Human Frontier Science Program (HFSP), based in Strasbourg, France, supports international grants and fellowships for basic research on the brain and cellular biology. This Program was announced by the Japanese Prime Minister at the Economic Summit of the G7 nations in 1987. The Program was developed and implemented in coordination with the G7 countries in 1989. All the G7 countries contribute to the Program, along with Switzerland and the European Union, but Japan remains the largest contributor. The NIH contributes annually to HFSP, and FIC makes the largest contribution. Examples of current multilateral research projects funded by this Program are presented here.

Scientists in the Czech Republic, the United Kingdom, and the United States have joined forces in an HFSP-sponsored project to dissect the molecular mechanisms of circadian clocks. Circadian clocks are ubiquitous in nature, spanning the whole phylogenetic tree from humans to Cyanobacteria. Circadian rhythms affect many aspects of human physiology, and an understanding of the mechanisms of circadian clocks should provide a basis for developing treatments for a wide range of disorders, such as sleep disorders. Using a variety of insect species, team members have succeeded in identifying molecules that are rhythmically expressed in various brain regions. These studies provide a basis for delineating both molecular and cellular mechanisms of circadian rhythms.

TABLE III-15.

Visiting Program: Rank Order by Country and Area, for all Institutes of the National Institutes of Health, Fiscal Year 1999^a

> 10 Persons		5-10 Persons		< 5 Persons	
Country/Area	No.	Country	No.	Country	No.
Japan	345	Belgium	9	Chile	4
China	332	Philippines	9	Hong Kong	4
Korea	170	Switzerland	9	Iran	4
U.S. permanent residents	162	Ireland	8	Jordan	4
India	138	Sweden	8	Malaysia	4
Canada	137	Ukraine	8	Nigeria	4
Italy	128	Pakistan	7	Peru	4
Germany	115	Colombia	6	Serbia	4
Russia	103	New Zealand	6	South Africa	4
France	101	Singapore	6	Belarus	3
United Kingdom	91	Thailand	6	Egypt	3
Israel	58	Bangladesh	5	Kenya	3
Spain	54	Croatia	5	Morocco	3
Australia	39			Portugal	3
Poland	30			Romania	3
The Netherlands	29			Venezuela	3
Taiwan	29			Algeria	2
Argentina	26			Cyprus	2
Brazil	24			Estonia	2
Hungary	22			Ethiopia	2
Mexico	18			Iceland	2
Slovakia	18			Mali	2
Czech Republic	16			Mongolia	2
Finland	15			Sri Lanka	2
Greece	15			Vietnam	2
Turkey	15			Albania	1
Austria	11			Armenia	1
Bulgaria	11			Bahamas	1
Denmark	11			Burkina Faso	1
				Congo	1
				Cuba	1
				Fiji	1
				Georgia	1
				Indonesia	1
				Jamaica	1
				Latvia	1
				Lebanon	1
				Liberia	1
				Malawi	1
				Norway	1
				Paraguay	1
				Senegal	1
				Slovenia	1
				Syria	1
				Trinidad and Tobago	1
				Uzbekistan	1
				Yugoslavia	1
				Zimbabwe	1

^aTotal of 2,453 persons from 89 countries and Taiwan. Includes 29 persons at the Center for Biologics Evaluation and Research, of the U.S. Food and Drug Administration.

Distortions in the way we recollect events have major practical, everyday implications, and the study of illusory recollections is relevant to understanding the aging and pathology of memory. In another HFSP-sponsored project, scientists from Switzerland, the United Kingdom, and the United States are using neuropsychological analysis and state-of-the-art brain-imaging tech-

niques to examine which parts of the brain are involved in memory storage and retrieval in young and old adults and in patients showing a high rate of false memories. They have identified brain regions that are involved in monitoring the act of remembering and especially in evaluating the results of a retrieval attempt. These studies are providing an important basis for understanding

brain mechanisms involved in the pathology of memory.

A team from France, the Netherlands, the United Kingdom, and the United States is characterizing a novel family of proteins, the HIR family, that is conserved evolutionarily. In yeast, these proteins function as cell-cycle-regulated repressors of core histone gene transcription. In higher organisms, genes from this family play an important developmental function. In humans, reduction of the HIRA gene to a single copy is thought to be responsible for DiGeorge syndrome and other disorders associated with the loss of a chromosome 22q fragment. The team has demonstrated that HIRA interacts with the transcription factor PAX3 and with core histones. These findings suggest that altered stoichiometry of complexes containing HIRA may result in these developmental malformations.

In addition to grants, HFSP provides support to young investigators who want to work abroad, through a 2-year postdoctoral fellowship program. A long-term HFSP fellow from France working at Washington University School of Medicine, St. Louis, Missouri, has been examining the role of neural activity on acetylcholine receptor density at the neuromuscular junction. Using quantitative fluorescence imaging, he demonstrated that the number of acetylcholine receptors is highly regulated by muscle activity and that loss of these receptors can be prevented by direct stimulation of muscle fibers. His research provides important information for the development of interventions to maintain muscle function after injury and disuse.

An HFSP fellow from the United States who is working in Switzerland is studying mechanisms that control cellular and organ size. The host laboratory has identified a *Drosophila* gene (CHICO) that is homologous to the vertebrate insulin receptor and that can lead to alterations in cell size. Through genetic manipulations, the investigator has produced "pinhead" flies that permit the identification of molecular pathways involved in the processes of cellular growth and size control.

A Japanese HFSP fellow working at Yale University, New Haven, Connecticut, is characterizing the recently identified mammalian analogue of the *Arabidopsis* COP9 gene. In plants, this gene codes for a sig-

TABLE III-16.

Guest Researchers: Rank Order by Country, for All Institutes of the National Institutes of Health, Fiscal Year 1999^a

> 10 Persons		5-10 Persons		< 5 Persons	
Country/Area	No.	Country	No.	Country	No.
Japan	18	Italy	9	China	4
		Germany	8	The Netherlands	4
				United Kingdom	4
				Brazil	3
				France	3
				Korea	3
				Spain	3
				Czech Republic	2
				Australia	1
				Austria	1
				Belgium	1
				Canada	1
				Chile	1
				Colombia	1
				Denmark	1
				Ethiopia	1
				Greece	1
				India	1
				Israel	1
				Jordan	1
				Norway	1
				Poland	1
				Russia	1
				South Africa	1

^aTotal of 77 persons from 27 countries.

nalosome, a large, 500-kilodalton protein complex involved in the light regulation of seedling germination. Subunit composition and sequence data have shown that this complex is remarkably similar to the mammalian 26S proteasome. Individual subunits can regulate the level of signal transduction in mammalian systems. The data suggest that the mammalian and plant complexes have similar cellular functions and probably share a common evolutionary ancestor.

NIH VISITING PROGRAM

Since 1968, FIC has provided administrative and immigration-related support for foreign scientists in intramural research laboratories at the NIH and at the Center for Biologicals Evaluation and Research (CBER) of the U.S. Food and Drug Administration, principally under the NIH Visiting Program, the Special Volunteer Program, and the Guest Researcher Program.

Established in 1950, the Visiting Program brings talented foreign scientists to the NIH to work or train with senior NIH investigators. A Program participant must be invited to the NIH by a senior intramural investigator who will sponsor the visitor's research.

In FY 99, the Visiting Program provided immigration-related support services for 2,424 scientists at the NIH and 29 at CBER, a total of 2,453 scientists from 90 countries. All these fellowships were funded in full or in part by the NIH Institute or Center in which the foreign scientist conducted the research or by CBER.

Special Volunteers and Guest Researchers are supported financially by their home institutions, foreign and domestic organizations, or both. Guest Researchers are independent scientists conducting their own research at NIH facilities. During FY 99, there were 77 Guest Researchers from 27 countries. Special Volunteers work in collaboration with and under the direction of an NIH sponsor. During FY 99, there were 451 Special Volunteers from 56 countries.

Tables III-15 through III-17 illustrate the distribution of foreign scientists by country.

INTERNATIONAL CONFERENCES, LECTURES, AND CONSULTATIONS

Another role of FIC is to bring together scientists from many parts of the world to confer and to explore health issues of

worldwide significance. For these purposes, FIC supports conferences, seminars, meetings, and workshops. In addition, FIC works with international and domestic partners to develop approaches for addressing critical needs for global health and biomedical research. Some of the international meetings in FY 99 are described here.

FIC was a cosponsor of a meeting on International Environmental and Occupational Health: Creating Global Linkages, in Bethesda, Maryland, on October 19-23, 1998. Participants from industrial and developing countries discussed the origins and scope of international challenges in environmental and occupational health, including global trade agreements, export of hazardous materials and devices, and shortages of resources and technical capability.

FIC cosponsored a workshop on Zinc and Health, which was organized by the NIH Office of Dietary Supplements and was held at the NIH, Bethesda, on November 4-5, 1998. This second workshop in a series presented a state-of-the-art review of zinc as it relates to health. It provided an overview of the biochemical, cellular, and nutritional requirements for zinc, focusing attention on six key areas where zinc supplementation may play a role in the prevention, reduction, or treatment of disease.

In collaboration with NIAID, the Center for Science, Trade, and Technology Policy of George Mason University, Fairfax, Virginia, the Korea Institute of Science and Technology Evaluation and Planning, the Ministry of Science and Technology of Korea, and the Korean Research Institute of Bioscience and Biotechnology, FIC cosponsored a Korea-U.S. Forum on Emerging Infectious Diseases, in Bethesda, on April 12-13, 1999. The forum was the seventh in a U.S.-Korea bilateral series and was the first devoted to the biological sciences.

The 1st Annual Lawton Chiles International Lecture on Maternal and Child Health in the Americas took place at the Lawton Chiles International House on the NIH campus, Bethesda, on May 11, 1999. The guest speaker was the Director of the Centro Latinoamericano de Perinatología, Montevideo, Uruguay, who made a presentation entitled, Is the Developing World's Research Agenda in Perinatal Health Applicable to the Developing World? The lecture was part of a new series announced at the dedication of the

TABLE III-17.**Special Volunteers: Rank Order by Country and Area, for All Institutes of the National Institutes of Health, Fiscal Year 1999^a**

> 10 Persons		5-10 Persons		< 5 Persons	
Country/Area	No.	Country	No.	Country	No.
Japan	82	France	10	Greece	4
Germany	46	Sweden	8	Portugal	4
China	39	Turkey	8	Switzerland	4
Italy	35	Austria	7	Taiwan	4
Korea	19	Denmark	6	Argentina	3
The Netherlands	19	Hungary	6	Belgium	3
India	14			Bosnia	3
United Kingdom	14			Chile	3
Canada	13			Finland	3
Russia	13			Iran	3
Brazil	12			Israel	3
Australia	11			Pakistan	3
Spain	11			Romania	3
				Thailand	3
				Algeria	2
				Colombia	2
				Egypt	2
				Mexico	2
				Norway	2
				Philippines	2
				Saudi Arabia	2
				Slovakia	2
				Ukraine	2
				Bangladesh	1
				Costa Rica	1
				Czech Republic	1
				Georgia	1
				Iceland	1
				New Zealand	1
				Niger	1
				Nigeria	1
				Poland	1
				Serbia	1
				Sierra Leone	1
				Trinidad and Tobago	1
				Uganda	1
				Yugoslavia	1

^aTotal of 451 persons from 55 countries and Taiwan, including 2 U.S. permanent residents.

Lawton Chiles International House in May 1998. It was cosponsored by FIC; the Center for Research for Mothers and Children, NICHD; and the Lawton and Rhea Chiles Center for Healthy Mothers and Babies, University of South Florida Health Sciences Center, Tampa.

FIC was a cosponsor of the second conference on Global Strategies for the Prevention of HIV Transmission From Mothers to Infants, in Montreal, Quebec, on September 1-6, 1999. The goals of the conference were (1) to provide updates on current issues concerning prevention of mother-to-infant HIV transmission; (2) to allow scientists and public health workers from developed and developing countries to define questions about mother-to-infant HIV transmission; (3) to identify effective and economical methods to prevent primary infection in women; (4) to identify effective and economical solutions for bringing an end to perinatal HIV transmission worldwide; and (5) to provide a forum for discussion of new and emerging issues related to HIV prevention.

