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Approaches to Addressing Occupational and Environmental Health Needs in Mexico

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The University of California, Los Angeles, has somewhat shifted the focus of its Fogarty program, taking a four-pronged approach: conducting high-level collaborative scientific research with Mexican faculty and trainees at the most advanced institutions in the country; providing training and collaborative research opportunities to faculty/students at other institutions in Mexico (primarily through training faculty who do not hold doctoral degrees); providing environmental and occupational health training to the professional community throughout Mexico; and developing short courses on special topics that provide means for greater research collaboration and skill building. The program is also working with existing institutions to develop academic programs that will enlarge the environmental and occupational health infrastructures in Mexico and Latin America. *Key words:* Mexico; Latin America; international collaboration; research training; Fogarty International Center.

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For the past three decades, Mexico has experienced rapid industrialization and economic development. Industrial development has been particularly rapid along the United States–Mexico border, spurred by the emergence of maquiladora industries owned in part by foreign investors. With the approval of the North American Free Trade Agreement (NAFTA), further growth and development of new industry has been occurring in Mexico. Although development has been slowed recently by political and economic events that have created monetary difficulties for Mexico, there is little doubt that growth will continue, in part due to NAFTA, but also because of the clear commitment of Mexico to expand its economic base.

Unfortunately, Mexico has historically had significant environmental and occupational health (EOH) concerns, including air pollution and water-quality issues. The governmental, public health, and academic capability in Mexico to address current and anticipated occupational and environmental health problems is limited. A U.S. General Accounting Office (GAO) study conducted by the University of California, Los Angeles (UCLA), has documented some of these limitations. The environmental impact of NAFTA was a matter of concern during congressional debate on the issue. Given the limitations of the EOH infrastructure in Mexico, it was feared the problems could worsen as industrial development continues.

UCLA has been working with academic scientists, public health professionals, government officials, and industry for a number of years to develop collaborative research and training programs in EOH. Because of its

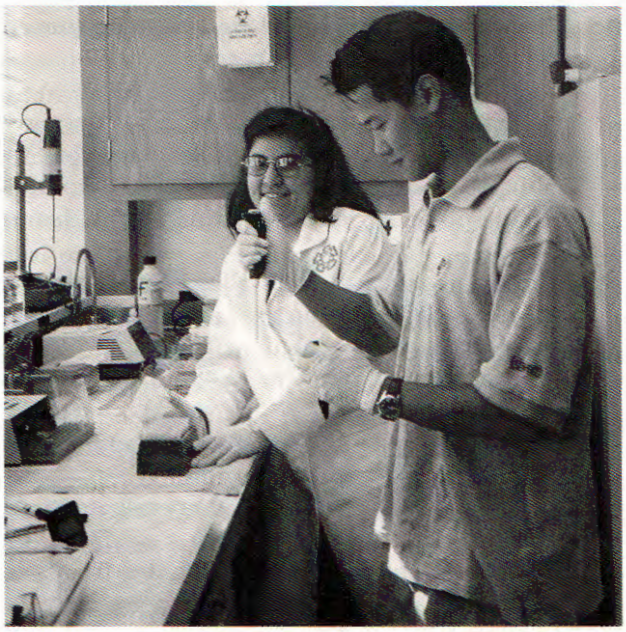
history of interaction and close proximity to Mexico, UCLA is well placed to work with the Mexican environmental health community. The Center for Occupational and Environmental Health (COEH) took the lead at UCLA in fostering collaborative training and research programs with academic and governmental institutions during the eight years prior to the establishment of the NIH/Fogarty International Training Program in Environmental and Occupational Health. The COEH worked with Mexico's National Institute of Public Health (INSP), the National Autonomous University of Mexico (UNAM), and the Autonomous University of Baja California (UABC), as well as several governmental institutions. In 1990, the COEH signed a collaborative agreement with the Mexican Secretary of Health (SSA) to build binational research and training programs in EOH.

The "UCLA–Mexico Collaborative Training and Research Program," supported by the Fogarty Program, focuses on the development of training and research related to EOH in Mexico. A major goal of this program is to train scientists to deal effectively with EOH issues through environmental monitoring and research in epidemiology, toxicology, medicine, environmental chemistry, occupational hygiene/exposure assessment, ergonomics, and related areas. Through its various activities, hundreds of Mexican students, professionals, and government officials have received valuable information and training since the inception of the program.

At its inception, the UCLA–Fogarty program identified a comprehensive set of objectives:

- To train scientists and professionals from Mexico in EOH via collaborative research at the master's, doctoral, and postdoctoral levels
- To work cooperatively with representatives from Mexican industry and government to improve their skills in and knowledge of EOH, and to conduct research in those industries where such training may be linked with defined problems
- To assist the training of individuals who will become leaders in the field of EOH in Mexico
- To improve the training of current EOH faculty at Mexican institutions of higher education, particularly those outside Mexico City
- To work with Mexican collaborators to better define the national needs in Mexico for advanced training of scientists and professionals in EOH

The following types of training are supported by the program: 1) doctoral and postdoctoral training; 2) master's-level training; 3) short-term training at UCLA; 4) short courses offered at UCLA or in Mexico; and 5) distance learning utilizing e-mail, the World Wide Web, and other forms of electronic communication. The program provides training for students from the advanced universities, research centers, and institutes in and around Mexico City, and also for students from areas outside the capitol, seeking a balance between the population center and the more distant neighbors.



Aracelli Hernandez (CINVESTAV, Mexico City) has spent time at UCLA working with UCLA doctoral student Russell Okoji on research aimed at investigating the mechanism of arsenic carcinogenicity.

The UCLA–Fogarty program strongly emphasizes collaborative research between UCLA scientists and Mexican investigators as a means to identify problems and address them directly. Training through research is a key pathway for enabling development of academic, industrial, and governmental leadership. The training program views interactive, collaborative multidisciplinary research as a primary long-term goal.

Through our interactions, we have determined that Mexico's capability in EOH is mixed. On the one hand, world-class scientific research is taking place at the country's advanced universities and institutions, while on the other, opportunities for training and research are more limited in other locations. For example, no formal industrial hygiene program is currently offered in Mexico. Balancing the needs of these diverse constituencies has proven to be a challenge.

TRAINING AT UCLA

Several scientific research projects are currently under way under the auspices of the UCLA–Fogarty Program. These projects involve the training of Mexican scientists and researchers who are not officially enrolled as students at UCLA, but who are enrolled in degree programs in Mexican institutions. These trainees spend most of their time in Mexico conducting their research, but visit UCLA for varying periods of time (ranging from three weeks to three years) to obtain training from

UCLA faculty and continue their research. Current projects include:

- A pesticide project to conduct an exposure assessment and epidemiologic study to determine the health risks associated with exposure to multiple pesticides in an agricultural region in Villa Juarez, Durango
- A project to assess the feasibility of merging data from two studies conducted in Los Angeles and Mexico City to determine the effects of chronic exposure to air pollution on children's respiratory health
- A study of the relationship between lead exposure and male infertility and subfertility
- A water-quality project designed to evaluate health problems related to drinking water quality in the Mexico City Metropolitan Area (MCMA) from a microbiological and organic-chemical perspective
- An investigation of the mechanism of arsenic carcinogenicity
- A project to model air quality in the Valley of Mexico City based upon applications of an advanced air-quality–modeling system developed at UCLA (the SMOG model) using local emission data for anthropogenic and biogenic sources

In each of these cases, the collaborating institution is located in or around Mexico City (at UNAM, INSP, or Centro de Investigación y Estudios Avanzados [CINVESTAV]). Efforts to develop similar projects in some of the outlying areas and along the United States–Mexico border have been less successful, despite extensive attempts to establish working relationships with faculty at those institutions. We remain committed to the development of more activities in these locations.

UCLA enrolled three Mexican graduate students beginning in the fall quarter of 1997. Each student is spending at least two years at UCLA taking graduate-level courses and conducting research with UCLA faculty. At the end of two years, they will have completed all the requirements for and earned a master's degree from UCLA's School of Public Health. Two of the three students have expressed an interest in remaining at UCLA to pursue the PhD degree; the third will return to Mexico after graduation. However, due to the high cost of non-resident tuition for students from outside California, the approach of enrolling Mexican students at UCLA is not the most cost-effective way for us to provide training and conduct research. We also do not want to draw Mexican students away from their home universities. We prefer they enroll in PhD programs in Mexico and conduct collaborative research with UCLA and Mexican investigators.

UCLA has been very successful in launching and has received an enthusiastic response to other types of programs, including short courses, short-term training, and collaborative programs. The following is a discussion of some of UCLA's most successful projects; these differ somewhat from the more traditional approaches to training.

OCCUPATIONAL MEDICINE PROGRAM

In conjunction with the Mexican Society of Occupational Medicine (Sociedad Mexicana de Medicina del Trabajo), the UCLA–Fogarty Program has entered into a unique partnership to provide training in the field of occupational and environmental medicine. This partnership involves several components: a *diplomado* course offered along the California–Mexico border, a summer meeting held on the UCLA campus, and increased interaction between occupational medicine societies in the United States and Mexico. These interactions arose from meetings with Mexican occupational physicians who indicated a strong desire to receive training and conduct collaborative research in occupational health. By joining with occupational health professionals in industry, we anticipate identifying important and interesting research opportunities that link training and in-plant investigations.

The *diplomado* course is a certificate program that was offered to occupational health professionals in Baja California, in 1996–1997. Students attended ten hours of classes during a Friday–Saturday module that took place in either Mexicali or Tijuana. Over the course of a year, the students were provided with 400 hours of training, which included classroom hours, work experience, and educational programs. At the end of the

Dr. Wendle Robbins of UCLA is collaborating with Dr. Rogelio Recio (University of Coahuila) on a pesticide project in an agricultural region in Villa Juarez, Durango.

course, each student received a certificate of completion. *Diplomado* course credit can count towards degree programs in occupational health at several institutes of higher education throughout Mexico, most notably UNAM, the University of Guadalajara, and UABC. Over 150 students throughout Mexico participated in the program, which is similar to part-time "executive programs" in the United States.

UCLA faculty (along with individuals from the California Department of Health Services and the Society of Toxicology) committed to teaching one module per month for this course. Topics covered included occupational exposures, carpal tunnel syndrome, lung disease, low back pain, industrial hygiene sampling, carcinogenesis, biomarkers, and heavy metals. Other instructors included university faculty from Mexican institutions, occupational physicians, and Mexican government professionals (from Instituto Mexicano del Seguro Social [IMSS] and the Secretaria de Salud [Secretary of Health]).

To provide more in-depth training in this area, UCLA hosted a three-day collaborative conference on occupational medicine September 12–14, 1997. The meeting included large-group presentations, lab demonstrations and tours, small-group discussions, and opportunities for informal interaction. UCLA faculty and graduate students, as well as representatives of the California Department of Health Services and Cal-EPA, led the presentations. There was also participation from the Fogarty grantee at the University of Texas, Houston. Approximately 75 Mexican physicians, nurses, government representatives, and other professionals attended the conference.

To coordinate activities with Sociedad Mexicana de Medicina del Trabajo, UCLA faculty members have participated in the Society's annual conferences over the past two years. Short-course modules have been offered, covering such topics as ergonomics, toxicology, and occupational asthma. We are currently in the process of developing collaborative research projects with several Mexican physicians. One project currently under way involves an occupational physician in a maquiladora factory developing an ergonomics program and a study aimed at reducing the physical demands related to the manufacture of airbags.

SPANISH LANGUAGE RESOURCE CLEARINGHOUSE PROJECT

The World Health Organization (WHO) hosted the initial meeting of the Fogarty grantees in 1996, and at that meeting UCLA agreed to work on developing a resource for Spanish-language EOH materials. The result of that effort is UCLA's Spanish Language Resource Clearinghouse Project, being coordinated by the UCLA Labor Occupational Safety and Health (LOSH) Program. This project (funded jointly by the UCLA–Fogarty Program, Pan American Health Organization (PAHO), NIOSH, and the UCLA COEH) is an ongoing effort to receive, evaluate, manage, and make available training as well as professional, technical, and other materials that may help Spanish-speaking workers and professionals prevent occupational injuries, illness, and disease.

Before initiation of the UCLA–LOSH effort, no central repository or clearinghouse for materials existed in a form that was easily accessible to workers. LOSH staff contacted and collected materials from publishers in Mexico, Nicaragua, and a host of other Spanish-language countries. With this information, UCLA–LOSH published the first "La Fuente"—a worker's sourcebook of Spanish-language health and safety materials, a bibliography of Spanish-language references useful for workers, trainers, and other health professionals.

Since the distribution of the first "La Fuente," UCLA–LOSH has received additional materials, including books, booklets, fact sheets, and videos, which are kept in a central resource library located within UCLA–LOSH offices. Copies of these materials are sent out upon request at no cost or for a nominal fee. If the resource is not directly available through UCLA–LOSH, interested parties are provided with instructions as to how to obtain the information. Materials are divided into 47 categories, ranging from Union Health and Safety Activity to Domestic Work. New materials are continually added to the collection, and a long-range goal of the project is the publication of a web site posting non-copyrighted items. June 1999 has been identified as the completion date for this project.

SHORT COURSES

Short courses offered by UCLA faculty members have been extremely successful and are in great demand. In the summer of 1997 five courses were offered in Mexico City, at CINVESTAV and UNAM. The response was enthusiastic and each course was filled to capacity (25–30 students). Course topics included human teratology, water quality, analytical chemistry, wastewater treatment, and soil remediation. These courses enabled UCLA faculty to interact with students, faculty, government officials, and environmental professionals, and, as a result, create opportunities for additional Fogarty projects, training programs, and research collaboration.

We have had several requests for additional courses to be offered in Mexico City, and offered a course in the analytical chemistry and biological monitoring of organophosphate pesticides jointly with the University of Washington Fogarty Program in February 1999. The University of Washington has Fogarty Trainees in other parts of Latin America, and some of their students participated as well. The bringing together of two Fogarty Programs in a collaborative effort is an exciting initiative.

OTHER ACTIVITIES

UCLA has made a concerted effort to publicize its Fogarty program using various media. A newsletter highlights the activities of the UCLA–Fogarty program. This newsletter is published in two forms: 1) as an English-language insert to the current UCLA COEH newsletter—issues are sent to approximately 3,000 individuals and groups in the United States who have an interest in the broad field of EOH; and 2) in Spanish, as a stand-alone newsletter to be distributed throughout Mexico and to Spanish-language constituencies in the United States. Also, as part of its site on the World Wide Web, the UCLA COEH has included detailed information about the UCLA–Fogarty program. This web site has been published in both English and Spanish at the Internet address <www.ph.ucla.edu/COEH/fogarty.html>.

While our scientific research projects are expected to generate the publication of a substantial number of articles in scientific journals, there needs to be a better-defined method of assessing the success of our applied programs, since they do not fall neatly into conventional methods of evaluation. We must identify scientific journals that will accept research findings on an applied level. There must be a way of recognizing the impact these EOH programs are having on the public health of the population in Mexico. Traditional gauges of success for NIH-sponsored activities may not be adequate where different training modes are required, and infrastructure development remains an important issue.

The NIH–Fogarty programs in occupational and environmental health are unique in their commitment to providing training for professionals, conducting sophisticated research to create new leadership in the fields, and assisting development of programs in the home countries. These efforts are essential in the selected countries and there should be consideration for expansion of the efforts over time. The Fogarty Program in EOH represents a major effort at addressing the training of EOH scientists, professionals, and leaders in EOH in developing countries. Continuing support is crucial for prevention of the consequences of industrialization that have taken decades to address in the United States.

CONCLUSION

In response to analyzing the needs of our constituents in Mexico and discussions with Mexican faculty and officials, UCLA has somewhat shifted the focus of its Fogarty program. Initially we intended to focus primarily on training at the master's, doctoral, and postdoctoral levels; we are now taking a four-pronged approach:

- Conducting high-level collaborative scientific research with Mexican faculty and trainees at the most advanced institutions in the country
- Providing training and collaborative research opportunities to faculty/students at other institutions in Mexico (primarily through training faculty who do not hold doctoral degrees)
- Providing environmental and occupational health training to the professional community throughout Mexico
- Continuing to develop short courses on special topics that provide means for greater research collaboration and skill building

Finally, we are currently beginning discussions about working with existing institutions to support newly developing academic programs that will enlarge the environmental and occupational health infrastructures in Mexico and Latin America.