DEPARTMENT OF HEALTH & HUMAN SERVICES

Memorandum

Date February 13, 2004

From Principal Engineer, OEP, NIOSH

Subject Final Progress Report for entry into NIOSHTIC2/NTIS for NIOSH Training Grant No. T42 CCT 510424

To Vern P. Anderson, Chief, IRB, EID (C-18)

The enclosed report has been received from the Center Director to document work performed during the specified grant project period. The following information applies to the designated Education and Research Center (ERC):

Title: Occupational and Environmental Health and Safety Education and Research Center

Center Director: Lorraine M. Conroy, ScD
School of Public Health
University of Illinois at Chicago
Chicago, IL 60612

Grant No.: T42 CCT 510424

Project Period: 7/1/98 - 6/30/2003

Please place the report in DIDS and I also recommend it for entry into NIOSHTIC2 and submission to NTIS.

Thanks for your assistance.

John T. Talty, P.E., DEE

Enclosure

fpr.uic

Occupational and Environmental Health and Safety Education and Research Center at the University of Illinois at Chicago

July 1, 1998 through June 30, 2003

T42/CCT510424
(522954)

Lorraine M. Conroy, ScD, CIH, Center Director

Leslie Nickels, MEd, Deputy Director

Lucy Marion, PhD, Director, Occupational Health Nursing
Peter A. Scheff, PhD, CIH, Director, Industrial Hygiene and Hazardous Substances Academic
Linda S. Forst, MD, MPH, Director, UIC Occupational Medicine
Rachel Rubin, MD, MPH, Director, CCH Occupational Medicine
Leslie Nickels, MEd, Director, Continuing Education and Outreach, Hazardous Substances Training, Agricultural Safety and Health Continuing Education
Robert Aherin, PhD, Director, Agricultural Safety and Health Academic
Rosemary Sokas, MD, MPH, Director, Pilot Projects Research Training

University of Illinois at Chicago
School of Public Health
EOHS (M/C 922)
2121 W. Taylor
Chicago IL 60612

October 21, 2003

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Abstract

The Occupational and Environmental Health and Safety Education and Research Center at the University of Illinois exists to improve, promote, and maintain the health of workers and communities by applying innovative and interdisciplinary approaches to:

- prepare professionals to be leaders in occupational and environmental safety and health who will direct and manage occupational and environmental safety and health programs, teach other occupational and environmental health professionals, and research issues pertinent to occupational and environmental safety and health;
- provide continuing education to occupational and environmental health and safety professionals and outreach to workers and communities to improve their knowledge, skills, and awareness of key issues in occupational and environmental safety and health, devoting special attention to the problems and needs of at risk and underserved workers and communities;
- contribute to the knowledge base in occupational and environmental safety and health by preparing doctoral students, performing faculty and student research on problems of regional, national, and global significance, and disseminating the results of their research; and
- serve as a regional information resource.

The ERC has 6 academic training programs, 3 continuing education and outreach programs, a pilot project research training program (PPRT), a NORA research program, and an administrative core (AC). The 6 academic programs include 3 core disciplines, industrial hygiene (IH), occupational medicine (OM-UIC and OM-CCH), and occupational health nursing (OHN), a specialty track in the IH program in hazardous substances (HS-A), and a program in agricultural safety and health (ASH-A). Doctoral-level research training (PhD) is provided in the IH program. The continuing education and outreach (CEO) program provides continuing education for health professionals in the core disciplines (IH, OHN, OM, occupational safety), in agricultural safety and health (ASH-CE), and in hazardous substances (HST), as well as mandatory training in asbestos, lead, and radon safety and health. Training in the ERC is both multidisciplinary and interdisciplinary. The ERC is administratively part of the Environmental and Occupational Health Sciences (EOHS) division at the SPH. EOHS is one of four academic divisions in the SPH and administers the graduate training programs in IH, HS-A, and the AC, CEO, ASH-CE, HST, and PPRT programs. The OM program includes residency programs at two institutions: a straight occupational medicine residency program in EOHS, SPH, UIC and a combined occupational medicine/ internal medicine residency program at Cook County Hospital (one year of the CCH residency is an MPH in EOHS at SPH). The OHN program is in the UIC College of Nursing, Department of Public Health, Mental Health, and Administrative Studies. The ASH-A program is in the Department of Agricultural Engineering in the College of Engineering, University of Illinois at Urbana-Champaign (UIUC). The AC provides support for each of the component programs and manages interdisciplinary activities such as the Occupational and Environmental Health and Safety seminar series. The ERC has an Executive Committee composed of the ERC Director and Deputy Director as well as each program director. The ERC also has an external advisory committee that meets three times per year.

Trainees in OM will have an MD or equivalent and need to complete a clinical internship in an approved US program. OM trainees complete an MPH degree at the SPH and a clinical year that includes rotations in clinical, public health, and in-plant settings. Trainees in IH/HS-A have a BS or equivalent with requisite math and science courses and complete an MS or PhD degree in the SPH. Trainees in OHN have a BS or equivalent and hold an RN and complete an MS degree in the College of Nursing with selection of a management or nurse practitioner track. Trainees in ASH-A must be in an academic program that will lead them to a professional position that will serve agricultural populations. Trainees will complete an MS or PhD degree in the College of Agricultural, Consumer and Environmental Sciences; College of Medicine; College of Nursing; College of Engineering; or School of Public Health.

Significant Findings

In August 1996, EOHS hired An Li, PhD whose expertise is environmental chemistry. In August 2000, EOHS hired two new tenure-track faculty members, Serap Erdal, PhD, and Daniel Tessier, PhD. Dr. Erdal's expertise is in the area of exposure assessment and measurement. Dr. Tessier is a molecular toxicologist. The addition of these two individuals and Dr. Li increases our strength in the industrial hygiene area and expands our bench-scale research capabilities. The University has supported the hiring and development of these faculty members with substantial investments in laboratory equipment. EOHS acquired a new GC-MS in 1999. Dr. Li's current research is detection and quantification of low concentrations of PAH and PCB. Dr. Tessier is currently outfitting a new molecular toxicology laboratory. Dr. Tessier's research interests include in vitro studies of cell signaling and cancer development. The new laboratory allowed him to continue research started at the University of California-Davis, studying effects of pesticides on cell signaling leading to cell proliferation. Dr. Erdal has built a new aerosol research laboratory and personal exposure measurement laboratory. These laboratories will be used by Dr. Erdal as well as Drs. Conroy, Franke, Scheff, and Wadden. Drs. Scheff and Hryhorczuk are improving our laboratory capabilities to measure and analyze bioaerosol samples. This includes both culturing methods as well as chemical analyses. Drs. Tessier and Li are assisting with this laboratory expansion.

In July 2000, Dr. Linda Forst became a full time member of the faculty in the School of Public Health, giving up her position in Emergency Medicine. Her position at the SPH is tenured and has allowed much greater interaction of the Industrial Hygiene and Occupational Medicine programs.

Dr. Samuel Dorevitch joined the faculty of the School of Public Health in July 2001. He is a Research Assistant Professor in Environmental and Occupational Health Sciences and Epidemiology.

Dr. Nurtan Esmen joined the faculty as Professor of Environmental and Occupational Health Sciences in August 2003.

Dr. Thomas Theis was recruited to be the Director of the newly created Institute for Environmental Science and Policy at UIC. Dr. Theis' background is in environmental engineering and he has extensive experience working with and leading multidisciplinary projects. His expertise in this area was one of the major reasons for recruiting him. The Institute has a number of goals and objectives. Two primary goals are of importance to the ERC. The first is a goal of initiating and enhancing multidisciplinary research in environmental science and policy. The second is to coordinate and enhance graduate student recruitment in environmental science and policy at UIC.

The Industrial Hygiene program was evaluated by the Accreditation Board for Engineering and Technology in 2002 and was reaccredited for the maximum allowable accreditation period, 6 years. The reviewers cited no weaknesses, deficiencies, or concerns.

The Occupational Medicine programs at UIC and CCH were both evaluated by Accreditation Council of Graduate Medical Education and were reaccredited for the maximum accreditation period, 5 years.

In Fall 2000, a new advisory board was constituted to coincide with the change in ERC leadership. Linda Murray, MD, MPH was invited to serve on the committee as Chair. Dr. Murray is the co-Medical Director of the Cook County Bureau of Health Services, Ambulatory Care network. Her commitment to the ERC has been exceptional. She is a voluntary attending physician in the CCH Division of Occupational Medicine. She has facilitated and collaborated on a number of continuing education and outreach activities, and her work as Chair of the Advisory Board for the last 36 months has been very valuable. Her experience in occupational health and in working with communities as well as NIOSH has

provided valuable insight for the activities of the ERC and for the preparation of this application. A number of previous members were invited to continue to serve and several new members were added.

We have met and expect to continue to meet NIOSH objectives for CE participants by Program area. In 2001-2002 we conducted 86 courses for 2383 participants (including agriculture and hazardous substances). Over the past 5 years (1998-2003) we have conducted over 400 courses for over 9,000 participants (excluding agriculture and hazardous substances).

The following is a list of significant accomplishments of the Agricultural Safety and Health CE program.

- INASH, a coalition of over 40 health and safety specialists representing over 25 organizations involved with agricultural health and safety from all parts of Illinois was founded and is sustained through the work of the ASH Project.
- Continuing well established partnership with agricultural heath care organizations in Illinois through the Carle Agricultural Occupational Medicine Training program. Rural Health & Farm Safety Update Seminar is a seminar which is co-sponsored with a Carle Foundation Hospitals Center for Rural Health and Farm Safety focused on agricultural safety programs and initiatives at the National Safety Council, agricultural resources available for rural health and agricultural educators, mental health and stress among agricultural workers, emergency preparedness, and rural health care issues.
- A Confined Space in Agriculture Awareness training program was developed in 1995 in cooperation with the ASH Project, Southern Illinois University, and the Equipment Manufacturers Institute. This course was offered to over 260 small business owners in Illinois, Wisconsin, Minnesota, Michigan, Ohio, Pennsylvania, and New York. The course was rated as very good to excellent by ninety percent of the participants.
- In 2001 the ASH program, in cooperation with the partnership in eye injury prevention to Latino farm workers project, developed an 11 module "Health and Safety Program Advisor for Agriculture". The "Advisor" was then adapted to be used specifically for eye injury program development. In summer of 2002 the "Advisor" is being pilot tested on two farms in Illinois and two farms in Michigan. Future program plans include working with partnerships in Wisconsin on the use of the "Advisor" at nurseries and greenhouses.
- Evolving partnerships with other NIOSH program in the region including Marshfield Clinic and University of Iowa.
- Medical Education is provided at the University of Illinois at Rockford, UIUC, UIC and Southern Illinois University. Dr. Petrea works with the medical schools on these campuses in conducting quarterly seminars on agricultural safety and health and continuing education through the program developed following the needs assessment.
- Implementation of the *Using History and Accomplishments to Plan for the Future:* A Summary of 15 Years in Agricultural Safety and Health and Action Steps for Future Directions Project. This project consists of three overlapping primary activities 1) a conference, 2) a consensus-work group activity, 3) writing and editing a document.

Center Administration

Introduction

The Illinois Center for Occupational and Environmental Safety and Health exists to improve, promote, and maintain the health of workers and communities by applying innovative and interdisciplinary approaches to:

prepare professionals to be leaders in occupational and environmental safety and health who will direct and manage occupational and environmental safety and health programs, teach other occupational and environmental health professionals, and research issues pertinent to occupational and environmental safety and health;

provide continuing education to occupational and environmental health and safety professionals and outreach to workers and communities to improve their knowledge, skills, and awareness of key issues in occupational and environmental safety and health, devoting special attention to the problems and needs of at risk and underserved workers and communities;

contribute to the knowledge base in occupational and environmental safety and health by preparing doctoral students, performing faculty and student research on problems of regional, national, and global significance, and disseminating the results of their research; and

serve as a regional information resource.

Major Changes

Leadership

As of September 1, 2000, Dr. Lorraine M. Conroy replaced Dr. Daniel Hryhorczuk as Program Director. This change was made as part of a reorganization of the Great Lakes Center.

In 1998, Dr. Scheff, who had been serving as the ERC deputy director, became the Interim Division Director in EOHS. In 1999, he became the research director for the ERC. This position includes directing the Pilot Projects Research Training Program. With these new responsibilities, Dr. Scheff resigned as the deputy director of the ERC. Ms. Leslie Nickels assumed the position of deputy director at that time. She continues in her position of Continuing Education and Outreach director.

We were successful in the recruitment of a permanent division director of Environmental and Occupational Health Sciences. Dr. Rosemary Sokas came to UIC in November 2002.

With the retirement of Dr. Richard Wadden, and the hiring of Dr. Sokas, Dr. Scheff assumed responsibility for directing the Industrial Hygiene and Hazardous Substances Academic Training programs. Dr. Sokas is now directing the Pilot Projects Research Training program.

After serving as program director of the Occupational Health Nursing program for many years, Dr. Karen

Conrad has decided to step aside and pursue her research interests. Lucy Marion, PhD, RN is the Department Head in Public Health, Mental Health, and Administrative Nursing at the UIC College of Nursing and assumed the responsibilities of Program Director for Occupational Health Nursing while a search for a new, tenure-track faculty member is carried out. She is assisted by Georgia Knuth who will serve as Deputy Director of the OHN program.

New faculty and new laboratories

In August 1996, EOHS hired An Li, PhD whose expertise is environmental chemistry. In August 2000, EOHS hired two new tenure-track faculty members, Serap Erdal, PhD, and Daniel Tessier, PhD. Dr. Erdal's expertise is in the area of exposure assessment and measurement. Dr. Tessier is a molecular toxicologist. The addition of these two individuals and Dr. Li increases our strength in the industrial hygiene area and expands our bench-scale research capabilities. The University has supported the hiring and development of these faculty members with substantial investments in laboratory equipment. EOHS acquired a new GC-MS in 1999. Dr. Li's current research is detection and quantification of low concentrations of PAH and PCB. Dr. Tessier is currently outfitting a new molecular toxicology laboratory. Dr. Tessier's research interests include in vitro studies of cell signaling and cancer development. The new laboratory allowed him to continue research started at the University of California-Davis, studying effects of pesticides on cell signaling leading to cell proliferation. Dr. Erdal has built a new aerosol research laboratory and personal exposure measurement laboratory. These laboratories will be used by Dr. Erdal as well as Drs. Conroy, Franke, Scheff, and Wadden. Drs. Scheff and Hryhorczuk are improving our laboratory capabilities to measure and analyze bioaerosol samples. This includes both culturing methods as well as chemical analyses. Drs. Tessier and Li are assisting with this laboratory expansion.

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Accreditation

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Advisory Board

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Program Description

Number of Programs

The Occupational and Environmental Health and Safety Education and Research Center (Illinois ERC) is comprised of 12 programs. There are 6 academic programs: Industrial Hygiene (IH), Hazardous Substances (HS-A), Occupational Medicine at the University of Illinois at Chicago (OM-UIC), Occupational Medicine at Cook County Hospital (OM-CCH), Occupational Health Nursing (OHN), Agricultural Safety and Health (ASH-A). There are three continuing education and outreach programs: Continuing Education and Outreach in industrial hygiene, occupational medicine, occupational health nursing, and occupational safety (CEO); Hazardous Substances (HST); and Agricultural Safety and Health (ASH-CE). The ERC also has Center Administration (CA), a Pilot Projects Research Training program (PPRT), and a NORA Research program.

Multiple Campus Locations

The ERC is administratively part of the Environmental and Occupational Health Sciences (EOHS) division at the SPH. EOHS is one of four academic divisions in the SPH. The IH, HS-A, OM-UIC, CEO, HST, ASH-CE, PPRT, and CA are administered through EOHS, allowing the ERC to have a more centralized administration and to rely on some administrative support from the division staff, particularly in the area of student affairs.

The OM program includes residency programs at two institutions: a straight occupational medicine residency program in EOHS, SPH, UIC and a combined occupational medicine/ internal medicine residency program at Cook County Hospital (one year of the CCH residency is an MPH in EOHS at SPH). A subcontract governs the relationship between the University of Illinois and Cook County Hospital. The OHN program is in the UIC College of Nursing, Department of Public Health, Mental Health, and Administrative Studies. The ASH-A program is in the Department of Agricultural Engineering in the College of Engineering, University of Illinois at Urbana-Champaign (UIUC).

The CA provides support for each of the component programs and manages interdisciplinary activities such as the Occupational and Environmental Health and Safety seminar series. The ERC has an Executive Committee that meets monthly and is composed of the ERC Director, Deputy Director, and directors of each ERC program area.

Computer and Library Resources

SPH faculty and students have access to the University of Illinois at Chicago Computer Center. The Center runs an IBM 3090/300J mainframe computer running VM/CMS and two large UNIX workstations

(an IBM RS/6000 running AIX and a Sun Sparcserver 1000 running Solaris). These systems offer a full range of analytical and reference services, including numerically intensive computing and large database applications. Five walk-in micro-computer laboratories are located on the east- and west-sides of the campus. There are a number of software packages available for use on these personal computers, including access to extensive information sources. Most of the labs have wheelchair accessible desks and are open 24 hours daily. The Center also manages a campus-wide backbone computer communications network, the Academic Data Network (ADN). This fiber optic based network connects the campus facilities and offices with each other, with the Center's VM/CMS and UNIX mainframe computer systems and other systems at UIC, and provides a link to the Internet and to BITNET. The School of Public Health operates a PC laboratory with 26 IBM compatible Pentium computers which are hard-wired to the mainframe systems allowing full access to the resources provided by the Center.

The UIC Library of the Health Sciences contains comprehensive collections to support teaching, research, and clinical programs in dentistry, medicine, nursing, pharmacy, public health, and the associated health professions. The library contains more than 5,000 journals and more than 850,000 bound periodical volumes, books, government documents, and audiovisual items. The University Library provides collections and services in support of campus instructional and research programs at the following locations: the Richard J. Daley Library, the Architecture and Art Library, the Library of the Health Sciences, the Mathematics Library and the Science Library. The total holdings of the libraries are more than 1,915,000 books and bound periodicals, some 16,400 current journal and serial subscriptions, and over 3,692,000 other items such as microfilms, maps, manuscripts, curriculum materials, music scores and recordings, and pamphlets. Information about the library's collections is available through the on-line catalog UICCAT and a number of automated systems. Detailed information on the use of these systems and about a wide range of services offered by the library is available from the library home page http://www.uic.edu/depts/lib.

New Program Development

Agricultural Safety and Health

A new academic program in agricultural safety and health began in July 2000. The goal of the agricultural safety and health academic training program is to provide graduate and undergraduate students who are seeking careers in agricultural and rural-related professions including health professions with a basic foundation in agricultural safety and health. The program is achieving its objectives. The first course, Agricultural Injuries: Issues and Interventions, was offered in Spring, 2001. Twenty students took the course; 18 seniors and 2 juniors from the College of Agricultural, Consumer and Environmental Sciences (ACES). The second proposed course, Agricultural Illnesses and Disease, was offered in Fall 2001 with Dr. Petrea as the lead instructor and Dr. Aherin and Dr. Forst provided lectures and assignments. Additionally, Steve Lacey (IH PhD trainee) traveled to Urbana several times to lecture on exposure assessment and industrial hygiene instrumentation. We are exploring ways to offer these courses to students on the Chicago campus through a format that allows for both visual and verbal communication between classrooms.

Pilot Projects Research Training

On July 1, 2002, we begin the third year of this program, however, the program is modeled on a program that has provided small grants to trainees for about 10 years. Peter Scheff, PhD served as the director for this program until July 2003, and Salvatore Cali, MPH provides program and administrative support. Since the beginning of the PPRT program, we have funded 21 projects. In 2001, we initiated the UIC Environmental Science, Health, and Engineering Research Symposium. The symposium was a day-long

event highlighting research in the areas of environmental science, environmental and occupational health, and environmental engineering. Recipients of PPRT funds and trainees presented at the first Symposium, held November 30, 2001. The Institute for Environmental Science and Policy was a co-sponsor of the event. Dr. Theis has indicated that the Institute would like to provide more leadership and support for the event in future years. A second symposium was held in April 2003. Recipients of funds from our PPRT program participated by presenting the results of their funded research.

Continuing Education and Outreach

In Fall 1999, the Center received a CDC Conference grant to hold a conference dealing with sweatshops in the Chicago area. In Fall 2000, the Center again received a CDC Conference grant to hold a conference on Health in the Arts. Both of these conferences have led to on-going projects to improve health, safety, and working conditions. The sweatshop conference led to a working group comprised of representatives from the Taylor Institute (the authors of a study identifying sweatshop conditions in the Chicago area); the ERC, the Center for Labor Research, and the U.S. Department of Labor (both OSHA and the wage and hour enforcement group). The working group has developed a number of ongoing activities, the most significant is a coordination of enforcement activities between the safety and health division (OSHA) and the wage and hour division of DOL. The wage and hour enforcement officers have been trained to recognize potential health and safety issues during their enforcement activities and to include OSHA enforcement officials in their inspections and vice versa. A pilot scale test of this coordination is occurring in the Chicago area. The Health in the Arts conference was the first large effort to reach out to Chicago area artists and assist them in reducing health and safety hazards in their jobs. The conference was co-sponsored by the ERC and the Health and the Arts Project in the Occupational Health Service Institute. The Health and the Arts Project provides medical and technical services to Chicago area artists.

Occupational health of the health care worker has become a very successful specialty area within the ERC. In 2001-2002, we developed, in conjunction with the Illinois Department of Commerce and Community Affairs, courses for home care industry employers and employees. The CE/O program developed a proposal for similar activities in partnership with the UCLA Labor Education Program. The proposal was not funded but we are continuing to explore activities and projects with the Labor Education Programs at UCLA and the University of Oregon.

Fifteen percent of the CE/O courses are held at a University facility equipped with audio-visual distance based equipment. The ERC continues to develop and deliver distance based courses. The ERC works with the Center for Advanced Distance Education (CADE). CADE is a center within the SPH with a staff to support distance based training. The ERC contracts with CADE to provide support for the website and other technical issues of course development. The following courses or training materials are available on line:
Community and Home Care Workers Conference materials
(http://www.uic.edu/sph/glakes/ce/health&safety/index.htm);
Sweatshop Conference (http://www.uic.edu/sph/glakes/ce/seminars/sweatshop/index.htm);
Confined Space for Agriculture (http://www.uic.edu/sph/cade/confined_space/index.htm);
Radon Mitigation Course, Illinois Department of Nuclear Safety approval pending,
(http://www.uic.edu/sph/glakes/radon_course/final/opening.asp);
Pesticide Exposure: Children's Environmental Health Case Study, Continuing Medical Education Credits pending (http://www.uic.edu/sph/glakes/kids/case1/index.htm);
Envirorisk, Continuing Education Credits available (http://www.uic.edu/sph/cade/envirorisk/).

Interdisciplinary Interaction

Common Coursework

Course requirements for each of the core areas include a set of common courses that trainees must take. These include:

EOHS421 Fundamentals of Industrial Hygiene
EOHS482 Occupational Safety Science
EOHS558 Industrial Toxicology
EOHS551 Occupational Diseases[1]
EPID400 Principles of Epidemiology
BSTT400 Biostatistics I

[1]IH trainees must take EOHS558 or EOHS551 although many trainees take both courses

In Fall 2000 and Fall 2001, EOHS529 Industrial Hygiene Lab II class developed and delivered a 2 hour course in laboratory health and safety to entering EOHS students, including the IH and OM trainees.

In EOHS421 Fundamentals of Industrial Hygiene, students are required to complete a project demonstrating the OSHA rulemaking process. Last fall the class conducted a mock Congressional Hearing on OSHA Reform with special consideration of rulemaking procedures. Students were assigned to groups. Each group had at least one IH trainee and one OM resident. Two groups also had an OHN trainee (there were only 2 OHN trainees in the class). One group of students was assigned to serve as Congressional Representatives. The other four groups were required to prepare written comments which were submitted 2 weeks prior to the hearing, prepare oral comments, and present oral comments at the mock Congressional hearing. The Congressional group was responsible for reviewing the written comments, questioning the witnesses (the other groups), and developing a "bill" for OSHA reform. The "bill" was distributed to the entire class for discussion. Faculty members Dr. Peter Orris (OM), Dr. Daniel Swartzman (Health Policy and Administration), Ms. Leslie Nickels (CE/Occupational Health), and Dr. Lorraine Conroy (IH) also participated in the exercise, serving as additional members of Congress and questioning the witnesses. In previous years, proposed rulemaking in ergonomics, tuberculosis, and indoor air quality have been used as case studies for this exercise.

Occupational and Environmental Health Seminar Series

The ERC conducts a seminar series on topics related to occupational and environmental health and safety. A schedule of seminar topics for the 1998-2001 academic years is presented in Appendix A of this section. Trainees are required to participate in the seminar and graduating trainees are strongly encouraged to present their research results in this forum. Faculty participation in the seminar is also expected.

Occupational History Tours

In Spring 2000, the CEO program began offering Occupational History tours of Chicago. Two tours per year are offered. The first is a tour of sites related to the Haymarket demonstration for an 8-hour workday, and subsequent events (murders, trial, hangings). This tour is conducted near the May 4 anniversary date and includes trainees as well as faculty, staff, other SPH students, and community members. The second tour is conducted near Labor day and visits the Pullman Historic District in Chicago. Both tours are led by noted labor historian William Adelman, Professor Emeritus, University of Illinois Institute for Labor

and Industrial Relations. The success of these events has resulted in plans for a yearly offering of each tour.

Occupational Medicine Clinic

The occupational medicine programs conducts three clinic sessions per week. This is one of the primary clinical training activities for OM trainees. The clinic offers an ideal opportunity for interdisciplinary training. Industrial hygiene, occupational health nursing, and occupational medicine trainees attend the clinic. The IH and OHN trainees work with the residents and attending physicians to elicit information on work history and possible workplace exposures. They research occupational health issues related to the cases presented in clinic and develop recommendations for controlling exposure. All trainees in the core academic program are required to participate in the Occupational Clinic program. Trainees from the non-core programs will be encouraged to participate and the opportunity is open to all students in EOHS.

Plant Visits

With assistance from Nancy Quick, an advisory board member and Compliance Assistance Officer for the West Chicago OSHA office, the occupational medicine program initiated a monthly plant visit experience. This program began last year and continues this year. Once a month, the weekly conference deals with an industrial process. The following Friday, trainees visit an industrial plant. The industrial sites are OSHA Voluntary Protection Program (VPP) sites in the Chicago area. These conferences and plant visits are open to trainees and faculty in all programs in the Center.

Research

A number of collaborative multidisciplinary projects have been initiated in the ERC and are continuing. Dr. Forst is the principal investigator on a NIOSH-funded intervention study to reduce eye injuries in migrant farmworkers in Illinois and Michigan. Ms. Nickels and Dean Scrimshaw (SPH) are co-investigators on this project. Two industrial hygiene trainees, one occupational medicine trainee, and one doctoral student in Community Health Sciences (CHS) are also working on the project. Dr. Forst is also the principal investigator on a World Health Organization-funded project to develop a 40-50 hour case-based curriculum for occupational health training that can be applied worldwide. Ms. Nickels and Drs. Conroy, Hryhorczuk, and Orris are co-investigators on the project. Dr. Forst, Ms. Nickels, and Dr. Conroy traveled to Cape Town South Africa to pilot test the curriculum and worked with faculty at the University of Cape Town and the Industrial Hygiene Research Group to evaluate the content and delivery. Drs. Conroy and Krantz and Ms. Nickels also traveled to Ankara Turkey to conduct additional evaluation of the training materials. One occupational medicine trainee and one EOHS MPH student worked on the project. Drs. Hryhorczuk and Scheff are collaborating with the Illinois Department of Public Health and the Building Research Center at the University of Illinois at Urbana-Champaign on an intervention study to reduce moisture infiltration and mold growth in asthmatics' homes. Drs. Tessier and Li are also collaborating on this study. The study also involves faculty and residents associated with the Center for Children's Environmental Health. Three industrial hygiene trainees are working on this project.

Through the Fogarty Center for Environmental and Occupational Health at the University of Illinois at Chicago and the ERC Pilot Project Grant Program, Dr. Robert Cohen, Dr. Hryhorczuk, Dr. Conroy, and one industrial hygiene trainee are working on a surveillance project of lung disease and dust exposure in Ukrainian coal miners.

Several other multidisciplinary projects are ongoing. Drs. Hryhorczuk, Scheff, and Wadden are continuing research on environmental exposure and health in Ukraine. Drs. Scheff, Franke, and Dorevitch

are collaborating with Victoria Persky, MD (Epidemiology) on a project related to environmental allergen exposure and asthma in schools.

A group of ERC faculty (Conroy, Forst, Erdal, Li, Tessier, Wadden, Scheff, Aherin) are initiating research related to biomarkers and adverse health outcomes (specifically asthma) in two different workplace settings, welding and swine confinement. Dr. Ernesto Indocochea, from the Department of Civil and Materials Engineering, is an expert on welding and is collaborating with the ERC on this initiative. Dr. Tessier's proposal to look at cytotoxic effects of metals on lung tissue was funded by the American Lung Association. One industrial hygiene trainee is working on this project. Two pilot project proposals have been submitted and some of the ERC NORA support funds are being devoted to this effort.

We have also developed and conducted research to meet the needs of high risk workers in the service sector. Two occupations in particular have been addressed by our research. Dr. Conrad's research with firefighters has resulted in significant insight into the ergonomic risk factors faced by firefighters and the potential benefits of workplace fitness programs for reducing these risks. Drs. Conroy, Franke, and Scheff have conducted a number of studies related to control of infectious airborne contaminants in health care settings.

Drs. Cohen, Hryhorczuk, and Conroy are conducting a study of respiratory disease and occupational coal dust exposure in Ukrainian coal miners. While this research is not regionally focused, the knowledge and insight gained in this study will provide benefits in the US and in our region.

We have an on-going commitment to underserved occupational groups. Our agriculture and health care research are examples of this commitment. A relatively new initiative is the Health and the Arts project. This project provides service to and conducts research with Chicago area artists, both performance and visual artists. This is a group of workers who face extreme musculoskeletal stress, are often exposed to toxic materials and noise, and who often work alone and at home. Because of the self-employed or contract nature of this type of work, these workers do not have access to traditional occupational health and safety services that might be available in a more organized workplace.

Collaboration with environmental health faculty in other programs and colleges

EOHS faculty have been working on developing research and training collaborations with other units on campus. Drs. Conroy and Franke are working with Pat Banerjee, PhD and Suresh Agarwal, PhD on development and validation of computational fluid dynamics models linked with virtual reality (CFD-VR) applied to occupational health issues. Ms. Nickels is also working with Dr. Banerjee on a project to develop interactive computer based safety training for work settings near or on roadways.

Dr. Scheff has been working for several years on a campus wide committee to develop an Institute for Environmental Science and Policy. The Institute is now in place and a national search has been completed. Dr. Thomas Theis began as Institute Director in January 2002. While the Institute is a campus-wide organization, the administrative center for the Institute will be in the School of Public Health building. This should result in close working relationships with Institute faculty and through the Institute, other faculty at UIC. As described above, we coordinated a University-wide conference titled "Environmental Science, Health and Engineering Research" held November 30, 2001.

ERC faculty have been working on developing research activities related to respiratory disease, specifically asthma, in welders. We are working with Dr. Ernesto Indocochea, from Civil and Materials Engineering on these efforts. We have on-going projects with faculty in the Division of Epidemiology

and are developing similar collaborative relationships with faculty in the Division of Health Policy and Administration.

The Illinois Public Health Preparedness Center is a newly funded CDC Center which will undertake an ambitious agenda to measure, understand, and improve public health preparedness in Illinois through initiatives that assess and promote competency in basic public health practice, public health administration using a credentialing mechanism, community health improvement strategies, infectious disease prevention and control, bioterrorism, public health nursing, and environmental health. The Center Director is Dr. Bernard Turnock. Ms. Nickels, Dr. Forst, and others in the ERC are working with Dr. Turnock on this project. The role of the ERC is to provide leadership in the core public health practice area of environmental and occupational health.

Collaboration with State, Local, and Federal Agencies

Illinois Department of Public Health has funded, and continues to fund, research projects that deal with exposure to toxic materials. One of these "Indoor Air in Southeast Chicago" involved evaluation of indoor measurements taken in homes located in an area heavily polluted by waste dumps and industrial pollution. The project supported a trainee and provided the basis for his thesis. A current project with IDPH involves determination of the efficacy of simple engineering intervention to reduce moisture and consequent mold growth in low-income housing. This project presently supports three trainees. Another project with Region V of the U.S. EPA was "Advanced Monitoring for Fenceline Toxic Emissions". The project involved a remote monitoring device which was tested on its capability of sensing BETX compounds in vicinity of a badly designed, unstable, landfill. One of our trainees completed her thesis using the results of the testing; and we expect another thesis project from evaluation of the emission data. We continue to use the emergency responder computer program, CAMEO, in our hazardous waste management course, since this predictive tool is the most common for fire departments and other municipal emergency responders in the Region V area. CAMEO program development is now coordinated through the EPA's Region V office.

We also have various avenues for feedback on our program activities. Drs. Scheff and Erdal, through the Intergovernmental Personnel Act Mobility Program, spend one day a week with the EPA working with the air pollution data analysis section, and the risk assessment section, respectively. In addition many of graduates work for the EPA and are helpful in advising us about our training program. In Fall of 2000 we completed a study of air pollutant exposure, "Air Monitoring Study in Winton Hills/Place, Ohio", which came to us through EPA contacts. The area studied is severely affected both by industry and by emissions from a hazardous waste landfill. This project also supported a trainee and she wrote her thesis on the evaluation.

The Great Lakes Center was recently awarded a CDC grant to fund a Center of Excellence in Environmental Health that will create and strengthen partnerships between the University of Illinois School of Public Health and state and local health agencies, academic institutions, and communities. This community of excellence would work to "improve, promote, and maintain the environmental health of residents and communities in our region" by creating and strengthening environmental health partnerships between the University of Illinois School of Public Health (UIC SPH) and the City of Chicago Department of Public Health (CCDPH), Cook County Department of Public Health (CCDPH) and other county and local health departments, Illinois Department of Public Health (IDPH), the Illinois Environmental Protection Agency (IEPA), Region V United States Environmental Protection Agency (USEPA), and Region V Agency for Toxic Substances and Disease Registry (ATSDR). Dr. Hryhorczuk is the director of this center and key faculty involved in the development and direction of the center include Dr. Scheff, Dr. Erdal, Dr. Turnock, Ms. Nickels, and Mr. Cali. The focus area for the CEEH will be environmental toxicology. Through this community of excellence program, we will share our faculty's

knowledge and expertise in environmental exposure assessment, environmental toxic outbreak investigation, and clinical and public health aspects of environmental toxicology to achieve our common goal of improving, promoting, and maintaining the environmental health of residents and communities in our region. While our efforts will focus primarily on building a community of excellence in Illinois, the regional, national, and global mandates of the UIC SPH Great Lakes Centers will allow us to establish broader networks and to disseminate successful strategies and models throughout our region. A unique aspect of the CEEH is that the pilot projects grant initiative started with NIOSH ERC funds for multidisciplinary trainee research is being used as the model to fund collaborative multidisciplinary research with local health departments.

We have a long-standing cooperative relationship with the Occupational Safety and Health Administration. Nancy Quick, Compliance Assistance Officer with OSHA and a member of our advisory board has worked with the ERC on a number of programs. As described above, she has assisted with the plant visits for trainees. She has also been a member of the planning committee for a number of CEO programs, most notably the annual Women's Occupational Health Conference. Personnel from the OSHA regional office have also participated, as members of planning committees, on a number of conferences, workshops, and courses.

The CEO program has been working with the Illinois Department of Commerce and Community Affairs OSHA consultation program to develop materials and deliver training on occupational health and safety for home care workers. The program materials are complete and several train-the-trainer programs have been delivered to employers in the home care industry.

Another CEO program was the development of a computer-based training for restaurant workers to prevent food borne illness. The training program was developed collaboratively with the ERC, the UIC Center for Literacy, and the Oak Park Health Department.

Occupational Health Nursing

The University of Illinois at Chicago (UIC) Occupational Health Nursing (OHN) Program has been part of the NIOSH funded Education and Research Center, Great Lakes Center for Occupational and Environmental Health, since its inception in 1978. Originally, the OHN program was limited to an OHN management program that awarded a master in science (MS) degree. However, in 1990, NIOSH expanded its UIC ERC funding to include another MS component and a doctoral program that awarded a Doctor in Philosophy (PhD). The added OHN MS option was the OHN nurse practitioner (OHNP) concentration that integrated the Family Nurse Practitioner (FNP)and OHN curriculum. All three options continued to be offered during the reporting period.

Program Objectives

The 1998-2003 OHN Program objectives included:

- Actively recruit highly qualified nursing students to the OHN Program. This includes the recruitment of minority students and international students
- Continue to offer curricula that are responsive to emerging competencies required of graduate-prepared OHN practitioners, managers, and researchers
- Continue to pursue opportunities to integrate occupational health content into the undergraduate program
- Further develop the OHN faculty expertise and research funding-base so that varied interdisciplinary learning opportunities will be available to students
- Maintain a high level of commitment to the UIC Fire Service Program through leadership in interdisciplinary research, teaching, and service initiatives.
- Offer continuing education (CE) programs of exceptional quality that meet the needs of practicing OHNs in a rapidly changing, complex, and competitive work environment
- Share faculty expertise with the worksite community through active practice and outreach

Progress in Meeting Program Objectives

During the five (5) year reporting period, the OHN Program has made significant objective achievement progress and a summary of that progress follows.

- Actively recruit highly qualified nursing students to the OHN Program. This includes the recruitment of minority students and international students
- Faculty of the ERC and CON strengthened the partnership between their WHO Collaborating Centers.
- The OHN Program continues its personal recruitment campaign that includes:
  - College of Nursing Graduate School informational session participation,
  - Conducting recruitment during local American Association of OHN's monthly meetings,
  - Faculty follow-up calls and emails,
  - Mailed personalized information packets,
  - Presenting undergraduate occupational health content, and
  - Connecting current/former students with potential applicants.
  - Use of recently updated web site has proven to be a powerful recruitment tool.
  - OHN Program has expanded its personal recruitment efforts to include:

Use of Nursing Spectrum's power e-mail system that reaches many of our service population's nurses that might otherwise remain unaware of our program's availability. We

expanded that recruitment method to include students who are already enrolled in graduate nurse practitioner and community health nursing programs and who seek OHN preparation and will include participants in the ERC CE offerings.

- Use of a newly developed prospective OHN student questionnaire to gather information used to match prospective students with the most appropriate OHN faculty member. Prior to enrollment, the matched faculty member conducts at least one, additional OHN faculty e-mail and/or telephone contact. Factors considered during prospective student to faculty matches include: geographic location, selected OHN tract (MS Management/Leadership, MS OHNP, PhD), clinical preferences, and research interests. Although recruitment efforts have been increased and the number of interested students has increased respectively, the enhanced recruitment initiatives have been hindered by the difficult economic situation and NIOSH funding reductions.
- Personalized follow-up and searchable web site (located at: http//www.nurs.uic.edu/ohnurse) and OHN web site (http://www.uic.edu/nursing/ohn/index.htm) development enhanced OHN student recruitment.

- Continue to offer curricula that are responsive to emerging competencies required of graduate-prepared OHN practitioners, managers, and researchers
- A toxicology course (EOHS 558, Industrial Toxicology) was added to the OHN core requirements and then it was changed (EOHS 455, Environmental and Occupational Toxicology)to increase the required credit hours by one (1). NUPH 400 (Introduction to Occupational Health Nursing) toxicology content was enhanced.
- To integrate the IOM (2001) objectives and recommendations into the OHN curriculum, the OHN faculty devoted a portion of monthly faculty meeting to examine and revise course content.
- OHNP/FNP course (NUPH 500, 524 and 525) content was modified to integrate OHN and toxicology readings and case studies into every relevant unit and the Introduction to Occupational Health course (NUPH 400) was revised to integrate informatics and environmental health content.
- OHNP faculty collaborated with FNP faculty to assure OHN content's continued integration into all FNP courses.
- OHNP faculty developed environmental exposure, occupational history taking, musculoskeletal evaluation, and ergonomically induced back disorder learning modules that are required FNP curriculum components that reach all FNP students at all five (5) UIC campuses.
- The OHN Program's clinical learning experiences were revised to enhance OHN student's clinical preparation. All OHN practicum hours requirements were increased and the OHNP practicum hours were expanded to facilitate students' ability to meet the eligibility requirements for the American Nurses Association's Family Nurse Practitioner Certification examination.
- To help ensure the availability of an adequate pool of OHN researchers, a newly formulated Bachelor's to PhD Program was developed and attracted one (1) new PhD students for Fall 2003.
- To meet the OHN learning needs of non-OHN MS prepared nurses and non-OHN nurse practitioners, the OHN faculty began work to create two (2) OHN Certificate Programs. Although both certificates will impart the same entry level OHN and interdisciplinary knowledge and skills, one is designed for practicing masters-prepared nurse practitioners who seek OHN preparation and the other is for baccalaureate prepared OHNs who want advanced occupational health preparation but are not ready to commit to a full graduate program.
- Continue to pursue opportunities to integrate occupational health content into the undergraduate program.
- Annually, OHN faculty used multiple teaching delivery methods to present occupational/environmental health content in a variety of undergraduate courses (e.g., NUSC 385, 392, 390, 395).
- OHN faculty presented to undergraduate nursing students at various Illinois schools annually.

- OHN faculty chaired the undergraduate community health nursing curriculum revision committee that incorporated occupational/environmental health content that was delivered annually to approximately 150 students at three (3) regional sites.
- RN to BSN students' requirements were expanded to include at least one (1) undergraduate OHN practicum experience (7 clinical days).
- An overview of OHN career opportunities and OHN graduate program recruitment information was provided annually to approximately 40 senior undergraduate students.
- Further develop the OHN faculty expertise and research funding-base so that varied interdisciplinary learning opportunities will be available to students
- Offered formal and informal opportunities for interdisciplinary activities (e.g., courses, independent studies, lectures, ERC biweekly seminars, field trips, Occupational Medicine clinic rotations).
- Two students were selected as Albert Schweitzer Fellows.
- During the 99-00 reporting period, one OHNP student was awarded our first paid internship at Baxter. During her internship, the student provided disability case management computer software education and training for physicians, safety engineers, industrial hygienists, and OHNs.
- OHN and industrial hygiene students (EOHS 421) participated in interdisciplinary plant tours.
- Since 2000, OHN students join occupational medicine residents and industrial hygiene students on monthly ERC industrial plant tours (one required for NUPH 400 and one required for NUPH 529A.)
- During NUPH 529, OHN students worked with other members of the interdisciplinary team at the UIC and Cook County Hospital Occupational Medicine Clinics and the UIC Emergency Department that provides UIC employees' work-related injury care.
- OHN Faculty presented the occupational disease course's (EOHS 551) worksite health promotion content.
- OHN faculty member was co-investigator on two grants that analyzed firefighter occupational injures and worker compensation costs and served as the Principal Investigator's a mentor.
- Doctorally prepared OHN faculty submitted R01 research proposals to fund their work. Several OHN faculty have other research funding sources.
- One OHN faculty member collaborated with an adjunct faculty member on a NIOSH funded pilot research project and was the principal investigator. The project used available data to determine the magnitude and cost of school assaults on Chicago Public School teachers.
- Maintain a high level of commitment to the UIC Fire Service Program through leadership in interdisciplinary research, teaching, and service initiatives.
- Offer continuing education (CE) programs of exceptional quality that meet the needs of practicing OHNs in a rapidly changing, complex, and competitive work environment
- In addition to the previously mentioned courses (Refer the CE section of the ERC progress report), the OHN Program sponsored an informatics CE course.
- OHN adjunct and Occupational Medicine ERC faculty offered "After work" seminars for ERC students and faculty.
- Share faculty expertise with the worksite community through active practice and outreach
- OHN faculty provided seven (7) firefighter occupational health issue consultations.
- OHNP faculty provided, "Employee Health and Infection Control" presentation to community infection control practitioners.
- One OHN adjunct faculty provided OSHA with expert testimony related to its voluntary protection program.
- OHN Faculty consulted on a long-term care nursing facility's healthcare safety questionnaire's development and critiqued worksite violence prevention material for the Circuit Court of Cook County Coordinating Council.

- OHN faculty met global OHN goals by meeting with Klaipeda University in Lithuania faculty to discuss graduate education in occupational health nursing and providing graduate OHN preparation consultation to three(3) Ching Mai University's (Thailand) nursing faculty

Occupational Health Nursing Graduate and Faculty Publications

OHN Program graduates and faculty have been prolific and their publications are included in the UIC ERC combined publication list.

NIOSH TRAINING GRANT PROGRAM GRADUATES AND THEIR RESEARCH WORK

Degree	Year	Name	Research Format and Title
MS	1998	Cindee Knopp	Project: Barriers to Safe Work Practices on Farms
MS	1998	Mary McLeod	Project: Employees' Perception of the Worksite Health Climate and its Relationship to Participation in Worksite Health Promotion Programs
MS	1998	Catherine Pflum	Thesis: Examining the Relationship Between Social Role Quality and a Home-Based Walking Program in Middle-Aged Working Women
MS	1999	Yeillie Concepcion	Project: Occupational Stress among Filipino Female Workers
MS	1999	Elyse Falanga	Project: The Experience of Fatigue in a Firefighter: A Case Analysis
MS	2000	Anna Kay Forbes	Project: Firefighter Physical Fitness: Identification of Perceived Facilitators and Barriers
MS	2000	Anne M. Reed	Project: Firefighter Fitness: A Focus Group Analysis of Job Performance and Health Outcomes
MS	2000	Patricia A. Schultz	Project: An Integrative Review of Computer Tailored Exercise and Nutrition Intervention: Worksite and Other Settings
MS	2000	Catherine Solcani	Project: Physical Activity: Subjective and Objective Measures of Adherence
MS	2001	Maria Avecilla	Project: An Integrative Review of Safer Needle Devices and Their Effect in Preventing Needlestick Injuries among Health Care Workers
MS	2001	Geraldine Genovese	Project: Compliance with Personal Protective Equipment: An Integrative review
MS	2001	Judith Levy	Project: Adolescent Worker Injury in the Agricultural Workplace
MS	2003	Betsy Jacob	Project: An Integrative Review: Studies of Prevention or Reduction of Carpal Tunnel Syndrome Symptoms
MS	2003	Dee Sternhagen	Project: Integrated Literature Review on the Efficacy of Ergonomics Training Programs for Office Workers Using Computers

Occupational Medicine

The ERC supports two Occupational Medicine residency programs: One at John H. Stroger, Jr. Hospital of Cook County (formerly Cook County Hospital) and one at the University of Illinois at Chicago. In January 1998, Dr. Rachel Rubin became the residency program director at Cook County Hospital and in September 1998, Dr. Linda Forst became the program director of the UIC residency. Dr. Daniel Hryhorczuk was the interim director from January to September, 1998 after the retirement of Dr. Stephen Hessl, who was the prior program director of both programs. The Cook County Program is a 4-year combined Occupational Medicine/Internal Medicine Program, and the UIC Program is a traditional 2-year OM residency. Although administrative oversight and funding come from two different sources, Drs. Rubin and Forst share resources and faculty , creating a synergy that strengthens and enhances the quality of each program. The two programs were reviewed by the Accreditation Council of Graduate Medical Education in 2001-2 and both have received five years of re-accreditation (through 2007), the maximum that is given.

Cook County Hospital Occupational Medicine Residency Program

The John H. Stroger, Jr. Hospital of Cook County (formally Cook County Hospital) Occupational Medicine Program provides clinical and educational services throughout the Midwest, especially to Northern and Central Illinois, Southern Wisconsin and Northern Indiana. The residency is a four year training program for physicians who are interested in both Internal Medicine and Occupational Medicine. Occasionally the program also takes a resident that has completed an internship either at this institution or elsewhere and wants to do only the occupational medicine portion of the training; s/he thus completes the two year OM residency after the internship (PGY-1 clinical year required for board eligibility). About 1/3 of the residents over the last five years have entered the program with a Master of Public Health degree in Occupational and Environmental Medicine or Epidemiology. These residents do not need to complete a second Masters of Public Health, but instead have additional time in their academic year to pursue occupational health research and clinical work in both occupational medicine and internal medicine. The ACGME Preventive Medicine Residency Review Committee re-accredited the program for another five years in 2002 (through 2007).

The Division of Occupational and Environmental Medicine within the Department of Medicine at Stroger Hospital houses the residency program. The Division maintains an active consultation service and runs two half-day Occupational and Environmental Clinics each week. For close to 20 years, the Division also has maintained a Black Lung clinic program, receiving funds from the National Institute of Health to provide medical services to former miners and help them obtain workers compensation. Over the years these clinical services have evolved to servicing all patients presenting with occupational lung diseases.

Over the last five years the major personnel change has been the recent retirement of Dr. Daniel Hryhorczuk in December 2002. Dr. Hyrhorczuk continues to work with the program as a voluntary physician and continues to work as the Director of our Children's Environmental Health Unit. He no longer is the Section Chair of our Section of Toxicology. Dr. Anne Krantz has assumed the section directorship of the Section of Toxicology. She is a triple qualified physician in Occupational Medicine, Internal Medicine and Toxicology who has been an attending physician and faculty member of the Division and of both residency programs for many years. Dr. Steven Aks has remained as the Toxicology Fellowship Director. Dr. Jack Clifton a pediatrician and toxicologist, a graduate of the toxicology fellowship in 1999, has recently been hired as a full time faculty member in the Division. He provides clinical toxicology services, has major responsibility in teaching the toxicology fellows and interacts, on a

daily basis, with the occupational medicine residents and provides educational experiences for them as well.

Center of Excellence

Stroger Hospital's Division of Occupational Medicine has continued to provide high quality clinical services including expert diagnosis and treatment for patients with a wide variety of occupational and environmental diseases, poisoning and exposures to hazardous substances. The services include not only traditional diagnostic assessments and plans but also determinations of workplace exposures to hazardous substances and conditions, worker education regarding the protection from hazards and detailed reports and testimonies to assist patients in obtaining insurance benefits and workers compensation. Much of the work is done via our consultation service which provides advice via telephone and correspondence, as well as through direct patient care in the outpatient clinics and on the inpatient services at Stroger Hospital and the University of Illinois Hospital.

There is a growing number of environmentally related medical problems addressed in the consultation service. In 1999 the Division of Occupational Medicine, under the direction of Dr. Daniel Hryhroczuk and Ms. Jackie Wuellner, a masters prepared nurse, established a Pediatric Environmental Health Specialty Unit funded by ATSDR and USEPA, and administered by the Association of Occupational and Environmental Clinics. Our Center for Children's Environmental Health is designed to provide expert evaluation and education about environmentally related problems in the pediatric population. This unit has provided opportunities for the resident to evaluate children and families with environmental exposures, and to develop expertise in these problems.

Residency Training

The Division sponsors a fully accredited Combined Occupational Medicine/Internal Medicine Residency Program with funding for seven to eight residents. The Division also has an accredited toxicology fellowship with a current total of two fellows. The four-year program continues to consist of a 1st year internship in Internal Medicine, a 2nd year at UIC School of Public Health--completing all course work related to the MPH degree, a 3rd year consisting of clinical rotations in Internal Medicine and a 4th year of practicum experiences in Occupational Medicine. During the second, third and fourth years the residents do a minimum of one-half day per week in one of the Occupational Medicine clinics regardless of their internal medicine duties. The practicum year includes two months of concentrating on completing an epidemiology research project, two months on the Occupational Medicine consultation service, a month with the University of Illinois University Employee Health Service, and seven to eight months of industrial rotations and electives.

From July 1998 thru July 2002 the Cook County/Stroger Hospital program has graduated ten trainees. Nine of the ten trainees are minority physicians and three have been women. Currently the program has six trainees, all of which are minority physicians, two being women. Of the recent graduates over the last 5 years, one has entered a private group practice in Occupational Medicine, three have entered private corporate practice in occupational medicine, one is practicing in New Zealand, one is completing a fellowship in Nuclear Medicine and one is working with a hospital-based employee health service.

Toxikon

The Section of Clinical Toxicology within the Division of Occupational medicine continues to house the Toxikon Consortium. Toxikon is a consortium of the clinical toxicology services at Stroger Hospital, Rush-Presbyterian St.-Lukes Medical Center, the University of Illinois at Chicago and the Illinois Poison Center. The Toxikon program has a medical toxicology fellowship and trains 2 to 3 fellows per year. Two

years ago the Toxicology Fellowship obtained accreditation by the ACGME. This fellowship is one of two or three accredited toxicology fellowships in the United States. Toxikon faculty, staff and fellows provide the medical backup to the Poison Center for the northern Illinois region. In addition, the program trains rotating residents from Emergency Medicine, Pediatrics and as well as our own Occupational Medicine Residents.

The presence of a clinical toxicology training, research and service program within the Division of Occupational Medicine has greatly enhanced the training experiences in Occupational Toxicology for all the ERC trainees. The occupational residency program continues to hold a monthly joint occupational medicine/toxicology conference with the Toxikon service. The Stroger Hospital Occupational Medicine residents spend a month rotating on the toxicology service as an elective month. The toxicology fellows participate in our monthly site visits coordinated by our industrial hygienist.

Center for Childrens Environmental Health

The ATSDR and EPA started to fund pediatric environmental health specialty units throughout the United States in 1998. The Division of Occupational Medicine began receiving grant monies from these agencies to set up such a unit in 1999. Since then we have run a strong clinical research and educational unit addressing the environmental health exposures to children. Children and families with environmental exposures are evaluated in our clinic and occupational medicine trainees evaluate these individuals under faculty supervision. The establishment of this unit has greatly enhanced the environmental health component of the occupational medicine residents training over the last several years.

Industrial Hygiene

The Division of Occupational Medicine employs an industrial hygienist, Ms. Lucile Buckley. Over the last two years Ms. Buckley has received additional funding through the NIOSH ERC grant to expand her services and expertise to the training of the residents. She gives monthly process talks to the residents and arranges one to two site visits per month to local industries and workplaces. She coordinates with the local OSHA office as well as other agencies so that residents may participate in emergency site visits to investigate serious violations, as well as to arrange site visits to work places that can provide models of good health and safety programs. The exposure to actual work places and the understanding of health and safety issues of workers has been enhanced tremendously over the last five years due to Ms. Buckley's activities.

Trauma Initiative

The Division and residency program continue to work closely with the Department of Trauma and its Burn Unit at Stroger Hospital. Occupational Medicine residents provide consultation services for all patients with work related injuries and burns. Workers' compensation rights and benefits and health and safety issues are discussed with all patients prior to discharge from the hospital and are provided with outpatient follow-up to address return-to-work issues and other concerns.

Over the last year, two Occupational Medicine residents have worked on research projects related to occupational cases treated in the Trauma and Burn Units. One project was the review of all work related injuries admitted to the Trauma Unit that were evaluated by the occupational medicine consult service over the prior year. Demographics and types of injuries were evaluated. The second project is currently underway, administering a standardized questionnaire to victims of work related trauma, with the objective of better characterizing the demographic and risk factors for injuries that we are seeing. There are plans to further this work in order to improve the services and care we give to our patients, and for the development of preventive strategies in the future.

Labor Initiatives

The Division continues to provide consultations to labor unions and union federations locally, nationally and internationally. The unions served include AFSCME, SEIU, International Association of Fire Fighters, United Steel Workers, UAW, International Brotherhood of Teamsters, the AFL-CIO and the World Federation of Trade Unions, amongst others.

All faculty and many residents have conducted and participated in numerous educational programs for unions concerning workers safety and health.

Community Service

The program continues to provide outreach to a variety of community groups and neighborhood areas. The Cook County of Bureau Health Services now has a well established Ambulatory Care Network. Faculty and resident have provided educational programs to several of these community based clinics and an attending physician of the Division continues to see patients at the Woodlawn Health Center.

Faculty have also responded and worked with local government agencies including the state EPA office as well the regional office of the Agency for Toxic Substances and Disease Registry. In particular, faculty have been involved in evaluations of toxic exposures in various communities in Indiana and provided educational forums to health care providers in these areas. In addition, through our work with the Association of Occupational and Environmental Clinics the program has provided expertise in rural Louisiana and other areas of the country.

Research

Resident research over this five year period has included projects related to house staff attitudes around treating HIV patients, sick building syndrome, environmental health concerns in urban minority populations, lead exposure in jewelry makers, occupational asthma, asthma in swimmers, and upper extremity muscular skeletal disorders.

University of Illinois at Chicago Occupational Medicine Residency Program

The UIC Occupational Medicine Program provides clinical and educational services throughout the Midwest, especially to Northern and Central Illinois, Southern Wisconsin and Northern Indiana. The residency is a two year training program for physicians who have completed at least one year of training in the U.S. Many of the residents have completed full residencies in other fields prior to coming to UIC.

The administrative offices of the residency are housed in the same area as the UIC University Health Services and takes advantage of the training opportunities and resources provided by "employee health." Dr. Forst, the program director, is a fulltime associate professor at the UIC School of Public Health and has the resources and support of the School to run the residency program. The School of Public Health has been the institutional sponsor of the residency since 1996. The program has continued to thrive under Dr. Forst's leadership with a 100% pass rate of recent graduates taking the Preventive Medicine qualifying exam. The ACGME Preventive Medicine Residency Review Committee re-accredited the program for another five years in 2002 (until 2007).

There have been some additions to the faculty over the last five years. Dr. Samuel Dorevitch, a 2001 graduate of the program is a research assistant professor at the UIC School of Public Health. He

coordinates the Wednesday morning educational conferences for the OM residents, run jointly by the Cook County and UIC programs. He also is a mentor for resident research and a superb teacher. Dr. Michelle Watters, a 2002 graduate recently took a position with the regional office of the ATSDR and she is adjunct faculty at the UIC SPH. She also has helped coordinate educational conferences and has been an advisor to the residents. Dr. Jill Rosenthal, a 2002 graduate is a part-time physician working for the University of Illinois Occupational Medicine Health Services Institute as the medical director for the local energy provider in Northern Illinois where she mentors residents doing practicum rotations, and she also advises the residents with scheduling during their academic year at the SPH. She also coordinates the Wednesday AM conferences with Dr. Dorevitch.

Ms. Lucille Buckley the industrial hygienist in the Division of Occupational and Environmental Medicine at Stroger Hospital has received partial support through the ERC grant since 2002. She has greatly improved the hands-on industrial hygiene experiences for the residents and other trainees. She coordinates one to two sites visits per month to workplaces, and gives a process talk each month related to the site visits. The exposure to actual workplaces and the understanding of health and safety issues of workers has been enhanced tremendously over the last five years, due to her activities.

Residency Training

The two year program continues to consist of an academic year leading to the completion of an MPH at the UIC SPH and a practicum year consisting of two to three months on the Occupational Medicine Consultation Service, a month of Clinical Toxicology at Stroger Hospital, a month rotation in University Health Services, seven months of industrial rotations and electives and two months devoted to working on the resident epidemiology research projects. During this period, the residents evaluate and treat patients in the Occupational Medicine Clinics at UIC and Stroger Hospital, one to three half-days per week. The residents also spend one-day per week at the UIC University Health Service during their first year of the program. They also participate in taking telephone consultations on occupational and environmental health issues from the community.

From July 1998-August 2003, 13 trainees-- 6 women and 7 men, 5 minorities--graduated from the program. These trainees have gone on to work in corporate settings (General Motors – 2, International Truck – 1, Midwest Generation -1), the military (2), public sector (US Postal Service and Chicago Fire Department – 1), Federal agencies (ATSDR -1), academia (1). One trainee is completing a third year as a fellow in Occupational Health Services Research (see description below). Those graduates remaining in the Chicago area continue to teach and serve as mentors for current residents at their work sites.

University of Illinois School of Public Health

Faculty participates in curriculum development, recruitment and research in the Division of Environmental and Occupational Health Sciences at the School of Public Health. For the last four years, Dr. Forst has taught the required occupational diseases course as well as the introductory course in environmental and occupational health. Residents interact with other ERC trainees in the SPH in their classes as well as in the interdisciplinary activities of the ERC: the Wednesday noon conference, industrial site visits, occupational medicine clinic and SPH sponsored activities.

Occupational Health Services Institute

The Great Lakes Centers for Occupational and Environmental Safety and Health which houses our ERC also includes the Occupational Health Services Institute (OHSI). The OHSI under the direction of Dr. Peter Orris was formalized in 1998 and is the umbrella for the Great Lakes Center's and the ERC's physician service activities. The OHSI allows faculty and trainees to provide needed expertise to workers,

companies, communities, and the University. The Institute's occupational medicine physicians run the University Employee Health Service, operate the Occupational and Environmental Medicine clinics, and serve as medical advisors for major corporations in the region. A Health Hazard Evaluation Program, established in partnership with the Illinois Department of Public Health, addresses challenging occupational and environmental health problems in Illinois. All residents and other ERC trainees participate in the activities of the Institute and it has greatly enhanced the learning and training experiences over the last five years.

Community Service

The Program has and continues to provide outreach to a variety of community groups. Some of these groups include migrant farm workers, farm owners, "healthy schools" activists, and union members. Formal educational sessions have been given by faculty and residents on topics including, eye injury prevention, cumulative trauma disorders, persistent organic pollutants, workers compensation, and others. One resident in the program testified in the OSHA ergonomics hearings. In addition to evaluating and treating individuals with environmentally and occupationally caused illnesses and injuries, the UIC Occupational Medicine Clinic is one of the sites designated to evaluate health problems in workers involved in the rescue and recovery operations at the World Trade Center disaster of September 11, 2001. Dr. Jill Rosenthal, a former resident, led this activity, and trained other residents in the protocol.

Research

Resident research over this five year period has included projects related to hazards in construction, urine biomarkers for methyl parathion, water jet blasting, accelerated silicosis, occupational asthma , a cancer cluster in a firehouse, health hazards of welders, occupational injuries in a level one trauma center, hazards to dancers, exhaled air condensate as a marker for exposure to heavy metals, hyperbaric injuries and occupational injuries to nurses. Faculty has intensified efforts to choose and mentor research projects, resulting in many contributions to the scientific literature and textbooks.

Occupational Health Services Research Fellowship

The UIC OM Program has been able to leverage funding from the Veterans Administration to support a fellowship position in Occupational Health Services Research. The Graduate Medical Education Committee at UIC has approved this fellowship. A resident trainee stayed on in this position after completing her residency (August 2003), and is being mentored by faculty at the local VA hospital, Dr. Forst, and Dr. Jack Zwanziger, the new head of Health Policy and Administration in the UIC School of Public Health.

Industrial Hygiene/ Hazardous Substances Academic

The Illinois ERC is administratively housed within the Environmental and Occupational Health Sciences Division (EOHS) and is one of the Centers within the Great Lakes Centers (GLC) at the University of Illinois at Chicago School of Public Health. EOHS consists of 14 faculty and approximately 46 graduate students, 25 in the IH program. Industrial hygiene training is carried out within this Division, and has been in existence since 1972. In 2003-2004, approximately 25 students were in the IH program in all degree categories (MS, MPH, DrPH, PhD). Since 1976 (when NIOSH funding began) there have been 256 IH graduates in all degree programs (187 since Fall, 1987), 107 of whom received full or partial NIOSH traineeship support. Over ninety-five percent of these graduates are actively working in the IH field. Eighty-seven graduates or students in the program are CIH's, and an additional 14 are in the IHIT category. The IH M.S./MPH program has been ABET accredited since 1993 and has been re-accredited to September 30, 2008. In addition the U. of Illinois IH M.S. curriculum and training program was designated by the U.S. Dept. of Energy as a participant in DOE's Industrial Hygiene Fellowship Program (which unfortunately went out of existence in 2000).

Major changes and accomplishments during the period July 1, 1998 through June 30, 2003

- We received ABET re-accreditation for 6 years with a nearly perfect score.

- Dr. Rosemary Sokas has joined EOHS as Professor and Division Director after leaving her previous position at NIOSH.

- Dr Nurtan Esmen joined the faculty this fall as a Professor of Industrial Hygiene. Dr Esmen will take a leadership position in the development of multidisciplinary research efforts for EOHS and the campus-wide Institute for Environmental Science and Policy.

- We continue to refine our training and student recruitment to pursue the three major goals of:
    1. To structure our courses and recruitment to meet the requirements of ABET accreditation;
    2. To incorporate as much hands-on field experience as possible into our student training; details of field training and experience are contained in Table 2 below;
    3. To develop an industrial hygiene track specializing in hazardous waste control.

- We carried out a variety of major field tests or field evaluations which included measurement of PAH's in ten homes; ventilation surveys and exposure assessments for formaldehyde, ethanol and xylene in histology labs of two hospitals; exposure assessments for lead, antimony, and barium, and ventilation surveys of local ventilation in the firing test chambers and general ventilation in a firing range; 4 days of monitoring and observation at an agricultural facility in rural Illinois to characterize dust exposure during processing of freeze-dried fruits and vegetables (in September 2001); analysis of samples and field consultation for the HUD Healthy Homes initiative; air sampling at a wood shop to field test thoracic particle samplers; and field sampling for components of diesel exhaust at a fire station; and 4 days of personal and biological monitoring of exposures for a group of welders.

- Our graduates continue to be able to get jobs in the field. For example, 3 graduates for calendar year 2003 immediately obtained jobs with the USEPA.

- We are able to continuously support 15 to 16 MS and PhD students in the IH/HSAT programs with stipend and Research Assistantship support.

- Our minority recruiting has had improved success with 2 Latinas and 4 students with African-American heritages among the recent trainees in the program.

- Since its inception, 16 students have graduated from the Hazardous Substances Academic Training component of the industrial hygiene program. In addition to completing the ABET accredited IH curriculum, these students receive additional specialized training in hazardous substances.

- Our soft money funding has greatly increased in the past several years: to $595,000/year in 2000-2001, and $694,000/year for 2001-2002.

- Many of our research efforts and some of our training activities also include a Service aspect. We have carried out such activities with Motorola, Briggs & Stratton, Brach Candy, Bucyrus-Erie, Midway Industrial Coating, Quad/Graphics, Abbott Laboratories, 44 homes in the Moline, IL area, the City of Lake Forest, 10 homes in Southeast Chicago, U.S. EPA, Illinois EPA, Illinois Dept. of Labor, five hospitals (West Side VA, Cook County, Oak Forest, Bethany, U. of Illinois), schools in Springfield, IL, and the Chicago area, U. of Illinois Environmental Health & Safety Office, UnoVen, LTV Steel, the Chicago Tribune, Chicago & Northwestern Railroad, the Cook County Bureau of Health Services, the Chicagoland Construction Safety Council, the Illinois Department of Public Health (for which the SPH is the primary research contractor), Evanston Northwestern and Highland Park Hospitals; the Illinois State Police Ballistics Laboratory, and GM Electromotive Division.

- Computers: All students and faculty have computer accounts on, and remote access to, the mainframe. Hazardous Materials Management, Industrial Ventilation, Air Quality Laboratory, Industrial Hygiene Fundamentals, Air Quality Management I and II and laboratory reports for other courses all require use of PC's and/or the mainframe and/or the Internet; and we have used the School of Public Health LAN for direct instruction in many of these courses. Our students have access to software for word processing, spread sheet calculations, statistical evaluation, CAD, CAMEO, and graphics.

Program Leadership and Core Faculty

- Dr. Peter Scheff, CIH, is the new Director of the Industrial Hygiene Program. He is Professor of Environmental and Occupational Health Sciences (EOHS) within the School of Public Health. Dr. Scheff has been on the faculty since 1989. He is Director of the Region V Center of the EPA's Air Pollution Training Institute, one of five regional training centers nationwide. He commits 50% of his time to the IH/HSAT Program in teaching, research advising, service and outreach.
- Dr. Lorraine Conroy, CIH, Associate Professor in EOHS and Director of the ERC, commits 70% (60% IH, 10% HSAT) of her time to the program in teaching, research advising, and outreach activities.
- Dr. John Franke, CIH, PE, is Industrial Hygiene Manager of Evanston Hospital, and also has an appointment as a Research Assistant Professor. He oversees our IH field research activities, teaches two required courses, and commits 30% of his time to our training and research activities.
- Dr. An Li, Associate Professor, is a specialist in environmental chemistry and teaches one required course and serves as research advisor for IH students.
- Salvatore Cali, MPH, CIH, is a Senior Research Specialist and is the Deputy Director of the IH, HSAT, and PPRT programs. He has both field and research experience and is a practicing industrial hygienist. Mr. Cali teaches one required course and supervises field research experiences. He commits 40% of his time to the IH/HSAT programs.

- Two new faculty members joined EOHS in fall, 2000, both of whom making significant contributions to both our industrial hygiene and hazardous waste training programs, particularly in the research areas. Dr. Dan Tessier is a toxicologist with 10 years of academic and practitioner experience. He has specialized in the fate, monitoring, and health effects of pesticides, and served for seven years as Manager of the Pesticide Laboratory for the State of Massachusetts. Dr. Serap Erdal has expertise in human exposure and health risk assessment. Among the activities in her background, she has performed multimedia exposure and risk analyses for complex hazardous waste sites in Guam and Arctic Alaska. Both are Assistant Professors, have active research programs and are research advisors for IH trainees.
- Starting in the fall of 2003, we were able to recruit Dr Nurtan Esmen, CIH, as a Professor of Industrial Hygiene. Dr Esmen brings a very strong research program to the division and will provide many opportunities for IH field research. Dr Esmen is a joint hire between EOHS and the Institute for Environmental Science and Policy at UIC.

Drs. Scheff, Conroy, Li, Tessier, Erdal and Esmen are supported by State salaries for the academic year. Dr. Franke and Mr. Cali are supported from soft money. All decisions on curriculum, student support, and trainee recruitment and selection are determined by a committee consisting of Drs. Scheff, Conroy, Esmen and Franke.

Accomplishments in Education

The two major goals of the academic training program are: (1) to develop industrial hygiene practitioners with as much practical experience as possible within the limits of an academic program; and (2) to provide a cadre of trainees, who have aptitude for research, with research training in occupational and environmental health. The research-trained group has the capability of entering into research-type activities in industry, as consultants, or in academe. The thrust of the IH training is to give students both an overall appreciation of the whole process of disease detection and risk evaluation leading to hazard control, and a competence in using the methods specific to the IH field. The overall emphasis of the training program is to give our students quantitative skills to aid them in solving occupational problems. The IH program has managed to hold a relatively steady enrollment despite dropping enrollments nationally. We continue to obtain outside funding and to increase our faculty depth and specialties. Table 1 below illustrates the enrollment figures for the past five years.

Table 1: EOHS enrollment

	1998-1999			1999-2000			2000-2001		
	MS	PhD	MPH	MS	PhD	MPH	MS	PhD	MPH
Full time	10	5	4	9	5	5	11	5	1
Part time	0	3	4		4	5		4	4
Total Enrolled	26			28			25		
Full time	19			19			17		
Part time	7			9			8		
Total Graduated (Fall-Su.)	6			7			9		

	2001-2002			2002-2003			2003-2004		
	MS	PhD	MPH	MS	PhD	MPH	MS	PhD	MPH
Full time	13	3	1	15	7	11	10	5	20
Part time		4	6		2	7		5	8
Total Enrolled	27			42			48		
Full time	17			33			35		
Part time	10			9			13		
Total Graduated (Fall-Su.)	7			17					

We have greatly increased the use of computers in our courses and have improved student and faculty access. All students and faculty have accounts on the campus academic data network which provides computing and library support. Most of our classes now require computers for homework and laboratory exercises. Table 5 summarizes employment positions of recent IH graduates.

Accomplishments in Field Projects

We continue to try to provide our students with as much field experience as possible. All Industrial Hygiene trainees are required to take three formal courses in workplace evaluation, EOHS 428, EOHS 438 and EOHS 529. EOHS 428 and 438 give hands-on experience in air and noise sampling and calibration techniques. These courses precede our field laboratory course, EOHS 529, where, under faculty guidance (until 2002, Dr. Conroy; now Mr. Selway), students perform walk-through hazard evaluation for actual workplaces, develop and implement sampling for air pollutants and noise, evaluate the analytical results, and write up formal reports for presentation to the workplace managers. These projects have been carried out at such installations as steel plants, railroad repair shops, and petroleum refineries; and on the UIC campus in cooperation with the UIC Office of Environmental Health and Safety which provides access to the workplace in exchange for our evaluation. This Office uses the test reports to improve environmental conditions. They have cited us in writing for the high quality of the evaluations and reports. This Office has also made a research assistantship available to our program which not only helps to support an IH student, but also provides "real life" professional experience. We have instituted a series of industrial plant tests in which one or several processes are intensively evaluated to determine emission rates for intermittently operated industrial processes; and the effect of worker and process activity on these rates (emission factors). Our indoor air measurement projects in hospitals, schools, and homes also provide field experience. Many of these field tests develop into student research projects. In addition, training in laboratory safety has become an integral part of the Industrial Hygiene field lab (EOHS 529). Students in this course, ordinarily taken in the Summer at the end of the first year, receive train-the-trainer instruction and develop materials and lesson plans for a laboratory safety short course. The course is then delivered by the students in the Fall of their second year to incoming IH students as one of the units of the first industrial hygiene laboratory course (EOHS 428). Interdisciplinary projects through the Health Hazard Evaluation program and the MPH practicum (which requires a minimum of 200 contact hours, but usually is much more) also provide opportunities for field experience.

Table 2: Industrial Hygiene Field Projects 1992-2003

Plant and facility tests in Wisconsin -

- large web-fed, offset, heatset print shop (Wadden, Scheff, Franke, Conroy, 5 students);
- large rotogravure print shop (Wadden, Scheff, Franke, Conroy, 8 students);
- large industrial welding facility (Wadden, Franke, Conroy, Scheff, 8 students);
- IH walk-through at a vehicle engine plant (Conroy, Wadden, Franke, 7 students).

Plant and facility tests in Illinois -

- electronics manufacturing complex (Wadden, Franke, Conroy, 5 students);
- railroad yards (Conroy, 8 students);
- Michigan Avenue bridge renovation (Conroy, 6 students);
- university photography lab (Conroy, 8 students);
- police firing range (Nelson, 2 students);
- indoor air quality and ventilation in a bank (Conroy, 2 students), in a hospital (Conroy, 2 students), and in a jail (Conroy, 1 student);
- bridge paint removal by abrasive blasting; bridge paint removal by power tooling (Conroy, 2 students);
- respiratory fit testing and training for hospital employees (Conroy, Keil, Nickels, 11 students);

- evaluation of safety procedures during and after pesticide applications at a flower nursery;
- ventilation survey of the TB clinic and sputum induction booth at a county jail (Conroy, 4 students);
- air pollution effects on siting of a new grade school, Public Building Commission, City of Chicago (Scheff);
- bioaerosol measurement in 44 Moline-area homes (Scheff, Wadden, Curtis, 2 students);
- bioaerosols from municipal composting facility (Scheff, Curtis, 3 students);
- industrial hygiene surveys of public buildings and facilities (Nelson, 1 student);
- indoor air quality in 10 Southeast Chicago homes (Scheff, 1 student);
- TB isolation performance in 5 Chicago hospitals, air contaminant dispersion in waiting rooms (Conroy, Franke, 6 students);
- organic chemistry lab ventilation evaluation;
- indoor air quality survey, anesthesiology (Conroy, 8 students);
- indoor air quality in a Springfield school (Scheff, Conroy, 4 students);
- *Aspergillus* monitoring in a hospital (Conroy, Scheff, Cali, Curtis, 4 students);
- IH walk-through at a pharmaceutical powders facility;
- IH survey of a foundry (Conroy, Franke, 8 students);
- particulate and bioaerosol exposure assessment in a Chicago high school (Scheff, 4 students);
- IH survey (dust, organic solvents, noise) in a carpentry shop (Conroy, 4 students);
- measurement of dust, SO_2, NO_x, CO, noise in a co-generation plant (Conroy, 3 students);
- IH walk-through at an industrial foundry (Conroy, 7 students);
- evaluation of indoor air quality and ventilation problems, University office building (Conroy, 3 students);
- monitoring of critical care patient areas for *Aspergillus* for a year, University of Illinois hospital (Scheff, 6 students);
- remote sensing of organics at a faulty landfill (Wadden, Scheff, 2 students);
- measurement of PAH's in ten homes (Li, 2 students);
- formaldehyde and xylene monitoring in histology & pathology laboratories (Conroy, 3 students);
- exposure assessments for formaldehyde, xylene, and ethanol and ventilation surveys for the histology department at two hospitals in the Chicago area (Conroy, Franke, 8 students);
- exposure assessments for lead, antimony, and barium, and ventilation surveys of local ventilation in the firing test chambers and general ventilation in the firing range in the Illinois State Police Ballistics Laboratory (Conroy, 8 students);
- 4 days of monitoring and observation at an agricultural facility in rural Illinois to characterize dust exposure during processing of freeze-dried fruits and vegetables (Conroy, Franke, Wadden, Erdal, 10 students);
- evaluation of noise and organic chemical exposure at a large printing plant (Selway, 6 students).
- field comparison of thoracic size-selective exposure assessment techniques (Conroy, Erdal, Franke and 2 students: Brown-Ellington and Matwyshyn)
- particulate, elemental carbon, and formaldehyde air sampling at fire department engine bays (September, 2003) (Cali and 1 student, Pralhad Gawde)
- personal and biological exposure of welders (Conroy, Franke, Erdal, Tessier, Forst and 8 students)

Plant and facility tests in Indiana -

- noise survey of a temper mill;
- noise survey and air pollution exposures to total particulate matter and air-borne metal concentrations in locomotive scrap cutting department;
- noise survey and measurements of exposure to metals, particulate matter, H_2S and SO_2 in tandem mill blast furnace (Conroy, Keil, 11 students);
- air pollution at a blast furnace and a continuous annealing line; noise determinations at a pickler and a recoiling area (Conroy, 8 students);
- dust, particulate metal, and noise levels at a sinter plant;
- IH walk-through at a coke battery (Conroy, 8 students).

Accomplishments in Research

Our research plan is based on providing research experience for both M.S. and Ph.D. candidates. (Although NIOSH Research Training program funding is restricted to Ph.D. activities, the M.S. and Ph.D. experiences are linked as our best M.S. researchers frequently go on for the Ph.D.). M.S. and Ph.D. research projects are ordinarily carried out in a defined area within a larger project (which is usually supported); or a research area into which a faculty member wants to expand and a project which can realistically be implemented with the resources available. This approach allows our M.S. students to finish in 2 years, and is based on our experience that Master's projects become greatly extended without this planning. While Ph.D. IH students are eligible for 2 years of traineeship support, this does not cover all their time in the program. Non-NIOSH support is about 4 times the NIOSH contribution.

In order to encourage student presentation of research results we try to find funds from our grants to support student travel expenses to professional meetings. So far we have been able to fully fund travel for all students who have had posters or papers accepted for presentation.

Our soft money funding has greatly increased in the past several years: to $595,000/year in 2000-2001, and $694,000/year for 2001-2002. Table 3 summarizes recent projects which underlie our student support. Table 4 gives MS and PhD theses projects during the reporting period. We also encourage publication of results. Publications and presentations of IH faculty and students are included in the report's appendix. Finally, Table 5 shows typical employment positions of recent IH/HSAT graduates.

Table 3. Funded Research and Training Projects Active During the Period 1998-2003			
Project Title	Prin.Investigator(s)/Co-Investigators	Funding	Funding Agency
Industrial Hygiene Traineeship Program	R. A. Wadden/P. Scheff, L. Conroy	$619,233 (1999-2003)	NIOSH
Hazardous Substances Academic Training	R. A. Wadden/L. Conroy, P. Scheff	$237,536 (1999-2003)	NIOSH
Graduate Training in Air Pollution	P. A. Scheff	$335,297 (1997-2003)	U.S. EPA
Intergovernmental Personnel Act Mobility Program	P. A. Scheff	$172,701 (1997-2003)	U.S. EPA
Source Apportionment of PAH's in Chicago Residences	An Li	$17,987 (2002-2003)	NIOSH (U. Ill. Small Grants)
Mechanisms of Lung Epithelial Cytotoxicity due to Metal Exposure	Dan Tessier	$17, 472 (2002-2003)	NIOSH (U. Ill. Small Grants)
Effect of Welding Process Parameters on Fume Comp. and Emission Rate	Serap Erdal	$16,000 (2002-2003)	NIOSH (U. Ill. Small Grants)
Graduate Assistant for Health & Safety Surveys	L. M. Conroy	$25,418 (1999-2002)	Env.Hlth.&Sfty. Off. (UIC)
Occupational Lung Disease in Ukrainian Coal Miners	R. Cohen/L.M. Conroy	$32,000 (2001-2002)	NIOSH (U. Ill. Small Grants)
Excellence in Environmental Health	D. Hryhorczuk/L. Nickels, P. Scheff, S. Cali, B. Turnock, S. Erdal	$249,745 (2001-2004)	CDC
Dust Exposure in Ukrainian Coal Miners	K. Kennedy/L.M. Conroy	$6,000 (2001)	NIOSH (ERC student grants program)
Expos. Assess. Method to Simulate Coughing in a Workplace	J. E. Franke	$13,550 (2000-2001)	NIOSH (U. Ill. Small Grants)
Health Effects of Mold and Moisture in Public Buildings	P. A. Scheff/Sal Cali, An Li	$161,095 (2000-2003)	Ill. Dept. of Public Health
Chronology of PBDE Air Dep. in Great Lakes from Sediment Records	An Li	$160,000 (2001-2003)	US Environmental Protection Agency
Cytotoxicity of Welding Fumes in Occupational Asthma.	Dan Tessier	$49,686 (2001- 2003)	American Lung Association
Intergovernmental Personnel Act Mobility Program	Serap Erdal	$35,348(2001- 2003)	U. S. EPA
Enhancing the Detection of PAH Metabolites	An Li	$15,984 (2001-2002)	NIOSH (U. Ill. Small Grants)
Endocrine Disrupting Pesticides in Hormonal Carcinogenesis	Dan Tessier	$15,000 (2001-2002)	UIC Campus Research Board
Air Pollution Exposure Assessment for Chicago Children	Serap Erdal	$15,000 (2001-2002)	UIC Campus Research Board
Invest. of Sampler Perf0rmance of Thoracic Size-Select. Personal Exposure Monitors	Serap Erdal	$16,000 (2001-2002)	NIOSH (U. Ill. Small Grants)
Pilot Study of Effective Environmental Modification in Chicago Public Schools	Victoria Persky, J. E. Franke	$25,000 (2001-2002)	Chicago Community Trust
Accumulation of PAHs on Soils and Vegetation Near Highways	An Li	$14,981 (2000 - 2001)	UIC Campus Research Board
Reducing Eye Injuries in Agricultural Workers	L. Forst/S. Scrimshaw, L. Nickels, R. Petea, D. Hryhorczuk	$209,841 (1999-2001)	CDC
Air Monitoring Study in Winton Hills/Place, Ohio	P. A. Scheff	$15,000 (1999-2001)	Hamilton County, OH, Dept. of Environmental Services

Table 3. Funded Research and Training Projects Active During the Period 1998-2003			
Project Title	Prin.Investigator(s)/Co-Investigators	Funding	Funding Agency
Advanced Monitoring for Fenceline Toxic Emissions	P. A. Scheff	$47,952 (1999-2001)	U.S. EPA
Source Apportionment of Indoor PAH's in Urban Homes	An Li/R. Wadden, P. Scheff	$110,064 (1999-2001)	Mickey Leland National Urban Air Toxics Research Center
Aspergillus Surveillance in the U. of Illinois Hospital	P. A. Scheff/L. M. Conroy	$50,398 (1998-1999)	U. of Illinois Hospital
Modeling of Airflow and Contaminant Distribution	L. M. Conroy	$35,000 (1998-1999)	NIH, Fogarty Center

Table 4. Recent MS/PhD Thesis Topics for Graduates from IH and HSAT Programs					
Last Name	First Name	Degree	Year of Graduation	NIOSH Trainee	Thesis Title
Berman	Laurel	M.S. (ABET)	2003	y	Analysis of Fish Uptake and Bioaccumulation of Polychlorinated Biphenyls from Western Lake Erie Sediments
Carollo	Amy	M.S. (ABET)	2003	y	Evaluation of the Public Health Protectiveness of the Risk-Based Remediation Standards for Midwestern Hazardous Waste Sites
Kennedy	Kathleen	M.S. (ABET)	2002	y	Occupational Dust Exposure in Ukrainian Coal Miners
Lacey	Steve	Ph.D.	2002	y	Dust Exposure Modeling at a Food Processing Facility
Schoonover	Todd	M.S. (ABET)	2002	y	Polycyclic Aromatic Hydrocarbons in Residential Air of Ten Chicago Area Homes Capstone: PAH Levels and Sources in Ten Chicago Area Urban Homes
Mills	William	Ph.D.	2001		Polychlorinated Biphenyls, Dioxins and Furans in Ambient Air During the Smithville PCB Incineration Project
Ou	Chia-Hao	M.S. (ABET)	2001		The Assessment of Aspergillus and Other Bio-aerosol Concentrations in a Public Hospital
Zierold	Kristina	Ph.D.	2001	y	Prediction of Worker Exposure in a Flux Core Arc Welding Facility
Jang	Jae-Kil	Ph.D.	2000		Temporal and Spatial Distribution and Source Identification of Organic Pollutants in the Lake Calumet Area
Casten	Cara	M.S. (ABET)	2000	y	Evaluation of Toxic Air Pollution in Hamilton County, Ohio
Cesarotti	Dennis	Ph.D.	2000		Comprehensive Assessment of the Recycling Potentials for the Waste Streams of Small Quantity Generators
Lardizabal	Lorraine	M.S. (ABET)	2000	y	Field Test of an Ultraviolet Differential Optical Absorption Spectrometer for Remote Air Toxics Sensing
Norlock	Felice	M.S. (ABET)	2000	y	Method Development for Collections and Analysis of Polycyclic Aromatic Hydrocarbons in Residential Air
Baker	Kirk	M.S. (ABET)	1999	y	Chemical Mass Balance Evaluation of 1995 Ambient Hydrocarbon Conc. in the Lake

Table 4. Recent MS/PhD Thesis Topics for Graduates from IH and HSAT Programs					
Last Name	First Name	Degree	Year of Graduation	NIOSH Trainee	Thesis Title
					Michigan Region
Krupinski	Dale	M.S. (ABET)	1999	y	Receptor Modeling Study of Southeast Chicago Aerosol
Poshyvanyk	Motria	M.S.	1999		Air Pollution Source Apportionment in Mariupal, Ukraine
Thielen	Belinda	M.S. (ABET)	1999	y	Characterization of Exposure and Emissions in a Flux Core Arc Welding Operation
Wu	Tung-Yi	Ph.D.	1999		Characteristics and Treatment of Mercury in Dental Wastewater
Chang	Jingxiang	M.S. (ABET)	1998		Construction Fatalities in the United States, 1984-1996
Cheung	Kent	M.S. (ABET)	1998	y	Cosolvent Enhanced Electrokinetic Remediation on Soil Contaminated with Polycyclic Aromatic Hydrocarbon
Halle-Stern	Michelle	M.S. (ABET)	1998	y	Assessing Contaminant Distribution in a Hospital Waiting Room via Field-Testing and Computer Modeling
Hua	Chih-Wei	PhD (MS in 1994)	1998		The Relationship between Environmental Exposure and Hospital Admission in Cook County, Illinois.
Lee	Shu-Chen	M.S. (ABET)	1998		Ventilation Survey in Two Hospitals
Paulius	Vidas	M.S. (ABET)	1998	y	Evaluation of Indoor Air Quality in a Middle School
Picciano	Christina	M.S. (ABET)	1998	y	Evaluating Efficacy of Tenant-to-Tenant Awareness Training in Reducing Childhood Lead Poisoning
Wattanawiroon	Suwimol	M.S. (ABET)	1998		Use of Dynamometer Based Vehicle Emission Categories in Receptor Modeling of Ambient Hydrocarbons
Bing-Canar	John	Ph.D.	1997		The Relationship of Nitrate Contamination to Aquifer Sensitivity, Land Use/Land Cover, and Watersheds
Huang	Sandra	M.S. (ABET)	1997	y	Evaluation of a Ventilation System Serving Tuberculosis Isolation Rooms at a Public Teaching Hospital
Iyiegbuniwe	Emmanuel	PhD (MS in 1994)	1997		Site-Specific Emission Factors for Sixteen Degreasers.
Lewis	Cynthia	M.S. (ABET)	1997	y	Bioaerosol Survey of a Yard Waste Compost Facility
Ross	Mary	PhD.	1997	y	Effect of Ambient Air Pollution and Aeroallergen Exposure on the Respiratory Health of Asthmatics
Yu	Hang	M.S. (ABET)	1997		Receptor Model Evaluation of Ozone Precursor Emissions During 1994 for Chicago
Chung	Joe	Ph.D (MS in 1993)	1996	y	Evaluation of the Effectiveness of NOx control in O3 Reduction Strategies in Two Nonattainment Regions.
Kenski	Donna	Ph.D (MS in 1991)	1996	y	Receptor Modeling for Ozone Prediction: Evaluation of the Lake Michigan Ozone Study Data.
Rizzo	Michael	M.S. (ABET)	1996	y	Modeling of Indoor/Outdoor Fungi Relationships in Forty Four Homes

Table 4. Recent MS/PhD Thesis Topics for Graduates from IH and HSAT Programs					
Last Name	First Name	Degree	Year of Graduation	NIOSH Trainee	Thesis Title
Suero	Maryann	Ph.D.	1996	y	Characterization of Rotogravure Press Emissions and Prediction of Press Worker Exposures
Van Winkle	Michael	M.S. (ABET)	1996	y	Volatile Organic Compounds, Polycyclic Aromatic Hydrocarbons, and Metals in the Air of Ten Urban Homes

Table 5. Typical Employment Positions of Recent IH/HSAT Graduates (ABET indicates accredited curriculum)					
Last Name	First Name	Degree	Year	Employer	Job Title
Murphy	Elizabeth	MPH	2003	U.S.EPA Region 5 Great Lakes National 77 West Jackson Blvd, Chicago, IL 60604	Program Officer, Great Lakes Fish
Bhooma	Thanikacualam	MPH	2003	U.S.EPA Region 5	Toxicologist
Berman	Laurel	M.S. (ABET)	2003	UIC SPH	EOHS PhD Candidate
Carollo	Amy	M.S. (ABET)	2003	Kent School of Law, Illinois Institute of Technology	Student
Dyson	Teresa	MPH (ABET)	2002	RCM Laboratories, Inc., Countryside, IL	Industrial hygienist
Kennedy	Kathleen	M.S. (ABET)	2002	University of Illinois at Chicago	Senior Research Specialist
Lacey	Steve	Ph.D.	2002	Johns Hopkins University	Post-Doc
Schoonover	Todd	M.S. (ABET)	2002	UIC SPH	Visiting Research Specialist
Moore	Tammy	MPH	2001	U. S. EPA, Region V, Chicago, IL	Environmental Scientist
Dorevitch	Sam	MPH	2001	Research Assistant Professor	University of Illinois at Chicago
Amatya	Neema	MPH	2001	University of Illinois at Chicago	MBA student
Berlett, Jr.	William	MPH	2001	Safety & Health, Naperville, IL	Engineering consultant
Mills	William	Ph.D.	2001	Environmental, Health & Safety Consulting, Oak Park, IL	President and Adjunct Assistant Professor
Ou	Chia-Hao	M.S. (ABET)	2001	Loma Linda University Center for Health Research, Loma Linda CA	Statistical programmer
Zierold	Kristina	Ph.D.	2001	Environ./Occup. Epidemiology, Wisconsin State Health Department, Madison, WI	Epidemic Intelligence Service Officer
Taiwo	Afiz	MPH	2000		
Kil Jang	Jae	Ph.D.	2000	Dept. of Industrial Health & Hygiene, Korea Occupational Health & Safety Agency, Incheon, Korea	Industrial hygiene/toxicology
Casten	Cara	M.S. (ABET)	2000	Wyoming Dept. of Environmental Quality	Air Quality Engineer
Cesarotti	Dennis	Ph.D.	2000	Aires Environmental Services, Batavia, IL	President

Table 5. Typical Employment Positions of Recent IH/HSAT Graduates (ABET indicates accredited curriculum)					
Last Name	First Name	Degree	Year	Employer	Job Title
Lardizabal	Lorraine	M.S. (ABET)	2000	Abbott Laboratories, North Chicago, IL	Industrial hygienist
Norlock	Felice	M.S. (ABET)	2000	Boelter & Yates, Park Ridge, IL	Environmental consultant
Sloman	David	MPH	2000	Environ. Health and Safety Office, U. Illinois, Chicago	Industrial hygienist
Derr (previously Rodeen)	Rebecca	MPH	1999	U.S. EPA, MS-113, 1200 Sixth Ave, Seattle, WA 98101	Environmental Scientist
Baker	Kirk	M.S. (ABET)	1999	Lake Michigan Air Directors Consortium, Des Plaines, IL	Air Pollution Control
Kesler (Salojarvi)	Marlene	MPH	1999	T. Harris Environmental Management, Toronto, Ontario	Industrial hygienist
Krupinski	Dale	M.S. (ABET)	1999	Abbott Laboratories, North Chicago, IL	Industrial hygiene
Panchanathan	Anitha	MPH	1999	Abbott Laboratories, North Chicago, IL	Industrial hygiene
Poshyvanyk	Motria	M.S.	1999	Air Monitoring Section, U.S. EPA, Region V, Chicago	Environ. Scientist
Thielen	Belinda	M.S. (ABET)	1999	Health & Safety Department, United Needletrades, Industrial, and Textile Employees Union, Milwaukee, WI	Industrial Hygienist
Thomas	Juan	MPH	1999	U.S. EPA, Region V, Chicago	RCRA Corrective Action Project Manager
Witherell	Ingrid	MPH (ABET)	1999	GME Consultants, Chicago, IL	Environmental Scientist
Wu	Tung-Yi	Ph.D.	1999		
Blough	James	MPH	1998	Civil Engineering, U. of Illinois, Chicago, IL	Electron microscope technologist
Brown	Michael Jr.	MPH (ABET)	1998	Abbott Laboratories, North Chicago, IL	Industrial Hygienist
Chang	Jingxiang	M.S. (ABET)	1998	Spectra Marketing, Chicago, IL	SAS Programmer
Charles	Daniel	MPH	1998	Boelter Consultants, Chicago, IL	Environmental Scientist
Cheung	Kent	M.S. (ABET)	1998	Abbott Laboratories, North Chicago, IL	Analytical Chemist
Halle-Stern	Michelle	M.S. (ABET)	1998	O'Donnell, Wickland, Pigozzi & Peterson Architects, Chicago, IL	Environmental design/Site planning
Hanson-Shockley	Barbara	MPH	1998	Abbott Labs, Abbott Park, IL	Senior Safety/Industrial Hygiene/Environmental Coordinator
Hua	Chih-Wei	PhD (MS in 1994)	1998	Cook County Dept. of Environmental Control, Chicago, IL	Environmental Engineer
Lee	Shu-Chen	M.S. (ABET)	1998	Spectramarketing Inc., Chicago, IL	Jr. Programming Analyst
Mole	Phillip	MPH (ABET)	1998	Mostardi-Platt, Elmhurst, IL	Environmental consultant
Paulius	Vidas	M.S. (ABET)	1998	IMC Global, Kenosha, WI	Industrial hygiene/environmental science
Picciano	Christina	M.S. (ABET)	1998	Ford Motor Company, Brookport, OH	Safety Engineer
Ripley	Laura	MPH	1998	U.S. EPA, Region V, Chicago, IL	Environmental Scientist
Roy	Robert Jr.	MPH	1998	Morton International Inc., Chicago, IL	Production Manager

Table 5. Typical Employment Positions of Recent IH/HSAT Graduates (ABET indicates accredited curriculum)					
Last Name	First Name	Degree	Year	Employer	Job Title
Wattanawiroon	Suwimol	M.S. (ABET)	1998	Thailand Environmental Protection Agency, Bangkok, Thailand	Air pollution control officer
Best	John	MPH	1997	Environmental Protection Industries, South Holland, IL.	Environ. Scientist
Bing-Canar	John	Ph.D.	1997	U.S. EPA, Region V, Chicago, IL	Environmental Scientist
Bonkalski	Michael	MPH	1997	Fermi National Accelerator Laboratory, Batavia, IL	Industrial Hygienist
Colmenares	Leticia	MPH	1997	Zenith Corporation, Chicago, IL	Industrial Hygienist
Dimit	Stacia	MPH	1997	I.T. Corp., Chicago, IL	Environmental Scientist, environmental site assessment & inspection
Huang	Sandra	M.S. (ABET)	1997	Environmental Occupational Risk Management, Newport Beach, CA	Industrial Hygiene Consultant
Iyiegbuniwe	Emmanuel	PhD (MS in 1994)	1997	Industrial Hygiene Dept., Environmental Design International Inc., Chicago, IL	Manager
Koralewska	Ludmilla	MPH	1997	Toxic Programs, U.S. EPA region 5, Chicago, IL	Life Scientist
Lewis	Cynthia	M.S. (ABET)	1997	Halliburton Health, Safety & Environment, Kellogg Brown & Root, Inc., Houston, TX	Industrial Hygienist
Mangilan	Bernardo	MPH (ABET)	1997	Nalco Chemical Co., Naperville, IL	Industrial Hygienist
Mohrdieck	Bertrand	MPH	1997	Abbott Laboratories, North Chicago, IL	Industrial Hygienist
Nipko	Kimberly	MPH (ABET)	1997	Occupational Health and Safety Administration, Madison, WI.	Winner of the 2003 AIHA John Bloomfield Award.
Ross	Mary	PhD.	1997	U.S.EPA, Off. of Air Qual. Planning & Stnds., Res. Triangle Park, NC	Health Scientist
Towey	Anthony	MPH	1997	OSHA Training Institute, Des Plaines, IL	Industrial Hygiene Supervisor
Yu	Hang	M.S. (ABET)	1997	AON Worldwide Resources, Chicago, IL	Programmer Analyst

Agricultural Safety and Health Academic

2000 to 2003 Program Summary (3 years)

The agricultural safety and health academic program is primarily located on the University of Illinois Champaign/Urbana campus in the College of Agricultural, Consumer and Environmental Sciences (ACES) Department of Agricultural and Biological Engineering. This special emphasis program completed its 3rd year June 30, 2003. Dr. Bob Aherin and Dr. Robert "Chip" Petrea are the principal program faculty. The primary goal of the program is to provide graduate and undergraduate students who are seeking careers in agricultural and rural-related professions including health professions with a basic foundation in agricultural safety and health. There is a strong need for those working in any area of production agriculture and rural health care to have academic training in agricultural safety and health for a variety of factors. Graduate students have the opportunity to develop a special interest area in agricultural health and safety by completing most of the agricultural safety and health related courses offered, completing a special problems course in agricultural safety and either focusing their thesis work or special project if in a non-thesis M.S. program in this area with guidance from the program faculty.

Trainees are provided partial stipends because the program provides special emphasis training within their respective degree program. Both graduate and undergraduate trainees must be willing to take multiple courses to support the special emphasis. The offered courses also attract students who only have the ability or interest to take one or two courses in this area. Currently there are 2 graduate trainees and 4 undergraduate trainees associated with the program.

Since July 1, 1999 to June 30, 2003:

Three core 300 level courses have been developed for graduate students and upper level undergraduates. One focuses on agricultural injuries, one on agricultural diseases and illnesses, and the third is a capstone type course on analysis and control of agricultural injury and illnesses. Students also can take a special problems course, an internship (undergraduates only) and select from 10 other elective courses offered within the university.

The first year of the project was primarily devoted to developing courses, recruiting students and conducting an employer survey. An employer survey was conducted to assess the knowledge and skills in the agricultural health and safety area that employers would desire of students they would potentially hire. Surveys were sent to 296 employers in Illinois and all the surrounding states. Forty percent completed and returned usable surveys. Some of the primary findings include: Ninety seven percent (97 %) of the respondents stated that at least some educational/training exposure to the general nature of agricultural safety and health issues valuable. The five most common educational/training areas they indicated were most desirable in the personnel they hire with responsibilities in agricultural safety and health are: 1) Chemical Handling and Storage, 2) Personal Protective Equipment, 3) Agricultural Safety and Health Resources, 4) Human Factors/Ergonomics, and 5) Effective Safety Messages.

The Agricultural Injury course has been offered in the spring of 2001, 2002 and 2003 with a total enrollment of 46 students.

The Agricultural Illness and Disease course has been offered in the fall of 2001 and 2002 with a total enrollment of 34 students.

The third core course on the Analysis and Control of Agricultural Injury and Illness was taught on a special project basis because, in the first two years, there were not enough students to warrant offering it

as a regular class. Two students took this course the second year of the program and it was offered as a regular course during the spring of 2003 and four students completed the course. This is a capstone type of course and students must have completed at least the agricultural injury or agricultural illness course to be allowed into it.

Several of the faculties from the industrial hygiene and occupational medicines program have collaborated on the offering of the agricultural illness and disease course. Some of their lectures were in person, however, several of the lectures were over a web based distant learning system between the Urbana/Champaign campus and the Chicago campus.

A trainee completed the first internship this past summer. He conducted the traineeship with the Community Health Partnership of Illinois. This program provides health care services to migrant workers. The trainee is bilingual and helped organize occupational health screenings and conducted a safety behavior survey among the workers. He anticipated publishing the work sometime next year.

Trainees have come from the program areas of agricultural engineering, medicine, natural resources, education, plant sciences, animal sciences and agricultural technical systems management.

Two students have completed their traineeships. One, an agricultural engineering student, is working as an area sales representative for a major agricultural equipment manufacturers in California. A portion of his job is in the area of product safety training and design. A second graduate student graduated with a M.S. degree in agricultural education and was hired by Purdue University as a rural youth educator. A portion of her job will be in the area of agricultural youth safety, which is the area, she focused on as a trainee. Another trainee who completed the program is a fourth year medical student who plans on practicing medicine in a rural area.

Developed a proposed minor in Agricultural Safety and Health for undergraduates students. Approval is expected in the next 12 months. It was hoped that the minor would have been approved in the third year of the project but electives were added and this required contacting the professors who taught the classes to seek their approval to add their courses as electives.

The four students who completed their traineeship have made paper presentations at professional meetings and have submitted two journal articles for publication based on work conducted in the program. One student was invited to present her work on the toxicity of agricultural pesticides and their effect on the environment at a European international conference this past June.
22 students applied for the six available partial traineeships available the third year (includes 5 graduate students and 17 undergraduates). This is a strong indicator in the level of interested that has developed for the program.

We have averaged approximately $500,000 in soft money support for research and outreach programs for each year of the project.

Project director was invited to speak about the program at two national agricultural safety and health conferences.

Trainees participated in joint workshops involving trainees from the ERC core areas on the Chicago campus.

A program advisory committee has met yearly to review the program and offer suggestions on improving the program. The committee consists of representatives of the agricultural industry and other academic

institutions. We hope to add one or two former students to the committee within the next two years as more students complete the program.

Program plans for the next five years are to:

Have an undergraduate minor established in agricultural safety and health.

Explore the potential of offering courses to other University campuses in the state partially through distant learning systems.

Maintain a minimum of 2 graduate and 4 undergraduate trainees in the program. We would like to increase the traineeships to 4 graduate students and 8 undergraduates if resources will permit.

Increase the average number of students taking the agricultural injury and disease courses to 25 each respectively.

Offer a graduate credit short course in agricultural safety and health for current agricultural educators and rural health professionals.

Enhance the collaboration between trainees on both the Champaign and Chicago campuses.

Continuing Education and Outreach

Abstract

Continuing Education and Outreach (CE/O) is one of the major programs of the Illinois Education and Research Center. The Illinois ERC is one of five Centers within the Great Lakes Centers for Occupational and Environmental Safety and Health (GLC). GLC is a multi-institutional and multidisciplinary center which provides professional education, research and services in occupational safety and health to Illinois and portions of Indiana and Wisconsin. CE/O is administratively based at the University of Illinois, School of Public Health in the Division of Occupational and Environmental Health Sciences and has component programs in Agricultural Safety and Health and Hazardous Substances. The CE/O program is a resource for course and outreach planning for faculty and staff in all of the Centers within the GLC and to sister programs such as the Center for Environmental Research, Policy, and Science and Air Pollution Training Institute. CE/O's mission is to provide continuing education to occupational and environmental health and safety professionals and outreach to other professionals and workers to improve their knowledge, leadership and technical skills, and awareness of key issues in occupational safety and health.

CE/O received five year approval during our last competitive renewal in 1998. Ms. Nickels is the full time academic professional and Program Director of CE/O. Joseph Zanoni is full time academic professional and Associate Director for CE/O. School of Public Health administrative staff who actualize the CE/O program are Marilyn Bingham, Natesa Sutton and Barbara Harper Smith. Continuing Education components include occupational medicine, occupational health nursing, industrial hygiene, and safety as well as targeted programs in Agricultural Safety and Health and Hazardous Substances. Outreach programs include targeted initiatives in the area of sweatshops, health in the arts, homecare workers, and schools as well as other more diverse activities.

Significant Findings

We have met and expect to continue to meet NIOSH objectives for CE participants by Program area. In 2001-2002 we conducted 86 courses for 2383 participants (including agriculture and hazardous substances). Over the past 5 years (1998-2003) we have conducted over 400 courses for over 9,000 participants (excluding agriculture and hazardous substances).

The summary statement from 1998 indicated that the program might be enhanced in the following ways:

1. consideration be given to the expansion of distance learning activities that would enhance the programs capabilities to reach the more sparsely populated sections of the region
2. consider conducting a regional needs assessment
3. consider establishing a CEO advisory committee
4. develop a mechanism to document participation of under-represented groups in the outreach program
5. explore the need for more traditional safety training, possibly through the local section of the safety professional societies
6. consider offering more CME as a method of improving attendance at courses

1. Consideration be given to the expansion of distance learning activities that would enhance the programs capabilities to reach the more sparsely populated sections of the region.
The CE/O program took the lead at the School of Public Health and UIC in offering distance based learning opportunities for continuing education. Distance based technology is an important method of

delivery that is ideal for some courses. For courses delivered in a class/workshop format, distance technology provides the opportunity to both archive programs and make them available to those who were unable to participate at a specific time and place. In addition to courses designed entirely for Internet delivery, we have also incorporated into most courses an objective for improving computer use by participants in addressing health and safety issues. Over the past five years CE/O has worked with faculty and staff in all core program areas to develop distance based short courses (both web-based and video-conferencing), web-based conferences, web-based seminar series, and hybrid courses that include web and face to face training. In addition course materials are created on CDRom to accommodate students that do not have access to fast Internet connections. How web based technology is used in course development is more completely detailed in each program area description. A list of courses offered through distance based medium is found in CE Appendix B.

2. Consider conducting a regional needs assessment.

Needs assessments are conducted through a variety of methods. In 2001 a new needs assessment tool was developed. This tool was used to collect information on continuing education needs in each of the core program areas. In addition, needs assessments were conducted in cooperation with professional associations in Illinois and safety conferences in Illinois and Wisconsin.

3. Consider convening a CE/O advisory committee.

The CE/O program relies on the Center Advisory committee for information on needs assessment, program development, instructors, and program evaluation. Each new course has a designated course coordinator (faculty or staff member) and planning committee specific to content. Program planning is also conducted in conjunction with local professional groups. For example industrial hygiene planning takes place with the regional section of AIHA in addition to the ERC Advisory committee and faculty. Details on program area advisory or planning committees are found in each program area description.

4. Develop a mechanism to document participation of under-represented groups in the outreach program.

CE/O sets outreach goals that are based on reaching underserved groups. Under-represented groups have participated in the outreach program through research and intervention with Spanish speaking and other minority workers, through conference development, through academic courses and through activities coordinated with organized labor. The CE/O program has documented their participation in the following ways: a) eye injury and illness prevention in Latino farm workers intervention project activities include focus group and one to one interviews with Latino farm workers, observations of farm working conditions and discussions with workers and analysis of questionnaire data related to knowledge and action for eye injury and illness prevention, b) Sweatshops in Metropolitan Chicago: A Conference on Workers' Voices (1999, Chicago) needs assessments and participant satisfaction evaluations were conducted related to ongoing health and safety training and programming needs; CE/O subsequently participated in the Chicago Area Workers Rights Initiative which conducted planning meetings and documented the needs and working conditions of minority workers in sweatshop employment, c) Environmental and Occupational Health in the Context of Integration of the Americas Conference (2000, Morelia, Mexico) provided a forum for discussion and documentation of environmental and occupational health challenges in Canada, US, Central and South Americas, d) in the UIC School of Public Health Course: Popular Education and Sustainable Development (1999, 2000, Chicago) minority community members and students cooperated in documenting environmental and occupational health concerns through community risk map assessments and developed intervention projects utilizing the principles of popular education, e) the community of organized labor partnered with CE/O to present numerous courses on basic safety and health awareness in the workplace titled "OSHA in Your Workplace" (1998 through

2002, Chicago, IL, Gary , IN, Columbus, OH, Fort Mitchell, KY); in the courses participants list their risks and exposures, create risk maps of their workplaces and create action plans to address their concerns. These sources of documentation guide the development and direction of the CE/O program.

5. Explore the need for more traditional safety training, possibly through the local section of the safety professional societies.

Since 1998 the CE/O program has developed a synergistic working relationship with the Northern Illinois section of ASSE, the Construction Safety Council, the Northern Illinois Section of AIHA, Central State ACOEM, and several sections of AOHN. These partnerships have resulted in an increase in safety programming and increased student participation.

6. Consider offering more CME as a method of improving attendance at courses.

The target audience for each course is identified by the course coordinator and planning committee. The ERC Executive committee is also consulted. Occupational medicine faculty have taken an active interest in this area over the past two years.

Program Status

Faculty Commitment/Breadth

GLC core faculty are exceptionally committed to continuing education and outreach activities. Lorraine Conroy, ScD, ERC Director continues this commitment. Dr. Conroy has provided CE/O leadership for the past 10 years. Dr. Conroy is particularly committed to working with vulnerable populations in developing skills in anticipation, recognition, assessment and prevention and control of exposures.

GLC has the commitment of a large and diverse faculty to support continuing education and outreach activities. Each of the three program areas, medicine, nursing and hygiene have faculty who bring experience and knowledge to continuing education courses. Leadership for safety and interdisciplinary courses historically comes from the CE/O Director. Currently program planning and implementation is done in consultation with the program directors and the advisory committee. First time course offerings are developed through a course planning committee. Specific program area and faculty support are defined in the following segment. In addition to faculty support CE/O has more than 150 exceptionally qualified faculty who participate in the CE/O schedule over the past three years. A list of core academic and consulting faculty is found in appendix C.

Occupational Medicine

The goal of the occupational medicine continuing education activities is to reach out to various groups of physicians including occupational medicine physicians and primary care physicians. Occupational medicine works closely with the CE/O program of the ERC in the development of courses; participation in courses offered through other program areas and on interdisciplinary conferences. OM has approximately 80% faculty participation in CE/O either through giving lectures at conferences or in the development and delivery of a short course.

Occupational Health Nursing

The OHN Program is currently in transition as new faculty are being recruited and hired. Dr. Karen Conrad resigned from her OHN Program Director position. Dr. Pamela Levin served this year as the Acting OHN Program Director. Dr. Levin has also worked with continuing education and outreach in the development of a new needs assessment process for continuing education and conducted the nursing continuing education needs assessment in 2002.

Over the past year Pamela Levin, PhD, RN has provided leadership and coordination for the occupational health nursing (OHN) program. Dr. Levin has been active in CE/O for the past 10 years and is an essential provider to the outreach program. She worked on revising the CE/O needs assessment tool and evaluation process. She regularly teaches, lectures, and provides technical assistance on violence in the workplace issues. Dr. Levin is the coordinator for the recording keeping, toxicology for nurses, spirometry, environmental health issues, and muscloskeletal evaluation courses.

Industrial Hygiene

The industrial hygiene faculty have a strong and long commitment to CE/O. Lorraine Conroy, ScD, CIH provides important leadership on CE/O activities and has a role at least half of the CE/O courses. She plays a predominant role in the Industrial Hygiene Review Course, Annual Conferences (Healthy Schools, Healthy You Conference in 2002), AIHA cosponsored courses, ASSE/OSHA and OSHA Spring Conference, History of Occupational Health courses, Recognition and Prevention of Biological and Chemical Incidents, Introduction to Occupational Health, and Respiratory Protection. Dr. Conroy has a commitment to both the content and methods of delivery of courses and has provided leadership on incorporating diverse delivery methods into training, including small group activities, web based training, workshops, laboratories, and field trips. Peter Scheff, PhD, directs the Air Pollution Training Institute Courses, coordinated the Environmental Research Forum and is part of the planning committee for indoor air quality courses

Safety

Faculty for safety programming is primarily supported by advisory committee members and safety professionals through our partnerships with ASSE, AIHA, OSHA On-site consultation program, and OSHA. In addition, Robert Aherin, PhD and Robert Petrea, PhD are both safety professionals. While their area of expertise is in agricultural safety their expertise in safety has become contributed to both the CE/O program and academic programs.

Continuing Education and Outreach Staff

The implementation of the CE/O program plan is directed by Ms. Nickels in coordination with each program area. Ms. Nickels is employed 100% time as Director of CE/O and provides for its overall direction. Ms Nickels has over 20 years of experience in health and safety. Before becoming Program Director for CE/O Ms. Nickels was Program Director for Occupational and Environmental Health for the Chicago Health Department. Prior to this she was the Area Manager for the Safety Inspection and Education Program for the Illinois Department of Labor. In both of these capacities Ms. Nickels was responsible for enforcing health and safety standards, conducting training programs and developing policies to protect workers health and safety. Ms. Nickels has a Master of Education degree and has completed courses in graduate training in industrial hygiene. Ms. Nickels is also active in national activities including Program Planner for the Occupational Health Section of APHA 1999 and 2000; conducting poplar education training programs as a short course at APHA and presenting papers at

national meetings. Ms. Nickels is the only representative on issues of occupational and environment health and safety on both the Turning Project and Illinois Futures. Both of these groups are Kellogg Project Partnerships for public health programs. Ms. Nickels is on the advisory committee for the Health and Medicine Policy Research Group.

In January 1998, CE/O was extremely fortunate to have Joseph Zanoni, MILR join the program as Associate Director for Continuing Education. Mr. Zanoni has over 10 years of experience in health and safety training. Mr. Zanoni worked for the Service Employees International Union on ergonomics issues in the nursing home industry and worker training programs in hazardous waste. Mr. Zanoni's expertise and experience have enabled the program to more systematically develop outreach objectives and implement outreach activities. Mr. Zanoni is employed 100% time in the program.

Faculty reputation and strength is summarized below by discipline area. Each of the faculty detailed participates in course development and delivery. Faculty support CE/O staff on improving course delivery and materials.

Courses offered

The CE/O is responsible for course development including topics, content, and instructors. Faculty and/or course lead instructors work closely with CE/O on program implementation. Targeted groups included physicians, nurses, industrial hygienists, safety engineers, architects, health and safety specialists and building engineers. Marketing activities include a web page (www.uic.edu/sph/glakes); distribution of brochures and flyers; and exhibiting at local and regional professional and specialty meetings. National marketing includes participating in the NIOSH course catalog and staffing NIOSH ERC booth at conferences.

A continuing emphasis is being placed on promoting professional association approvals. Medicine, nursing and industrial hygiene courses all receive appropriate professional approvals. This effort has been enhanced by the commitment of faculty in working with CE to obtain appropriate continuing education credits. CE/O has an excellent relationship with Continuing Medical Education, the department that is responsible for approving CME at UIC. In addition, GLC issues University of Illinois continuing education credits (CEUs). University of Illinois CEUs are recognized as meeting the requirements for professional nursing continuing education. Publications prominently display credits offered.

Course development and implementation are based on needs assessments, advisory, professional and planning committee recommendations, faculty expertise, and availability of funding. Needs assessments conducted at conferences suggest that distance learning opportunities are of greatest interest in terms of delivery methods in all professions. The use of appropriate web-based training is always considered in course development. Distance based training includes internet courses, CDROM, and/or video conferencing.

Over the past four years the CE/O program has strategically identified regional resources for the delivery of occupational safety and health programs. Included in the inventory are the National headquarters for ASSE, NSC, ACOEM and the Construction Safety Council. In addition, the OSHA Training Institute and an OSHA designated Training Center are also in this area. In order to meet the occupational and environmental health training needs the CE/O program identified opportunities to work in conjunction with these training providers to enhance and compliment their work. This effort has resulted in a partnership with AIHA, OHSA, ASSE, Northern Illinois University, two community colleges, the OSHA State Consultation Program and multiple state and federal agencies. Our goals in developing these partnerships is to disseminate state of the art research knowledge through existing networks, increase the quality and scope of training, and ensure that mandatory training needs are being met. Our role within the

partnerships ranges from program development, implementation and evaluation to administration. Additionally, our experience and access to resources for distance education offer a unique contribution.

Medicine

The courses offered in the past year were well attended and received. Instructors work closely with CE/O in addressing the needs for future programming based on the needs assessment. Well received courses include Occupational Medicine for the Primary Care Physician, spirometry course, and health and safety in the arts. Also there has been an exceptional response to the web based courses developed by Dr. Forst. Additional new course development includes a seminar series for Occupational Medicine Physicians. This course began in September 2001 and continues monthly through May. The series will be offered again in 2002-2003. This series has been evaluated very favorably. In addition, the Occupational Medicine for the Primary Care Practitioner is offered every February in conjunction with the Central States Occupational Medicine Conference. Beginning in August of 2002, we will use our Wednesday morning residents' seminar as a forum to offer CME to occupational health providers, city-wide. We will be able to offer four Category 1 credits per month for Grand Rounds, Occupational Medicine-Toxicology Combined Conference, Case Presentation, and Journal Club. Many local providers were trained in our programs and we intend to advertise these courses to them. This four-credit School of Public Health course is taught on the internet. It will be piloted for international students by including 10 international students in the existing course. They will receive a certificate at the end of 15 weeks of participation.

The primary audiences for these courses are occupational medicine practitioners, primary care practitioners, and emergency room physicians.

Occupational Health Nursing

Occupational Health Nursing courses have been well received. Course offerings for 2002-2004 are based on consultation with regional AAOHN chapters in addition to needs assessments and advisory committee recommendations. In 2001-2002 the OHN program pioneered the use of video conference continuing education courses in the ERC. Two courses were held for a total of 44 participants (one course was canceled). Participants are from four sites across Illinois. This program was so successful that three more courses will be offered each year for the next 2 years. These programs provide both continuing education and outreach opportunities. In addition we propose to use this method of delivering training as part of the weekly seminar series.

Industrial Hygiene

The needs assessment for industrial hygiene indicated that there is a need for toxicology and indoor air quality courses. Beginning in 2001-2002, Ms. Nickels became a member of the program planning committee for the Chicago Section of AIHA. In this role the industrial hygiene program coordinates with the local section in program implementation. The ERC co-sponsors monthly AIHA courses agreed upon at the annual program planning meeting and AIHA co-sponsored in 2001-2002 two ERC courses. This approach to planning industrial hygiene course offerings through the ERC proved to be an excellent opportunity to better meet the training needs of industrial hygienists in this region.

Safety

Leadership for course development has come from the CE/O director. GLC has strength and commitment on the part of the Advisory committee. Training in safety has been enhanced by working with OSHA and ASSE to plan, provide speakers, and evaluate two conferences annually. In addition, CE/O will be working with the NSC on two safety courses this year an OSHA 10 hour course and the SOLVE course.

SOLVE is a 40 hour curriculum on addressing psycho-social issues in the workplace. As part of strategic planning and the partnership emphasis described above, CE/O will not offer asbestos courses in 2002-2003. For the past two years CE/O has worked in partnership with two community colleges to coordinate asbestos initial and refresher courses. This year CE/O will continue to work in partnership with these programs but will not offer any asbestos courses at the UIC facilities. Lead courses will also be eliminated from the schedule in 2002-2003, however, the need for inexpensive lead training at the worker and supervisor contractor level is recognized. CE/O is working with the Illinois Department of Public Health and the Chicago Department of Public Health to explore ways to offer these courses in 2003-2005.

Safety CE/O programming has been conducted through partnerships in research and CE/O program development. Intervention research in the area of eye injury prevention in Latino farm workers enabled the development of an eye injury and illness prevention training manual and intervention program where workers received protective eye wear and instruction from peer educators. The program was the joint effort of UIC School of Public Health faculty and staff, UIUC faculty, community based migrant advocates and farm workers. Also developed in this effort was an agricultural eye safety and health program advisor to highlight and facilitate the involvement of growers in conducting effective safety programs.

CE/O partnered with staff of the National Safety Council to conduct discussion and training related to the SOLVE program written by the ILO, collaborated on a teen safety focus group, and began discussions of cooperation related to home health care employer health and safety training programs.

In the area of organized labor, CE/O partnered with labor leaders, OSHA and labor education professionals in Illinois, Indiana, West Virginia, Ohio and Kentucky to offer a variety of programs including ergonomics for labor union women, basic and advanced union safety training and credit courses offered in Indiana through Indiana University Northwest Division of Labor Studies and Swingshift College (United Steel Workers of America).

Other

The courses offered in this category are exceptionally well attended and evaluated. Many of these courses are unique in this area and therefore are meeting a need. Most of these courses were developed over the past three years and will continue to be offered through 2004. Course development in this area is also focused on identifying and addressing the needs of underserved populations.

In the radon area CE/O was funded to conduct a nominal group technique related to the integration of radon awareness into the practice of architects, builders and real estate agents. This research promoted the development of the Passive to Active Radon Mitigation Systems CE course that was created and offered during the 2001-2002 program year. The Illinois Department of Nuclear Safety also funded CE/O to develop radon mitigation and measurement on-line and field experience courses to meet the needs of participants throughout Illinois maximizing the use of distanced-based and direct hands on components integrated in the same courses.

In the area of home health care health and safety programming the 1998 conference partners identified safety issues such as ergonomics and vehicle incidents as key areas of concern. CE/O partnered with the Illinois On-Site consultation program and OSHA to continue the development of programming in this area. The consultation program funded CE/O to develop a home health care employer health and safety program advisor, to create a curriculum and web site to disseminate this information. The two-day train the trainer program reached 32 participants from the following states: IL, OR, TX, FL, WA and WI.

In the area of safety for elementary and secondary school personnel CE/O partnered with the national,

state and local teachers and school personnel union (AFT, IFT and CTU) to create conference programming identifying safety needs in the areas of ergonomics and accessibility. CE/O continues this effort with the Healthy Schools Network, Inc, of New York and the Illinois Health Schools Campaign.

In the area of housing and environmental safety CE/O has a long standing partnership with Eugene Goldfarb, Midwest Environmental Officer, US HUD, to conduct and enhance nationally recognized courses (Best Practices Award, HUD, 2000) in the areas of Orientation to Environmental Assessment, Brownfield Redevelopment and Energy Performance Contracting presented in Chicago for participants from across the United States. CE/O partnered with Com Ed and Nicor Gas to develop two one day Brownfield Redevelopment courses for local economic development officials. In 2001 Mr. Goldfarb and Jim Vanderkloot, EPA Sustainability Team Leader, created the Sustainable Development course and organized the Sustainability Midwest Lecture Series in 2002 with the support of Com Ed, Skidmore, Owens and Merrill and the City of Chicago.

Agricultural Safety and Health

Agricultural health and safety has been successful in bringing health and safety courses to providers in the diverse agricultural community. The success is in part due to alliance with health care providers and their organizations around the state concerned with agricultural health and safety. Programming over the past two years has focused on injury prevention and pesticide safety. Future program planning includes: Agricultural Safety and Health: Illinois Network for Agricultural Safety and Health Spring and Fall Conferences; Medical Surveillance Programs for Agricultural Workers; and Confined Space for Agriculture Train the Trainer Course. Other programming and outreach are detailed in the Agricultural Safety and Health section.

Distance Based Learning

To fulfill the ERC's mission of reaching targeted populations in our large catchment area it is essential to explore and make available a wide range of training options.

To address this issue the ERC has discussed the range and depth of distance based learning modalities. We have concluded that the best option at this time is to focus on Web based learning programs. We have established a site for the ERC and have resources in terms of personnel and hardware to accomplish these tasks. The School of Public Health has made distance based learning a priority and recently received a grant to develop six core courses to be offered over the Web. The School of Public Health also has a Center for Advanced Distance Education (CADE). CE/O has courses, resources, and conference proceedings (including video and audio) that are completely accessible through the Internet. Other courses offer a "hybrid" approach that includes some web-based learning with a field or laboratory component. Other courses offer a 1-3 hour Internet component as part of the learning objectives for a more traditional classroom based course. We hope to include this type of distance based component into portions of all interdisciplinary conferences.

Needs Assessment

National

The CE/O Program participates with the other NIOSH ERC's in conducting needs assessment of practicing professionals attending the national conventions of major professional associations. Participants at meetings of the American Public Health Association, American Occupational Health Conference (physicians and nurses); American Industrial Hygiene Association; and American Society of Safety Engineers regularly complete surveys which seek information about primary professional

activities, geographic location, and educational needs in specific topic areas.

Course interest area is one piece of data used by GLC for course planning. Names and addresses are added to the mailing Center mailing list. The NIOSH Occupational Research Agenda (NORA) list of leading work-related diseases and injuries is a second piece of national needs assessment information considered.

Regional and Local

We recently completed a needs assessment for occupational medicine physicians in the Chicago metropolitan area. We sent a total of 149 questionnaires and received responses from 39. Of the 39 responders, 33 expressed interest in attending regular continuing education programs. Greatest interest was in a ½ day program conducted once per month. Responders also checked off preferred location, day and course content. In addition, respondents, in the open ended question suggested other topics to be covered. Topics will be chosen from the interest list completed. The expanded programming noted in the occupational medicine section reflects a response to these needs.

Needs assessments are both ongoing and regional assessment activities. On an ongoing basis needs assessment are conducted in four ways: 1) through course evaluations and participant interviews; 2) advisory committee meetings and key informant discussions; 3) outside requests for courses; and 4) program area experience and research, especially for "hot" topics. Regional needs assessment activities are conducted in two ways: 1) through ERC and UIC needs assessment data collected as part of exhibiting at conferences; and 2) comprehensive surveys of targeted populations and consultation with other are ERCs (Michigan, Minnesota, and Cincinnati).

Conclusions

Based on needs assessments, funding and Center program goals and objective the continuing education and outreach program has identified the following as needs in this region:

1. Define and address the needs of the occupational and environmental health and safety community in Illinois, Wisconsin, and Indiana by offering short courses and coordinating outreach activities.
2. Continue to develop partnerships with local occupational and environmental health and safety professional associations, government agencies, and non-governmental organizations (advocacy groups, labor organizations and trade associations) to conduct needs assessments and training programs.
3. Develop training and outreach programs using the best learning context including, conferences, workshops, seminars, laboratories, small group activities, one-on-one mentoring, self study, and field trips.
4. Identify the most effective training methods and tools for delivering training including case studies, small group activities, presentations, demonstrations, videos, web-based, CDROM, video conferencing and problem solving scenarios.
5. Identify underserved and minority populations and develop continuing education and outreach initiatives to meet the needs.
6. Develop teaching and training knowledge and skills in students in the academic program areas.
7. Create interdisciplinary opportunities for faculty, staff, students, and professionals through course and outreach implementation.
8. Increase resources (financial and faculty) for program development and implementation.
9. Evaluate the continuing education program for student satisfaction, instructor and material quality, implementation outcome and program effectiveness in meeting its goals.

Hazardous Substances Training

Abstract

The Hazardous Substance Training Program (HST) develops and conducts continuing education programs for public sector employers and employees. The objectives of the program are to provide training to occupational health and safety professionals which improves their knowledge, technical skills, and awareness of key issues related to hazardous substances. This includes remediation, transportation, emergency releases, and the control, reduction and safe handling of hazardous substances. Proposed courses reflect the technical needs of occupational safety and health professionals. Training is targeted to state, county, municipal employees as well as other governmental jurisdictions with the exception of federal employees.

The HST Project was begun on July 1, 1993. Leslie Nickels, MEd. is the HST Project Director and Program Director for Continuing Education at the University of Illinois-Chicago. Symantha Aydt is the Project Coordinator for the HST Project and the Program Coordinator for the NIEHS Hazardous Substance Program at the University of Illinois-Urbana/Champaign. The Hazardous Substance Training program is part of the Continuing Educational and Outreach Program located at the Great Lakes Center at the Univ. of Illinois-Chicago School of Public Health. However, the majority of the courses are offered through the Institute of Labor and Industrial Relations at the University of Illinois at Urbana Champaign. This program also houses the NIEHS Hazardous Substance training program as well.

Significant findings

Through our work with the state, regional and local agencies that must respond to hazardous substance incidents we have identified the needs of local health departments to be significant. In 1997, the Illinois EPA and local environmental partners received more than 2000 open dumping complaints. That same year there were 908 incidents involving release of toxics from fixed facilities in Illinois and 302 transportation accidents involving toxic releases. In 1997, there were approximately 3000 people evacuated from their homes due to significant toxic releases. Environmental health hazards disproportionately attack disadvantaged communities, especially minority, inner-city children. A good example is childhood lead poisoning. Of the 136, 432 children screened for lead poisoning in Cook County in 1996, 13,328 had blood lead levels over 15 mcg/dl, 5,704 had levels over 20 mcg/dl, and 271 had levels over 45 mcg/dl. Sixty-nine percent of lead-poisoned children in Chicago are African-American and 25% are Hispanic. Asthma also disproportionately attacks inner city children. From 1976 to 1991 asthma mortality among Chicago's African-American children and young adults increased by 337% while remaining stable among whites in the same age groups.

This complex web of environmental responsibility is also evident at the state level in Illinois. Among the state agencies with responsibilities related to environmental health and hazards are the following:
Illinois Department of Public Health+
Environmental Protection Agency+
Department of Energy and Natural Resources+
Department of Agriculture
Department of Transportation
Department of Mines and Minerals
Illinois Geologic Survey
Department of Registration and Education
Department of Nuclear Safety+
Emergency Management Agency+

Pollution Control Board
Fire Marshall+
Department of Commerce and Community Affairs+
Department of Labor+
+Agencies that have employees who have participated in needs assessments and have attended courses.

Certified local health departments in Illinois are responsible for carrying out several environmental health duties including: food sanitation, water, and sewage. Standards for these programs are established by the Illinois Department of Public Health and promulgated through rule-making that involves affected parties, expert resources, advisory committees, and ultimately the Illinois State Board of Health and the Joint Committee on Administrative Rules. Standards and rules for optional environmental health programs are also established and promulgated by the state health department.

Local ordinances related to environmental health are also established by county boards and city councils, acting as their legislative roles for units of local government in Illinois. In these cases, local health departments act as the implementing and enforcement agencies.

A study conducted in 2000 by the UIC School of Public Health identified public health titles (positions) that had some environmental health responsibilities. Environmental positions accounted for 11 percent of workers in the 26 Public Health Position Titles. Non-professional titles were found twice as frequently as professional titles among environmental services staff; there were 119 licensed environmental health practitioners (professionals) compared to 93 non-licensed practitioners and 152 inspectors (both non-professionals). There were 69 directors of environmental health, also considered professionals, bringing the total number of environmental professionals to 188 (43 percent of the environmental positions). Only 2 of the licensed environmental health practitioners, and 17 of the directors were employed in the 28 LHDs serving populations of less than 25,000. Because of the lack of training in environmental health at the local level, there is a lack of knowledge and skills to address hazardous substance issues.

In addition to the need for locally trained people skilled in addressing hazardous substance issues, in previous training years, mail surveys have been sent to safety professionals to determine their training needs in the areas of hazardous substances. The results of these surveys form the foundation of our current program plan.

Program Status Report

The HST Project Director is Leslie Nickels. Ms. Nickels has over 20 years of experience in health and safety and is the Program Director for Continuing Education at the Occupational and Environmental and Occupational Health and Safety Education and Research Center at the University of Illinois-Chicago. Ms. Nickels began working with the NIEHS Hazardous Substance Program in 1990 and became Project Director of the NIOSH HST Project in 1999. Ms. Nickels is a member of the ERC Executive Committee and a member of the School of Public Health faculty. The implementation of the CE/O program plan, in coordination with each program area, is directed by Ms. Nickels. The HST project is implemented in the same way.

The Program objectives are to continue to develop excellent instructional materials and training programs that will enable public sector professionals in the field of hazardous substance response and its remediation to better carry out their job related responsibilities. We will also attempt to maintain our success in seeking participation from the region and from an increased number of government agencies. Future plans include:

Work with local health, fire and police departments to develop programs for planning and responding to hazardous materials incidents. Beginning in 2002 we will specifically focus on the needs of local health departments and their role in hazardous substance response and emergency planning committees (LEPCs)

Expand Territory –Next years mailings will include targeted areas and organizations in Wisconsin, Indiana and Illinois. In addition, the CE/O program and Center Administration are committed to conducting over the next three years three focus groups in our region to better define the needs of our audience. The focus groups this year will include local health, fire and police departments in an effort to identify training needs for improving local planning and emergency response.

Reduce cost of training for public sector employers by developing alternative course delivery schedules and by offering partial scholarship policy – in order to assist a greater portion of the population, we have adopted a policy of offering partial scholarships to lower the cost of the programs and to assist more students in receiving grant money.

Update and Maintain Equipment – our program has a fully functional office with state of the art equipment. In addition, we have several laptops and projectors for professional quality Powerpoint presentations. We have two fully equipped trailers for our hands-on portions of the programs. This will allow us to have two such classes running simultaneously.

The HST Project is committed to reaching government agencies for identifying needs, scheduling courses, course schedule notification, and inclusion in training programs. This year the HST program worked with an advisor committee to identify needs, increase awareness of the program, and explore resources for addressing the needs. The advisory committee convened as part of the Center of Excellence in Environmental Health includes: John Lumpkin, MD, MPH, Director of the Illinois Department of Public Health; John Wilhelm, MD, MPH, Director of the Chicago Department of Health; Karen Scott, MD, MPH, Director of the Cook County Department of Public Health; Mr. Mike Connors, Director of Region V, OSHA; Mark Johnson, PhD, Director of Region V, ATSDR, and Mike Wahl, MD, Medical Director, Illinois Poison Center. We propose to add the Director of the Environmental Protection Agency Region V to our advisory board in 2003. In addition, a working group has been formed to advise and support training program initiatives. Representatives to the working group include UIC SPH, Chicago Department of Public Health, Poison Control Center, EPA Region V, OSHA Region V, Oak Park Department of Public Health, and the Illinois Department of Public Health. In addition, the HST Project has experience with many public sector employers for example:

Local – we have contact with private, municipal, and county organizations. Our instructors take part in local emergency drills, LEPC committees, and coordinate fire and police training. Local health department representatives will be invited to sit on the hazardous substance advisory committee. We have contact with private, municipal and county organizations. Our instructors take part in local emergency drills, LEPC committees and coordinate fire/police training. Members of two local health departments are on the advisory and working committees.

State – we work closely with IDNS, Public Health, Natural Resources, EPA, and unions to establish standardized training throughout their organizations. Representatives from the Illinois Department of Public Health, EPA, and Emergency Response Department are on the advisory committee.

University / College – will be targeted this year for both needs assessment and inclusion in courses. In 1999 a conference held for community and small college health and safety professionals revealed a need for hazardous substance training. We have had several new students from this group and our goal is to offer safety seminars soon to make it more convenient for these professionals to attend 40 Hr classes and refreshers.

The following agencies have participated in needs assessment and training: Illinois Department of Public Health, Illinois Department of Nuclear Safety, Waste Management and Research Center, Illinois EPA, Illinois Department of Labor, and many municipalities. Also participating in our programs are the University of Illinois at Chicago, University of Illinois at Urbana Champaign and Northern Illinois University.

Course offerings and locations are selected using a variety of criteria which includes past history, information obtained from the needs assessment, consultation with government agencies, participation in the NIOSH Hazardous Substance meeting and new information to determine which classes will be offered and where they will be offered. Courses for several state agencies are customized and include the Illinois Department of Nuclear Safety, Waste Management and Research Center, University of Illinois-Urbana/Champaign and University of Illinois-Chicago.

We have increased the number of types of classes, students attending, and locations for classes. Scheduling for classes has become dynamic. For example, the refresher class was scheduled for four two hour sessions instead of one eight hour class to coincide with a quarterly training schedule. This method of delivery met the needs of the government agency and enabled the HST program coordinator to tailor specific curriculum for that groups needs for that quarter. (Lab Safety, DOT Regulations, Hazard Recognition, etc...)

Courses are marketed in a variety of ways and include:

Website – current and perspective students can view our course outlines, register, and use our site as a search engine to help them in their educational and professional needs. This also helps us in our outreach assistance directive to assist the public with various circumstances.
Brochures – This year we have sent out over 6500 brochures.
Trade Shows – we have attended and set up displays in several regional conventions
Interviews – student, telephone, in meetings with agencies and corporations have all helped to influence priorities in course, location, price, and content of materials
CEUs – we offer continuing education credit CEUs, Industrial Hygiene Maintenance Points, DOT, and SFM certifications toward students continuing education.

Courses offered during this project period 2001-2002:

Course	Location	Participants	Length
40 hour general site worker	Champaign, Il	2	5
3 hour awareness course	Champaign, IL	15	0.4
8 hour general site worker	Summit, IL	8	1
8 hour general site worker	Champaign, IL	3	1
8 hour general site worker	Springfield, IL	1	1
8 hour general site worker	Bedford Park, IL	4	1
16 hour emergency management System	Champaign, IL	1	2
8 hour general site worker	Champaign, IL	11	1
40 hour general site worker	Springfield, IL	3	5
40 hour general site worker	Peoria, IL	1	5
8 hour general site worker	Springfield, IL	20	1
8 hour general site worker	Peoria, Il	1	1
40 Technician	Peoria, IL	1	5
8 hour general site worker	Chicago, IL	1	1

40 hour general site worker	Chicago, IL	1	5
8 hour general site worker	Champaign, IL	14	1
IMS	Beford, IN	4	1
8 hour general site worker	Peoria, IL	1	1
Biological and Chemical	Chicago, IL	42	1

Agricultural Safety and Health CE

Abstract

The Agricultural Safety and Health Program (ASH) was established in the Illinois ERC in 1991. The ASH Project is administratively housed in the Continuing Education Program. Leslie Nickels, MEd is the Program Director for Continuing Education at the Illinois ERC and Project Director for the Agricultural Safety and Health Project. Dr. Robert Aherin, a Professor in the College of Agricultural and a nationally recognized expert in agricultural safety and health, has been associated with the ASH Program since its inception. Dr. Robert Petrea has been active with the program since 1997 in his roles as Extension Specialist-Ag. Safety and Health, Chair of the Illinois Network for Agricultural Safety and Health (INASH), and as Executive Director of the national Agricultural Safety and Health - Network (ASH-NET). The ASH Program has thus historically been a collaborative endeavor between our University of Illinois at Chicago (School of Public Health) and University of Illinois at Urbana/Champaign College of Agriculture, Consumer, and Environmental Sciences(UIUC ACES) campuses. For the past several years, the primary focus of the ASH Program has been on Continuing Education and Outreach. However, on July 1, 2000 an academic agricultural safety and health program began at the University of Illinois at Champaign Urbana. Robert Aherin is the Program Director.

The target audience for the ASH continuing education program is practitioners and workers in the agricultural community. This includes health care providers, emergency response personnel, health and safety specialists, health educators, public health workers, cooperative extension workers, migrant farm workers, advocacy groups and farm owners. In addition, while the academic portion of the program goal is to increase the number of people with agricultural health and safety skills, the continuing education program seeks to support through continuing education and outreach those currently in secondary agricultural teaching secondary agricultural science teachers, and university teacher educators. Our previous record, current and past needs assessments, collaborations and course development and offerings are all developed with these audiences in mind. Our success in reaching and addressing some of the needs of this diverse audience is the cooperative relationships we have developed between local and regional groups such as UIC School of Public Health, UIUC College of ACES, partners who comprise INASH, Agricultural Extension Offices, Marshfield Clinic (Wisconsin), Community Health Partnership of Illinois, Migrant Health Promotion (Michigan), Illinois Department of Public Health, Illinois Rural Health Care Association, Carle Foundation Hospital and Carle Clinic, Southern Illinois University, Illinois State University, and ASH-NET.

Recommendations from the last review included:

- Include projections on the number of courses and students to be trained
- Discuss recruitment strategies
- Extend activities into the region surrounding Illinois
- Expand medical focus beyond pesticides and eye injuries
- Explore existing materials on personal protection from pesticides that might be suitable for the needs of the Community Health partnership of Illinois
- Increase the variety and number of course offerings

The ASH program goals are: 1) to identify the training needs of health and safety professionals, health care providers, public health workers, cooperative extension workers, farm owners, secondary agricultural science teachers, university teacher educators, and migrant farm workers on the issues of agricultural safety and health; 2) establish cooperative arrangements with agencies and organizations whose mission includes to addressing the agricultural safety and health needs; and 3) to develop and conduct continuing education and outreach programs to increase awareness and reduce the incidence of agricultural injuries and illnesses.

Significant Findings

a. INASH, a coalition of over 40 health and safety specialists representing over 25 organizations involved with agricultural health and safety from all parts of Illinois was founded and is sustained through the work of the ASH Project.
b. Continuing well established partnership with agricultural heath care organizations in Illinois through the Carle Agricultural Occupational Medicine Training program. Rural Health & Farm Safety Update Seminar is a seminar which is co-sponsored with a Carle Foundation Hospitals Center for Rural Health and Farm Safety focused on agricultural safety programs and initiatives at the National Safety Council, agricultural resources available for rural health and agricultural educators, mental health and stress among agricultural workers, emergency preparedness, and rural health care issues.
c. A Confined Space in Agriculture Awareness training program was developed in 1995 in cooperation with the ASH Project, Southern Illinois University, and the Equipment Manufacturers Institute. This course was offered to over 260 small business owners in Illinois, Wisconsin, Minnesota, Michigan, Ohio, Pennsylvania, and New York. The course was rated as very good to excellent by ninety percent of the participants.
d. In 2001 the ASH program, in cooperation with the partnership in eye injury prevention to Latino farm workers project, developed an 11 module "Health and Safety Program Advisor for Agriculture". The "Advisor" was then adapted for to be used specifically for eye injury program development. In summer of 2002 the "Advisor" is being pilot tested on two farms in Illinois and two farms in Michigan. Future program plans include working with partnerships in Wisconsin on the use of the "Advisor" at nurseries and greenhouses.
e. Evolving partnerships with other NIOSH-funded programs in the region including Marshfield Clinic and University of Iowa.
f. Medical Education is provided at the University of Illinois at Rockford, UIUC, UIC and Southern Illinois University. Dr. Petrea works with the medical schools on these campuses in conducting quarterly seminars on agricultural safety and health and continuing education through the program developed following the needs assessment.
g. Implementation of the *Using History and Accomplishments to Plan for the Future:* A Summary of 15 Years in Agricultural Safety and Health and Action Steps for Future Directions Project. This project consists of three overlapping primary activities: 1) a conference; 2) a consensus-work group activity; and 3) writing and editing a document. The primary first-year activity, the 2001 National Agricultural Safety & Health Conference: Using History and Accomplishments to Plan for the Future, featured Dr. Robert Aherin and Leslie Nickels assisted Dr. Robert Petrea of the University of Illinois College of Agricultural, Consumer and Environmental Sciences with the development and facilitation of a national conference of agricultural safety and health professionals, practicing farmers and practicing farmworkers or their representatives. The goal of the conference was to review the accomplishments during the past 15 years in agricultural safety and health and to develop a strategic plan for the foreseeable future. The offering of the conference was approximately two years in the making. The conference was held in March of 2001 in Baltimore, Maryland. Funding for this overall project was provided by various private and public organizations including Pioneer Seed Company, Deere and Company, the Kellogg Foundation, NIOSH, University of Illinois, Farm Foundation etc. Dr. Aherin was invited to make a white paper presentation on the academic training background needed by agricultural safety and health professionals. Leslie Nickels assisted with program planning and facilitation of the conference. Meeting and discussions were held with a variety of professional organizations and individuals in formulating the process to achieve the overall goal of developing a strategic plan. Attendance at the conference was 165 with funding provided for 25 practicing farmers and 26 Latino farmworkers and representatives to attend. A complete listing of conference presentations, sponsors, and invited organizations is available at http://www.age.uiuc.edu/ash-net/index.htm. The primary second-year activity, the consensus work-groups composed of professionals, farmers, and farmworkers, consisted of a one-day meeting immediately following the conference, scheduled teleconferences, and a one-day face-to-face meeting in February 2002. This meeting provided a forum to reach consensus on the particulars of the forthcoming

document. This consensus included the primary generalized recommendations and actions; specific strategies for achieving the recommendations; and document style, format, and contents.

h. The ASH project will continue to be a state wide resource for outreach and consultations. There is a resource center located at the UIC-SPH housed within the ASH project office and extensive materials housed at the University of Illinois at Urbana Champaign College of Agriculture. This duel collection of resources has been made possible by the existence of the ASH project. Faculty and student acquisition of materials from research, teaching, and conferences have enriched the resource center. The resources are used both for continuing education program development and implementation and academic program development. The materials are used by faculty to develop lectures and graduate students use the materials for literature review. The resources are a valuable asset to both the academic and continuing education program. The ASH Project provides a focus and home for these resources.
i. Age Appropriate Tasks for Farm Youth- Two one-day seminars in different parts of the state were presented to rural educators on age appropriate tasks for farm youth. The new national guidelines that were recently developed were reviewed. Dr. Aherin was involved in the development of these guidelines. One portion of the seminar involved a discussion on developmental characteristics of children from both a physical and cognitive standpoint and their effect of increasing injury risk to children exposed to farm environments. Participants were also made aware of the extensive resources that have been developed for this new program. Participants were encouraged to offer programs in their local service areas on this very important topic.

Report and Conclusions

Needs Assessment

Continuing education training continues basic program planning based on assessed needs using state and regional information. Needs assessment sources include in addition to national statistics: 1) strategic planning and priority setting within the Illinois Network for Agricultural Safety and Health (INASH); 2) Cooperative Extension Vital Statistics analysis; 3) Marshfield Clinic Survey; 4) UIC-GLC Primary Care Practitioner and Ophthalmologist Survey; 5) Survey of education secondary agriculture programs in Illinois; and 6) key informant survey. Future plans for needs assessments include a survey of employers in Illinois and surrounding states.

A survey of Illinois secondary agriculture teachers will be conducted in summer 2003 to assess the availability of, the use of, and the specific topics perceived as most needed relating to rural and agricultural safety and health. This survey will be available to the approximately 300 Illinois instructors at the 2003 Agriculture Teachers conference. The Illinois secondary agriculture curricula and format has been adopted as a model by several other states and Illinois agriculture programs currently provides education to over 24,000 students, the highest number of students on record.

Another survey of unit leaders and extension educators using the UI-Extension database will be conducted in 2005 on the perceived needs related to rural and agricultural safety and health topics. There are approximately 275 unit leaders and extension educators in the state. Based upon the findings of that survey, ASH will contact the annual conference planning committee for appropriate inclusion of requested topics in the 2005 – 2007 extension conferences.

Cooperation with Other Agencies and Organizations

Drs. Aherin and Petrea and Ms. Nickels have developed strong working relationships with a variety of campus, state and national organizations. The ASH Project is active with many organizations throughout the state. Courses are developed and implemented in cooperation with the College of Agriculture, Consumer and

Environmental Sciences, UI-Extension Service. In cooperation with Southern Illinois University, the ASH project developed and delivered 16 confined space courses for agriculture. These courses were conducted in Wisconsin, Illinois, Minnesota, Michigan, New York, Pennsylvania, and Ohio.

The ASH Project collaborates with state agencies, county health departments, hospitals, advocacy groups, trade associations, professional associations and educational institutions. Association with the Center for Rural Health, the Illinois Rural Health Association and the Illinois Public Health Association have solidified. Several state agencies are involved with the ASH Project. These include the Illinois Department of Agriculture and Illinois Department of Public Health. These organizations are active in INASH and provide technical and policy guidance. The Department of Agriculture is working with INASH specifically on issues surrounding the EPA Worker Protection Standard. The Illinois Department of Public Health has several divisions that cooperate with the project. The Center for Rural Health is an active member of INASH and provides program guidance. The Division of County Health Departments supports the research being done with the county health departments and is working with the ASH Project to bring the needs assessment component to other health departments.

ASH Project collaboration on the ASH-NET project has resulted in contacts that are national in scope. ASH-NET member participants include the directors of NIOSH Ag. Research Centers in New York and Kentucky and faculty members at Western Kentucky University, Emory University, University of Nebraska, and Eastern Washington University. Member participants also include the director of Iowa Easter Seals and principal staff within farmworker organizations in New York, New Jersey, North Carolina, and Florida. These contacts have already proved fruitful in securing the speakers presenting at the ASH-NET conference, the participants attending the conference, and the individuals participating in the consensus development work-groups. Such included personnel from all NIOSH Ag. Research Centers, NIOSH in Morgantown and Cincinnati, and USDA. Also participating in some fashion were farmers from nine states including Illinois and Indiana and farmworkers from all three migrant streams including individuals from Illinois. Others participating directly from the ASH Project region were speakers and other professional participants from Illinois, Iowa, Indiana, Kentucky, Wisconsin, Minnesota, and Ohio.

County health departments and community hospitals have cooperated with the project. The advocacy groups who work most closely with the ASH Project include the Illinois Eastern Seal Society, Illinois Farm Bureau, and Community Health Partnership of Illinois/ Illinois Migrant Council. In addition, stronger partnerships are developing with the National Farm Medicine Center in Wisconsin and Migrant Health Promotion in Michigan. In 1999 as part of the eye injury prevention program, ASH began working with Migrant Health Promotion. These partnerships resulted in the creation of a "Farm Health and Safety Advisor" described above. These organizations help to implement programs and disseminate information. For example the ASH in cooperation with the Illinois Migrant Council and Region V Environmental Protection Agency sponsored two intensive train-the-trainer courses for health care workers on worker protection from pesticides. The ASH Project trained the first "class" of certified pesticide trainers under the EPA Worker Protection Standard. In 1995/1996 the ASH Project developed and presented a Pesticide Recognition and Case Management Course for Practitioners in Illinois, Wisconsin, Indiana, Minnesota, and Ohio. Other organizations who work in cooperation with the ASH Project include the Illinois Medical Society, Illinois Rural Health Association and Illinois Public Health Association.

Finally, the ASH Project works has a long standing partnership with Community Health Partnership of Illinois which serves the migrant community. Dr. Aherin and Ms. Nickels are members of the Worker Protection Stakeholder Committee chaired by Susan Bauer of Community Health Partnership. This committee is made up of the Illinois Department of Agriculture, Farm Bureau, Cooperative Extension, and Great Lakes Center. Ms. Bauer is also on the GLC advisory committee.

Faculty and Staff Leadership

Program leadership is the combined effort on the part of Robert Aherin, PhD, Robert Petrea, PhD, and Leslie Nickels, MEd. The working partnership has existed since 1991 and resulted in: the establishment of a state wide network on agricultural safety and health in Illinois (INASH); establishment of training and research partnerships between academia, business, and workers (through advocacy groups); increased interdisciplinary teaching and research in industrial hygiene, occupational medicine, safety, and occupational health nursing; and leadership in bringing the public health occupational and environmental health community together with the agricultural community.

In addition this project has benefited from the expertise and commitment of faculty in other ERC programs. Anne Krantz, MD, MPH is an Attending Physician in Occupational Medicine, Department of Medicine at Cook County Hospital. Dr. Krantz is board certified in occupational medicine, internal medicine, and medical toxicology. For the past four years Dr. Krantz as lectured in short courses offered through the ASH Project, as well as been a speaker on agricultural health and safety issues at conferences around the state. Over the past four years Dr. Krantz has developed an expertise in medical surveillance for agricultural chemical exposures and monitoring. She is part of the planning committee for the Pesticide Cases Management courses as well as principal instructor. She was the co-investigator on the pesticide research project in Zamora, Mexico. She investigated the usefulness of a field test kit (EQM) for cholinesterase screening. Her investigation and findings have become an important part of training and technical assistance to local health departments.

Linda Forst, MD, MPH, MS is an Associate Professor in the UIC School of Public Health. Her undergraduate degree was in agriculture. She is board certified in occupational medicine and internal medicine, and her faculty appointments in the medical, nursing and public health schools make her uniquely qualified to develop, facilitate, and implement academic programs in the realm of agricultural health. She is also working cooperatively with other University of Illinois medical school campuses to develop occupational and environmental health curricula in occupational medicine. In 1999 Dr. Forst was awarded a NIOSH intervention grant on reducing eye injuries in Latino Farmworkers. Susan Bauer, MPH, MS, is Health Resources Coordinator for Community Health Partnership of Illinois/Illinois Migrant Council. Ms. Bauer has been an important member of this project for five years. She has over fifteen years in primary health care services for migrant farm workers with extensive experience in program management and resource development, occupational/environmental health, dental services delivery, interagency networking, conference planning, reproductive health, and public policy. Ms. Bauer has native oral and written fluency in Spanish. Ms. Bauer is an important link to the migrant farm worker community.

In addition to faculty strength the ASH program also benefits from support from the Center for the Advancement of Distance Education (CADE) at the School of Public Health. CADE is a state of the art instructional technology center that provides expert program development support for web and distance based training.

Training and Outreach

Over the past 3 years the program has conducted 15 courses and conferences for approximately 950 participants and provided leadership on many outreach activities.

The strengths the ASH program come from the long 10 year commitment and partnership of the UIC SPH, the UIUC ACES and Community Health Partnership of Illinois in identifying and addressing the health and safety needs of agriculture in Illinois. Drs. Aherin and Petrea, Ms. Nickels, and Ms. Bauer share a common collaborative commitment to prevention, training and outreach. In the past 2 years the ASH project has expanded this partnership to include NFMC (Wisconsin) and Migrant Health Promotion (Michigan). This has provided an opportunity to expand continuing education and outreach to the region, addressing the particular needs in each area. Successful programs and partnerships sustained through the ASH project include:

Pesticide Inspector Training for Government Officials

Rural Health and Farm Safety
Emergency Response Farm Program (3 times)
Agricultural Safety and Health Issues and Answers
Agricultural Appropriate Tasks for Youth
Agricultural Safety and Health in the New Millennium (Baltimore)
Illinois Network for Agricultural Safety and Health Fall Conference, Spring Conference
Worker Protection Train the Trainer (3 times)
Emergency Response to Pesticide Incidents
Pesticides Alternatives and Solutions
Agricultural Medicine/Pesticide Toxicology (2 times)
National Meetings (co-hosted National Institute for Farm Safety Conference)
Farm Accident Rescue/FarMedic (24 times)
Grain Bin Rescue
First on the Scene Training (3 times)
Agricultural Injuries and Issues (4 times)
Agricultural Occupational Health Hazards (3 times)
Age Appropriate Task for Children on Farms (4times)
The Effectiveness of Sensors to Detect Hazardous Atmospheres in Agriculture (2 times)
Utilization of Personal Protective Equipment in Agricultural
Agricultural Medicine Pesticide Identification
Agricultural Safety for Physicians Assistants
Health and Human Services Region V: Pesticides in the Rural Health Environment
Primary Injury Prevention (2 times)
Occupational Medicine in Illinois
Agricultural Health and Safety Fall Conference (4 times)
(Bloomington, IL)
Pesticide Case Management for Primary Care Practitioners
Agricultural Safety and Health Spring Conference (4 times)
(Effingham, IL)
Confined Space (Syracuse, NY) two times
Confined Space (Champaign, IL)
Confined Space (Madison, WI) two times
Confined Space (Manitowac, WI)
Confined Space (St. Cloud, MN) three times
Confined Space (Rochester, MN) two times
Confined Space (Lansing, MI)
Confined Space (EauClaire, WI)

While worker protection from pesticides was a central part of the ASH program over the past 6 years, new programming will include a broader range of topics specified in the program plan. Over the next 5 years programming will include one state and one regional conference per year; quarterly seminars for medical students throughout Illinois; and increasing the availability of health and safety training on the Internet. Internet training will include short courses and lectures.

Needs assessment results indicate that there is an increasing interest and use of web-based training by potential participants. The training needs of the target audience are varied and include both content and delivery issues. The content issues include increasing knowledge of recognition, control, and treatment of agricultural hazards. The program delivery issues include reduced resources, including time and dollars, for paying for training programs. In response, the ASH Project, in the next five years will emphasize identifying content area needs and deliver training through a variety of methods with an emphasis on distance education.

Pilot Projects Research Training

The purpose of the ERC Pilot Project Research Training Program (PPRTP) is to develop both the skills and the careers of new research scientists, by introducing them to the competitive grant application process and supporting them to conduct pilot research in the priority areas identified by the National Occupational Research Agenda (NORA). These pilot projects will encourage new and creative research approaches to help solve work environment problems in our region, and will develop future research scientists badly needed nation-wide. The research training objectives of this program are to:
1) Develop research expertise and capacity in ERC research trainees and young investigators;
2) Support new investigators in establishing new research areas; and
3) Encourage investigators from other research areas to apply their expertise to NORA topics.

Prior to the initiation of the Pilot Project Research Training Program, the ERC at the University of Illinois at Chicago initiated a mini-grants program that awarded funding to 34 trainees in the occupational health programs at UIC. Table 2 in the appendix presents the research projects and trainees with their disciplines that have been funded through this research training program. These projects have generated 18 presentations at scientific meetings and 14 publications in peer-reviewed journals.

Twenty-one awards have been given to fund 18 projects since the inception of the ERC Pilot Project Research Training Program in 1999 (FY2000). To date, these projects have supported 22 students, generated 2 subsequent grant proposals, one of which was successfully funded, 12 presentations at regional or national meetings, 6 reports/abstracts/posters or papers, and 3 publications. Three Pilot Projects received supplementary funding from other sources and 3 resulted in findings that were used toward MS or PhD degree theses.

The abstracts for all projects are contained in the appendix. Table 3 in the appendix lists the project #, fiscal year each project was funded, title, abstracts, principal investigator, affiliation of the principal investigator, total amount of the award, IRB status, NORA topics, and work products generated by the pilot project research projects funded since 1999 (FY2000).

Special Accomplishments

Although the number of awards each year is limited by the amount of available funds, the Illinois ERC has an active outreach and support program to encourage applications from affiliate and non-affiliated regional institutions. In FY2004, applications for Pilot Projects showed a marked increase in number, quality, and affiliate institutions relative to previous years. The targeted e-mail list normally used to publicize the Pilot Project Program continued to expand and targeted outreach efforts by the ERC Advisory Board and Executive Committee provided additional communications. This year, the Board and Committee expanded individual efforts to encourage potential researchers to apply, and several applications are directly attributable to that appeal. Table 1 below illustrates the number of applications and awards by year:

Table 1: Pilot Project Applications and Awards

Fiscal Year	**Applications**	**Awards**	**Available Award Funds**
2000	7	4	$43,840
2001	4	3	$43,468
2002	5	5	$74,533
2003	5	4	$66,311
2004	10	5	$63,244

Outreach has also included other campuses within the University of Illinois system, and two of the pilot grants were awarded to investigators at the University of Illinois Urbana-Champaign. In addition to enhancing the research capacity of the principal investigators, these awards funded graduate students at the Master's and Doctoral levels to work as Research Assistants on the research projects, amplifying the impact of the research training. The University of Illinois (UI) has a policy of providing complimentary tuition to graduate-level Research Assistants, but UI generally charges the tuition remission against the research grants. This year, the Illinois ERC negotiated a new University policy to defer charging tuition remission against Pilot Project awards, which increases available award funds to UI system researchers by as much as 10-20%.

Dr. Rosemary Sokas has taken over the chairmanship of the Research Committee as of FY2004 from Peter Scheff, Ph.D., who has taken on other responsibilities at Illinois ERC. Dr. Sokas joined the faculty of the School of Public Health last year as professor and director of the Division of Environmental an d Occupational Health Sciences, most recently having served as the Associate Director for Science at NIOSH. In previous academic positions she has successfully nurtured students and junior faculty through competitively funded grant applications and peer-reviewed publications, and has run similar pilot research projects. She will continue to emphasize regional outreach for applications and national presentation and publication of pilot project results.

Program Plan

Program announcement and competition: The ERC Research Committee mails and e-mails the Request For Proposals to ERC faculty and trainees and other investigators at our participating institutions who are engaged in research in related fields, TPG programs in our region and their trainees, other academic institutions in our region who have investigators working in these areas, members of the ERC Advisory Board, and occupational safety and health researchers in labor and industry in our region. The ERC Research Committee has prepared Request for Proposal (RFP) forms and instructions in electronic format that are easily downloaded from web pages or e-mailed as attachments. The instructions and application forms are posted on the GLC web site at: http://www.uic.edu/sph/glakes/ under "Funding Opportunities".

Scientific merit review process and criteria:
The project coordinator performs timely review of all applications the day after the proposal deadline to ensure that each is complete and meets the basic application criteria. Copies of the proposals are then distributed to the Research Committee for review. The committee is comprised of senior, research-productive faculty reflecting the ERC disciplines and the UIC and UIUC campuses as well as from one non-affiliated regional university. The committee conducts standard peer review with formal written evaluation and scoring and meets once to finalize review, with primary and secondary reviewers presenting recommendations. For FY2004, the Research Committee will be chaired by Dr. Rosemary Sokas, (previously chaired by Dr. Scheff) and coordinated by Salvatore Cali, MPH, CIH and currently includes the following members:

- Peter Scheff, Ph.D., (Industrial Hygiene, UIC)
- Lucy Marion, Ph.D. (Interim Director, Occupational Health Nursing, UIC)
- Rachel Rubin, MD (Occupational Medicine, Cook County Hospital)
- Linda Forst, MD (Occupational Medicine, UIC);
- Robert Aherin, PhD (Agricultural Safety and Health, UIUC);
- Richard Steffen, PhD (Agricultural Safety and Engineering Tech, Southern Illinois University)

The following criteria is used to evaluate the applications;
*1) **Significance:*** Extent to which the project, if successfully carried out, will make an original, important and/or novel contribution to the relevant field;
*2) **Approach:*** Extent to which the conceptual framework, design, methods, and analyses are properly developed, well-integrated, and appropriate to the aims of the project;
*3) **Feasibility:*** The likelihood that the proposed work can be accomplished by the investigators, given their documented experience and expertise, past progress, preliminary data, requested and available resources, institutional commitment, and (if appropriate), documented access to other research or technologies;
*4) **Submission:*** Plan for submission to external funding agency (specify) and expected submission date.

Preference is given to proposal applications that include one or more of the following criteria of relevance to the objectives:
1) Research capacity building in trainees and new investigators;
2) Regional occupational safety & health needs;
3) NORA objectives;
4) Participation of multiple stakeholders, including employers, employees, labor unions, professional trade associations, private non-for-profit organizations, and academia;
5) Workplace intervention and intervention effectiveness;
6) Scientific merit; and
7) Multi-disciplinary approaches.

Preference is given to proposals from the following states: Illinois, Wisconsin, Indiana, Missouri, and Iowa.

Program Records

The Program Coordinator, Salvatore Cali, maintains records of all grants submitted, reviewer comments, final priority scores, grants awarded, and amounts awarded. Each successful grantee is required to submit both programmatic and financial progress reports to Mr. Cali at least annually. In addition, the program tracks publications and presentations that result from funded projects; new products or processes; and subsequent grant applications based on pilot data collected through the PPRTP grant.

Faculty Reputation and Strength

The Research Program is a high priority at our Center as indicated by the composition of our Research Committee.

- Dr. Rosemary Sokas is Chair of the Committee and Director of the Environmental and Occupational Health Sciences Division.
- Dr. Scheff is a Professor of Environmental and Occupational Health Sciences.
- Dr. Marion is the Department Head of Public Health, Mental Health and Admin. Nursing, and Interim Director of the Occupational Health Nursing program at UIC.
- Dr. Rachel Rubin is the Director of the Occupational Medicine Residency Program at Cook County Hospital.
- Dr. Linda Forst is the Director of the Occupational Medicine Program at the University of Illinois and is an Associate Professor of Medicine.
- Dr. Robert Aherin is the Director of our Agricultural Safety and Health Program.
- Dr. Steffen is a Professor at Southern Illinois University

Program Evaluation

The success of the PPRTP program will be quantitatively evaluated on the basis of the number and quality of proposals submitted; the percent applications funded; the number of research publications produced by the grant; the number of RO1 and other types of applications submitted on the basis of pilot work conducted through the PPRTP program; the number of publications and presentations generated from the funded projects; and the number of trainees, young investigators, or new investigators engaging in occupational safety and health research as a result of the PPRTP program. The PPRTP program at UIC is currently in its fourth year of funding. To date, 21 pilot grant awards have been given to fund 18 projects. These projects have supported 13 junior faculty, one Ph.D. student principal-investigator, 21 student research assistants, and have generated 2 subsequent grant proposals, one of which was successfully funded, 12 presentations at regional or national meetings, 6 reports/abstracts/posters or papers, and 3 publications. Three Pilot Projects received supplementary funding from other sources and 3 resulted in findings that were used toward MS or PhD degree theses. This information is summarized in Table 3 of the appendix to this section.

Program Support from Other Sources

All faculty on the ERC Research Committee (University of Illinois and Southern Illinois University) contribute their time to this effort. University of Illinois at Chicago facilities, equipment, and support staff are also dedicated to this program. In addition, one of the projects funded received supplemental funding from the Great Cities Institute at UIC and one project received supplemental funding from the Fogarty grant of the Great Lakes Center at UIC.

APPENDIX: Summary of Funded Research Projects, Application and Instructions.

Table 2. University of Illinois Trainee Mini-Research Projects.

Research Project	Trainee	Program	Note
Development/validation of a heat-generated velocity field model	Ralph Bahr	IH	*□
An analysis of characteristics of employee health newsletter	Joan Davis	OHN	□
The relationship of CEO characteristics to health promotion in the small business workplace	Judith Kavathas	OHN	
Beliefs oncology nurses have about the use of personal protective measures while handling neoplastic agents	Valerie Gongaware	OHN	
Pilot study of occuptional and environmental factors associated with scleroderma	Linda Cocchiarella	OM	
An initial look at a group of patients with reversible bronchospasm	Enola Owi	OM	*
Surveillance of pesticide poisonings in Illinois	Pamela Strauss	OM	*□
IH survey of boron purification workers	Chris Keill	IH	*
Field study of vapor degreaser local exhaust hood performance	Rich Prodans	IH	*□
Characterization of organic and particle emissions from diesel bus engines	Jean Graf	IH	*□
Experience with having blood drawn	Pam Fox	OHN	□
Factors which influence male workers to engage in physical activity	Julia Cowell	OHN	□
PPD conversion amongst house staff in a public hospital	Linda Coccchiarell	OM	*□
Occupational characteristics of 19 to 35 years olds in Chicago who died of asthma	Mary Demers	OM	□
Screening protocol of boron purification workers	Aubrey Miller	OM	
A survey of field experiences in US occupational medicine residencies	Aubrey Miller	OM	*
Identification of sources of bio-hazards in hospital environments	Luke Curtis	IH	*□
Descriptive study of occupational lead exposure	Rose Menezes	IH	*□
Conversion rates of PPD and health behaviors in physicians	Lynn Fredrich	OHN	
Musculoskeletal injuries of fire fighters	Carolyn Blue	OHN	□

Research Project	Trainee	Program	Note
Predictive factors in acute and chronic low back pain	David Drury	OM	
Improving the process of case management	Sandra Cotting	OHN	
Occupational noise exposure and hearing loss in Korean airport workers	Oi Saeng Hong	OHN	*
Chemical exposure and pulmonary function in firefighters	Mike Beedle	IH	*
Level of uncertainty in risk assessment of unbuilt incinerator	Ingrid Witherel	IH	*
Evaluation of local exhaust ventilation devices used during cough induction with TB patients	John Dimos	IH	*
Evaluation of hospital respiratory protection	Tim Stauder	IH	*
Survey of TB isolation rooms in four hospitals	Jackie Vitallo	IH	*
Neuropsychiatric effects of ethylene oxide	Brian Svazas	OM	*
Barriers to safe work practices on farms	Cindee Knopp	OHN	
Ethanol emissions from candy glazing	Dave Baird	IH	*□
Emission factors for TCE degreasing and chromium plating	Jack Hawkins	IH	*□
Occupational dust exposure in Ukrainian coal miners	Kathleen Kennedy	IH	
Adolescent worker injury in the agricultural workplace	Judith Levy	OHN	
Prevalence of and associations between cardiovascular risks in firefighters	Lance Byczek	OHN	
Heavy metal exhaled air condensate	Michelle Watters	OM	

Note: * indicates that the project was presented as an oral or poster presentation at a scientific meeting; □ indicates that it was published in a peer-reviewed publication.

Abstracts for PPRTP Research Projects Funded July 1, 1999 (FY2000) - June 30, 2004 (FY2004)

Proposal Title: Teacher Assaults: Risk Factors & Compensation Costs
Abstract: Although school violence has received much attention, little is known about factors that precipitate an assault, the nature of resulting injuries, or consequences of the assault. The purpose of the study is to describe the magnitude and costs of assaults to a high-risk group of workers, teachers in Chicago Public Schools (CPS). Project objectives include: 1) describe the frequency, cost, outcome, and nature of injuries associated with teacher assaults; 2) identify contributing factors in terms of teacher, school, and environmental/community characteristics; 3) identify predictors of teacher assault. The sample will consist of all cases of intentional assaults that occurred to CPS teachers over the last three years (n ~ 225). Existing data will be used and sources include CPS internal reports, police and health department records. The data collection instrument will be refined during the study and reliability established. Descriptive statistics, analysis of variance, chi-square analysis, and logistic regression procedures will be used. This study will increase knowledge about contributing factors of assault in an understudied population, as well as provide initial data about claim costs. Knowledge gained from this study will serve as a basis to develop interventions to reduce the incidence and severity of assault-related injuries to teachers.

Proposal Title: An Exposure Assessment Method to Simulate Coughing in a Workplace
Abstract: The project will develop an exposure assessment method for a burst source of air contaminants, namely an infectious cough, using tracer particles that are detectable at very low concentrations in a room. The research product is an exposure assessment method that can be applied in work environments to simulate the hazard of viable or non-viable aerosol sources. The method is needed (1) to validate exposure assessment models of particle emissions in workplaces, (2) to evaluate sources and pathways of airborne infection in healthcare settings and to augment ventilation control strategies, and (3) to trace suspected sources of particulate air contaminants in other indoor environments. A portable device that simulates the expulsive phase of a human cough will be built to emit a burst of droplet nuclei. It will use respirable-size fluorescent microphores propelled by a pressurized air and tracer gas mixture to simulate the hazard. The device will be tested in a wind tunnel using an air sampling strategy to characterize the

dispersion and residence time of the tracer particles and gas. The particles will be collected on filters and counted with epi-fluorescent microscopy. The cough simulation device and air sampling array experiments will determine the limits of quantitation and detection for the new method.

Proposal Title: An Analysis of the Prevalence, Cause, and Cost of Injury to Fire Fighters
Abstract: The objective of the project is to study the prevalence, costs, and causes of occupational injuries among fire fighters. The analysis will take advantage of a unique data set provided by IRMA that contains detailed information regarding type, cause, and complete workman's compensation costs of injury to fire fighters in Northeastern Illinois. Changes in the prevalence, costs, and causes of injury will be examined across demographic characteristics of the workers and time. Costs of injury will also be examined across common types and causes of injury. The data will also be used to distinguish injuries that may be preventable through improved physical fitness. Total workman's compensation costs for fitness related injuries will be analyzed to evaluate potential economic benefits from programs designed to improve fitness levels. The cost of injury to firefighters has not been studied beyond single department analyses. Hence, the main contribution to improved work safety will be a detailed analysis of the costs of injury to fire fighters across type and cause as well as demographic characteristics and time. More generally, this analysis will help inform policies and programs designed to prevent injury, and help to efficiently allocate resources for reducing injury

Proposal Title: Intelligent Safety Sensing & Controls For Off-road Equipment
Abstract: This research will address the specific topic of intelligent safety sensing and control technology for off-road equipment. Off-road equipment is designed to perform operations while in moving. This often results in an unsafe working environment around the equipment for human-machine interaction while in operation. The long-term goal of this research is the development of an intelligent safety sensing and control technology to provide an automated safety assurance for off-road equipment. The principal objectives are to develop an intelligent safety sensing technology for detecting human presence and to develop a safety measure method for identifying safety index around the operating equipment. The information of human presence in area with different safety indexes will be used to support automated safety assurance function for off-road equipment. Interest exists at the commercial level in developing technologies along the line of this proposal. This proposal will cover the initial phase of developing intelligent safety sensing and control technology for off-road equipment. Funding to complete the final phases of the project will be sought from Federal agencies and industry. A project advisory committee, including experts from both agricultural safety and equipment automation areas, will be established to provide advice in conducting this research.

The above project was partially funded in its first year; it was expanded and funded for a second year.

Proposal Title: Human Exposure To A Mixture Of Dust And Ammonia
Abstract: Through the National Occupational Research Agenda (NORA), the National Institute for Occupational Safety and Health (NIOSH) has emphasized the need for research related to occupationally-related airway diseases such as asthma and chronic obstructive pulmonary disease (COPD). With that agenda as its primary emphasis, this research will investigate the health hazards associated with both airborne dust and ammonia gas concentrations typically found in modern swine confinement buildings by clinical trial. To that end, a novel human exposure apparatus will be tested for its ability to provide consistent, and easily monitored, levels of dust and ammonia to human subjects without constraining the subject's ability to breath normally through the nose and mouth. The apparatus consists of a small air-blower that moves air through a steel drum and into a hood worn over the subject's head. An aerosol and/or gas is injected into the drum where it is mixed with the main air supplied by the blower. Sample ports are available to measure aerosol and gas concentrations. Human subjects will be recruited and initially given a standard histamine challenge test. Subjects will then be exposed to low and high levels of an organically-derived dust (ground corn plant), ammonia, and a combination of the two. Results from

this study will be used as preliminary data in support of a larger grant developed to determine threshold levels of airborne contaminant concentration levels in swine confinements.

Proposal Title: Occupational Lung Disease in Ukrainian Coal Miners
Abstract: This pilot surveillance project will study occupational lung disease among Ukrainian coal miners. This population is ideal since they undergo a mandatory annual physical examination with 97% participation rates. Work, smoking , and clinical history will be obtained by face to face interview. Spirometry will be performed according to ATS guidelines. Lung function results will be compared to exposure and smoking history. Chest radiographs will be taken using Ukrainian equipment and the films read by NIOSH certified B-readers using ILO 1980 standards. Data on concentrations of coal mine dust will be obtained from MSHA sampling studies obtained in Ukraine as well as pilot dust samples from the specific mines where the study population works. Data will be analyzed for relationships between dust and tobacco smoke exposure and indicators of occupational lung disease. This study will aid evaluation of lung function measurements in medical surveillance as recommended by NIOSH in the 1995 Criteria Document. The results of this study of would have important implications for our domestic coal industry since spirometry surveillance has yet to be implemented. Outcomes for this project will be: presence of respiratory symptoms, category of pneumoconiosis on CXR, and lung function impairment.

Enrollment of subjects began after IRB approval 12/18/00. Training of research staff was completed 9/00 including ten who received NIOSH certification in spirometry. X-ray surveillance on two of the three study mines has been completed. 379 miners have been radiographed. 256 x-rays are in the U.S., 107 of which have had B-readings by NIOSH certified B-readers using ILO 1980 standards. 25 miners have been examined since the opening 2/27/01 and work, smoking, clinical history, and spirometry according to ATS guidelines have been obtained. Data on concentrations of coal mine dust have been obtained from Ukrainian sources. For the second year we, in conjunction with MSHA, plan to study the incidence of disease in an intervention mine, which will receive dust control measures, and compare this to our two control mines which have not been selected for this assistance. MSHA inspectors will accompany our investigators and sample these mines. We plan to expand the number of experienced miners and add a cohort of new hires evaluate the baseline rates of disease. Outcomes for this project will be: presence of respiratory symptoms, category of pneumoconiosis on CXR, lung function impairment and respirable dust levels in control and intervention mines.

The above project was expanded and funded for a second year.

Proposal Title: Immunologic Risk Factor for Laboratory Animal Allergy
Abstract: This project seeks to prevent occupational asthma, allergic dermatitis (such as contact urticaria), and allergic rhino-conjunctivitis. Laboratory animal allergy (LAA) effects about 30% of all laboratory animal workers. The proposed study seeks to identify risk factors for LAA. The risks we will study are those of the "hygiene hypothesis" of allergic diseases, which postulates that the risk of allergic diseases increases as childhood exposure to infectious agents decreases. Information regarding these risk factors will be obtained by questionnaire and blood testing. A cross-sectional study of current laboratory animal workers, with and without LAA, will be performed as will a prospective cohort study. In the cohort study we will obtain baseline historical and immunologic profiles of new workers with laboratory animals. Over time and we will identify variables that predict the development of LAA. This work has the potential to make several contributions to occupational health. Occupational allergic diseases are common yet there are currently no variables that consistently identify workers as being high risk for the development of these illnesses. The identification of such variables would allow greater protection of these workers in the workplace control measures that may otherwise not be implemented.

Proposal Title: Enhancing the Detection of PAH Metabolites

Abstract: The overall objective of this proposed work is to enhance the detection of PAH metabolites in urine samples. Compared with the methods published previously, improvement will be made regarding the number of PAH metabolites to be analyzed, and the detection limits. Both GC/MS and HPLC/FLD will be used, and compared for their sensitivity, accuracy, precision, and reproducibility. The method will be validated using raw or spiked urine samples. The identity of the metabolites detected will be confirmed using MS spectrum matching, and, if needed, by nuclear magnetic resonance spectroscopy (NMR). This work will establish the expertise at UIC SPH in analyzing PAH metabolites in urine and other biological samples. Realizing the high research priority of various funding agencies on cancer and risk assessment of PAHs, such expertise will enhance our ability in competing for external funding on occupational safety and environmental exposure to PAHs. This pilot project addresses a fundamental need in exposure assessment. Because of the state-of-the-art feature of our instruments, it is possible that the detection limits obtained from this work be the lowest ever achieved. This work has the potential to contribute significantly to occupational and environmental exposure and risk assessments.

The above project was expanded and funded for a second year in FY2004.

Proposal Title: Investigation of Sampling Performance of Thoracic Size-Selective Sampling Devices
Abstract: Improved criteria for sampling biologically-relevant aerosol in the inhalable, thoracic, and respirable size ranges have achieved international acceptance, and have been established in the U.S. by the ACGIH. The focus of this study, the thoracic size fraction, is intended to provide a conservative estimate of particles capable of reaching the portion of the respiratory system below the larynx, i.e., the lungs, during the mouth breathing. The thoracic fraction is biologically-relevant in the case of substances having a local effect on the conductive respiratory airways, like irritation, or in the case of toxic substances, which can slowly diffuse into the blood through the tracheo-bronchial walls. In recent years, a few thoracic samplers have been constructed and made commercially available but no extensive evaluation or field measurements with these samplers have been reported in the literature to date. The purpose of this study is to test the performance of commercially available thoracic samplers against commonly used 37-mm samples for wood dust exposure; and to determine how well each thoracic sampler mimics the ACGIH thoracic convention. The results of this study will serve to advance our understanding of thoracic dust exposure assessment methods, and eventually facilitate practical implementation of the ACGIH standards.

Proposal Title: Characterization and modeling of dust exposures at an agricultural facility.
Abstract: The overall objective of this proposed study is to examine dust exposure in an agricultural produce sorting and packing operation in an ultimate effort to control such exposures, thereby reducing eye and respiratory injuries and illnesses. Specifically, the proposed study intends to: 1) To quantify exposure to total and respirable dust; 2) To develop emission factors for sorting/packing operations; 3) To characterize the composition of the dust samples, including: Particle size distribution, Allergens, Metals, Pesticide residue, Percent silica, Percent plant fiber. Basic exposure data are limited, and there are no emission factors for any agricultural processes noted in the literature. This proposed study is to develop an emission factor for dust exposure in a produce sorting and packing facility. Development of such a factor will permit proximate estimation of exposures in similar facilities, will provide exposure estimates for historical epidemiological studies, and will allow for better design in the control of agricultural dust hazards. By characterizing the composition of dust, we will better understand possible health implications from such exposures in agriculture, specific to the Midwest region of the United States.

Proposal Title: Source Apportionment of PAHs in Chicago Residence Homes
Abstract: The overall objective of this work is to quantitatively apportion the sources of polycyclic aromatic hydrocarbons (PAHs) found in urban homes. This objective will be achieved by applying a chemical mass balance (CMB) to measured PAH concentrations in residential indoor air. Major indoor sources will be sampled and characterized for their molecular profiles, or fingerprints, of PAHs. The

proposed study will take the advantage of a large database obtained from our recently completed indoor PAH study. All data sets contain PAH concentrations in indoor and outdoor air samples collected simultaneously from non-smoker homes, and detailed information on other air quality parameters and household activities. Using this data base and other data obtained from the literature, the CMB model will be evaluated for its performance on indoor PAHs source identification and apportionment. The computer software CMB8.2 developed by USEPA will be used as the major computation tool. Source identification and apportionment are important components of exposure assessment, and key steps in the development of intervention strategies. Such efforts will foster our ability to assess human exposure and risk without the need of costly measurement, and provide scientific guidelines for intervention plans.

Proposal Title: Study of the Effect of Welding Processing Parameters on Fume Composition and Emission Rate

Abstract: Our objective is to evaluate and establish the relationships between the welding processing parameters such as composition of base metal, composition of the filler material (i.e., electrode), current, voltage, weld travel speed on welding emissions (composition, particle size, and morphology) and consequently on welding exposures. Welding emissions are complex mixtures of various elemental compounds (e.g., Mn, Ni, Cr, Si, Mo, V), gaseous compounds (ozone, nitrogen dioxide), and hydrocarbons (e.g., dioxins, PAHs). The complexicity of evaluating welding exposures is partly due to many different welding processing employing various base and filler materials, shielding gases for materials and metallurgical processing applications. By selecting two welding processes, which build on top of another, we will be able to isolate filler emissions from base metal emissions, which has not been reported in the literature to our knowledge. Construction of semi-empirical relationships for the emissions of elements as a function of welding processing variables (our literature review did not reveal such relationships already established) will be very beneficial in predicting emissions from other base and filler materials used in the same two welding processes and under various welding processing conditions.

Proposal Title: Mechanisms of Lung Epithelial Cytotoxicity due to Metal Exposure

Abstract: Occupational asthma occurs as a result of exposure to specific respiratory hazards in the workplace, and is currently the most common form of work-related lung disease. Welding is a common job function in many workplace settings, and is a significant risk factor in the development of occupational asthma. Condensed metal vapors of chromium and manganese stand out as putative causes of welding-associated occupational asthma, based on epidemiological studies. Current understanding of the biochemical mechanisms by which metal vapors cause occupational asthma is very limited. Toxicologic rather than immunologic processes may be primarily responsible for the development of occupational asthma following exposure to metal vapors. Epithelial damage is common to all forms of asthma, so the direct toxic effects of respiratory hazards to lung epithelium are significant. Chromium and manganese are cytotoxic to lung epithelial cells in vitro.The current proposal will determine the mode of cellular death following exposure to these metals (i.e., apoptosis vs. necrosis), and the initiation of toxic stress responses in epithelial cells. This mechanistic information may help explain individual susceptibilities to the development of occupational asthma, provide a rationale for workplace prevention and clinical treatment options, and provide an experimental framework for the characterization of other respiratory toxicants.

Proposal Title: Immunologic Markers of Laboratory Animal Allergy

Abstract: This application is for continuation of funding of a NIOSH Research Pilot Project funded in 2001. The research seeks to identify factors that allow predicting the development of occupational allergies and asthma. Laboratory animal workers have about a 1 in 3 chance of developing occupational allergies and for this reason serve as good model for study. The putative predictive factors for the development of occupational allergies to animals come from five sets of data. First, we are evaluating historical information that, according to the "hygiene hypothesis" predict the development of allergies and asthma. Second, we are performing allergy testing to determine atopy, the tendency for allergies to

common aeroallergens. Third, we are evaluating concentrations of specific serum cytokines, molecular mediators of allergic and inflammatory responses. Fourth, we are evaluating exhaled nitric oxide, a marker of pulmonary inflammation as a predictor. Last, we are evaluating antibodies to microbes that have been associated with allergic diseases. During the current year of funding this project has proceeded very well, exceeding expectations for subject enrollment. Cross sectional data has been obtained and with continuation of funding for collecting 1-year prospective data and for enrolling newly hired workers without prior exposure to lab animals

Proposal Title: Adaptive Tractor Overturn Prediction System (ATOPS)
Abstract: It is proposed to fit a ¼ scale tractor with load cells that indicate the forces on all wheels in real time. The tractor will also be modeled in a mechanical systems simulation tool called ADAMS. The tractor and model will be used to run classical tractor overturn scenario's such as 1) gradual lateral overturn on a hill slope, 2) gradual backward overturn on a hill slope, 3) high draft force backward overturn. The results will be used to show that the proposed method is superior compared to alternative sensors such as tilt or acceleration sensors. These sensors can only detect an overturn as it is happening, whereas the proposed force measurement sensor can give an indication of the proximity of the overturn occurrence.
The objectives are to 1) develop the instrumented tractor, 2) to model the overturn behavior in mechanical systems simulation software (ADAMS) and to 3) validate the model using the ¼ scale tractor.

Proposal Title: Effectiveness of Standing Conditions in Reducing Fatigue & Discomfort
Abstract: The objectives of this study are:
1) Compare the effects of wearing safety shoes, standing on a floor mat, and wearing shoe in-soles on workers' perceptions of tiredness, fatigue and discomfort following eight-hours a day of standing for two weeks of exposure to each condition.
2) Determine the strength of the relationships between age, gender, height, weight, and job tenure and fatigue and discomfort experiences when exposed to each of the three different standing conditions.
Thirty workers from a manufacturing company will be divided into three groups of ten, stratified by age. Each will be exposed to the three standing conditions for two weeks and rotated by a Latin square design. After each eight-hour shift, the worker will fill out a questionnaire, which rates the standing condition used.

Determining the influence of flooring conditions on discomfort and fatigue, and correlating these conditions with age, gender and job tenure addresses one of NORA's top research priority areas: intervention effectiveness. The findings of this research will advance efforts in determining the most effective interventions to reduce fatigue and discomfort from prolonged standing in the workplace.

Proposal Title: Pesticide toxicity to lung epithelium as a factor in chemically-induced asthma
Abstract: Exposure to chemical sensitizers in the home, school and workplace contributes to the steady increase in asthma incidence observed over the last twenty years. Exposure to pesticides in both occupational and home settings has been associated with asthma. Toxicologic, rather than immunologic, mechanisms may be most important in the induction of asthma via low molecular weight chemical agents such as pesticides, but the nature of these toxicologic mechanisms is unknown.

We hypothesize that chronic, low level exposure to certain pesticides results in toxicity to lung epithelium, and that this in turn leads to the initiation of cellular signaling and inflammatory mediator release to effect further responses in the lung, one manifestation of which is asthma. Lung epithelial cells *in vitro* will be used to study the mechanisms of toxicity of pesticides associated with chemically induced asthma. Pesticide treated epithelial cell cultures will be used to determine: 1) direct toxic effects; 2) the initiation of cellular signaling cascades; and 3) the release of inflammatory mediators (i.e., GM-CSF, IL-6, IL-8, IL-10, TNF-α).

Understanding pesticide toxicity in lung epithelium will clarify the mechanisms through which these and other low molecular weight chemicals act in the lung, ultimately enabling better prevention and treatment strategies for chemically-induced asthma and other respiratory diseases.

Proposal Title: Laboratory Animal Allergen Production and Transport in a Working Animal Research Facility

Abstract: Allergy to laboratory animals is a common problem in research facilities and can cause rhinoconjunctivitis, contact urticaria or occupational asthma. Controlling allergen exposure is key to preventing the development of allergies and reducing disease severity among those sensitized. Prior research has described allergen concentrations in animal rooms of research facilities but little is known about the transport of allergens within the facility, which is useful in planning control measures to reduce allergen exposures of all workers, both sensitized and non-sensitized. We propose a study that has two components: 1) allergen production and transport modeling within the facility, and 2) an intervention to reduce exposure. Mouse allergen concentrations will be measured over a twelve hour period daily for five consecutive days, both inside a mouse room, in the adjacent corridor, and in an administrative office where animals are not present. This will be repeated following the implementation of micro-isolator cage cover use. Measures of ventilation and real-time particle counts will be obtained throughout the study. Samples will also be obtained in the rooms, corridor and office for endotoxin analysis. We expect to model the production and transport of the allergen and to measure the effectiveness of the intervention.

Table 3: Summary of Pilot Project Research Grant Awards

								Project Outcomes								
Project #	Project Title	Principal Investi-gator	Institu-tion	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# stu-dents funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supple-mental funding	# of findings/data toward degree	Miscell-aneous Project Outcomes
2000-01	**Teacher Assaults: Risk Factors and Compensation Costs**	Pamela Levin, Faculty	UIC	4/00-6/01	$13,697	UIC Expedited initial & continuing review; Mar 3, 2000 & Mar 3, 2001; Protocol #H-2000-0098	Traumatic Occupational Injuries	Yetunde Solade, MD, MPH candidate, 2 semesters; Erica Green, DrPH candidate, 1 semester.	2	The data collection tool and approach was used in a grant application to NIAAA in June, 2000		Poster presentation was given March, 2001 at the Midwest Nursing Research Society Meeting, Cleveland, OH	A report was provided to Human Resources at the Chicago Public Schools		Project funding was supplemented by funding obtained from the UIC Great Cities Faculty Seed Fund.		
													Manuscript in preparation: *Risk Factors and compensation costs related to teacher assaults*				
2000-02	**An Exposure Assessment Method to Simulate Coughing in a Workplace**	John Franke, Faculty	UIC	11/99-4/02	$13,550	N/A	Exposure Assessment Methods; Infectious Diseases; Indoor Environment										In progress
2000-03	**An Analysis of the Prevalence, Cause, and Cost of Injury to Fire Fighters**	Surrey Walton, Faculty	UIC	12/99-11/00	$8,400	N/A, Feb 1, 2000; Registered as research involving 'persons' but not 'human subjects'	Social & Economic Consequences of Workplce Illness & Injury	One research assistant, Lance Byczek, @ 50%, one semester	1			Walton, SM, Conrad, KM, Furner, SE and Samo, D, "Analysis of the Cause, Type, and Cost of Injury to Fire Fighters", IRMA Coffee & Conversation, Fitness and Wellness, Where Do You Begin?; Chicago, IL; September, 2000.		Walton, SM, Conrad, KM, Furner, SE and Samo, D, "Cause, Type, and Cost of Injury to Fire Fighters" American *Journal of Industrial Medicine, 2003; 43(4): 454–458.*			
												Conrad, KM, Reichelt, PA, Lavender S, Walton SM, Reducing Musculoskeletal Injuries in the Fire Service: Getting from There to Here", Chicago Area Health Services Research Meeting, Chicago, IL, May 2003.				

Table 3: Summary of Pilot Project Research Grant Awards

								Project Outcomes									
Project #	Project Title	Principal Investigator	Institution	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# students funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supplemental funding	# of findings/data toward degree	Miscellaneous Project Outcomes
2000-04	Intelligent Safety Sensing and Controls for Off-road Equipment	Qin Zhang, Faculty	UIU-C	4/00-6/01	$8,193	N/A	Control Technology & PPE	One graduate student @ 30%, one year, One Ph.D. candidate, Mr. Linsong Guo, was partially funded by this project	1	NIOSH research grant proposal, *Intelligent Shared-control Safety Protection Technology for Mobile Agricultural Machinery*		Oral presentation at 2001 ASAE Annual Meeting, Sacramento, CA, July, 2001	Guo, L. S., Q. Zhang, and S. Han, 2001. Safety Detecting System using ultrasonic sensors, ASAE Paper 01-3135, ASAE, St. Joseph, MI.				
Total FY 2000:	4				$43,840			3	4	2	0	4	3	1	1	0	1
2001-01	Human Exposure to a Mixture of Dust and Ammonia	Patrick T. Shaughnessy, Faculty	U. of Iowa	7/00-6/01	$15,518	UIowa Full Board Review & Continuing Review; Oct 9, 2000 & Oct 9, 2001, ID #200007075	Asthma & Chronic Pulmonary Disease	One research assistant, Deb Pfab, @ 50% for one semester	1		"Exposure of Grain Dust and Ammonia to Asthmatic Subjects: A CAFO Model" Sigurarson ST, Kline, JN, O'Shaughnessy PT. Pilot grant supported by the NIEHS funded Environmental Health Sciences Research Center. College of Public Health, University of Iowa.	Research apparatus at American Industrial Hygiene Conference & Exposition, San Diego, CA Abstract # 48, Mehaffy, J. O'Shaughnessy PT Characterization of a novel human exposure apparatus	Sigurdarson ST, O'Shaughnessy PT, Watt JA, Kline JN. Experimental Human Exposure to Inhaled Grain Dust and Ammonia: A Model of Concentrated Animal Feeding Operations. Abstract: American Journal of Respiratory and Critical Care Medicine, 2003 167(7) A504.	**Manuscript in review:** O'Shaughnessy PT, Mehaffy JM, Watt J, Sigurdarson S, Kline JN. Characterization of a hooded exposure apparatus for inhalation of gases and aerosols. Am Ind Hyg Assoc J (In Press).			
														Sigurdarson ST, O'Shaughnessy PT, Watt JA, Kline JN. Experimental Human Exposure to Inhaled Grain Dust and Ammonia: Towards a Model of Concentrated Animal Feeding Operations. American Journal of Industrial Medicine. Submitted for Publication 2003			
2001-02	Intelligent Safety Sensing and Controls for Off-road Equipment	Qin Zhang, Faculty	UIU-C	4/00-6/01	$11,950	N/A	Control Technology & PPE	1 PhD candidate partial funding	1								See award 2000-04

Table 3: Summary of Pilot Project Research Grant Awards

								Project Outcomes									
Project #	Project Title	Principal Investigator	Institution	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# students funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supplemental funding	# of findings/data toward degree	Miscellaneous Project Outcomes
2001-03	**Occupational Lung Disease in Ukrainian Coal Miners**	Robert Cohen, Faculty	UIC	7/00-6/01	$16,000	UIC Expedited initial & continuing review; Dec 4, 2000 & Dec 4, 2001; Protocol #2000-0578	Surveillance, Occupational Chronic Obstructive Lung Disease					27th ICOH International Congress on Occupational Health, Iguassu Falls, Brazil, February 23-28, 2003, abstract accepted for Free Paper Session: PREVALENCE OF RESPIRATORY DISEASE IN UKRAINIAN COAL MINERS, Cohen, R.A., Basanets, A., Besonova, N. Latishef, E., Lysenko, O., Kundiev, Y.	Cohen R. Kennedy K. Mukhin V. Conroy L. Levels Of Respirable Coal Mine Dust Ukrainian Coal Mines. Amer J Respir Crit Care Med 165: Suppl 8: A532, 2002		Co-funded by a Fogarty grant		
													Cohen R. Basanets A. Besonova N. Latishef E. Oliynyk I. Shulzhenko I. Velho V. Kundiev Y. Prevalence Of Radiologic Pneumoconiosis In Active Ukrainian Coal Miners. Amer J Respir Crit Care Med 165: Suppl 8: A529, 2002				
Total FY 2001:	3				$43,468			2	2	0	1	2	3	2	1	0	1
2002-01	**Occupational Lung Disease in Ukrainian Coal Miners**	Robert Cohen, Faculty	UIC	1/02-6/02	$16,000	UIC Expedited initial & continuing review; Dec 4, 2000 & Dec 4, 2001; Protocol #2000-0578	Surveillance, Occupational Chronic Obstructive Lung Disease										See award 2000-04
2002-02	**Immunologic Risk Factor for Laboratory Animal Allergy**	Samuel Dorevitch, Faculty	UIC	1/02-6/02	$15,844	UIC Initial review; Nov 5, 2001; Protocol #2001-0349	Allergic & Irritant Dermatitis; Asthma & Chronic Obstructive Pulmonary Disease	Student funding: 1 RA @ 12.5%, Kimberly Hopp	1			Occupational Medicine Grand Rounds, June 4, 2003			Supplemental funding from "Asthma and Demolition in Chicago Public Housing (NIEHS K-08 ES 113202-01)		
2002-03	**Enhancing the Detection of PAH Metabolites**	An Li, Faculty	UIC	8/01-6/02	$15,975	UIC Expedited review; Aug 16, 2001; Protocol #2001-0487	Exposure Assessment Methods	One RA, 2 semesters	1								In progress

Table 3: Summary of Pilot Project Research Grant Awards

								Project Outcomes									
Project #	Project Title	Principal Investigator	Institution	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# students funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supplemental funding	# of findings/data toward degree	Miscellaneous Project Outcomes
2002-04	Investigation of Sampling Performance of Thoracic Size-selective Sampling	Serap Erdal, Faculty	UIC	1/02-6/02	$15,621	UIC Expedited Review; Nov 15, 2001; Protocol #2001-0709	Exposure Assessment Methods	Two RAs, 1 semester	2			Investigations of Sampling Performance of Thoracic Personal Samplers in Woodworking Facility (Brown, Conroy, Franke and Erdal) presented at AIHA Local Section, Chicago, 3/6/2002.				Data used toward MS degree	
												Investigations of Sampling Performance of Thoracic Personal Samplers in Woodworking Facility (Brown, Conroy, Franke and Erdal) presented at UIC Environmental Symposium, Chicago, November, 2001.					
												Investigation of Sampling Performance of Thoracic Personal Samplers in a Woodworking Facility, (Brown and Erdal) presented at AIHA Conference and Exposition, June, 2002.					
2002-05	Characterization and Modeling of Dust Exposures at an Agricultural Facility	Steve Lacey, Research Trainee, PhD candidate	UIC	8/01-6/02	$11,093	UIC Expedited Review; Aug 9, 2001; Protocol #2001-0506	Special Populations/ Exposure Assessment Methods	One RA, 1 semester	1			Presented at June, 2002 American Industrial Hygiene Conference and Exposition, and awarded best student paper				Data used toward PhD degree	
Total FY 2002:	**5**				**$74,533**			**4**	**5**	**0**	**0**	**5**	**0**	**0**	**1**	**2**	**2**
2003-1	Source Apportionment of PAHs in Chicago Residence Homes	An Li, Faculty	UIC	7/02-6/03	$14,246	N/A	Indoor Environment	1 PhD candidate, 2 semesters	1								In progress
2003-2	Study of the Effect of Welding Processing Parameters on Fume Composition and Emission Rate	Serap Erdal, Faculty	UIC	7/02-6/03	$17,806	N/A	Exposure Assessment Methods and Mixed Exposures	One RA, 2 semesters	1								In progress

Table 3: Summary of Pilot Project Research Grant Awards

Lorraine M. Conroy | 010-52-7262

								Project Outcomes									
Project #	Project Title	Principal Investigator	Institution	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# students funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supplemental funding	# of findings/data toward degree	Miscellaneous Project Outcomes
2003-3	Mechanisms of Lung Epithelial Cytotoxicity due to Metal Exposure	Daniel Tessier, Faculty	UIC	7/02-6/03	$17,277	N/A	Asthma and COPD	One RA, 2 semesters	1			Cytotoxicity of Chromium(VI) and Manganese to Lung Epithelial Cells In Vitro, Presented by Laura Pascal at the 25th Midwest Environmental Chemistry Workshop, UIC, October 4, 2002.				Data used toward PhD degree	In progress
2003-4	Immunologic Risk Factor for Laboratory Animal Allergy	Samuel Dorevitch, Faculty	UIC	7/02-6/03	$16,982	UIC Initial review; Nov 5, 2001; Protocol #2001-0349	Allergic & Irritant Dermatitis; Asthma & Chronic Obstructive Pulmonary Disease	Two RA, 1 PhD, 1 semester	3								In progress
Total FY 2003:	4				$66,311				6	0	0	1	0	0	0	1	4
2004-1	Adaptive Tractor Overturn Prediction System (ATOPS)	Tony Grift, Faculty	UIUC	7/03-7/04	$15,686.12	N/A	Traumatic Injuries										In progress
2004-2	Laboratory Animal Allergen Production and Transport in a Working Animal Research Facility	James Artwohl, Academic Staff	UIC	7/03-7/04	$15,049.38	Animal welfare assurance ACC# 03-141	Asthma and Chronic Obstructive Pulmonary Disease; Indoor Environment; Mixed Exposures; Control Technology and Personal Protective Equipment; Exposure Assessment Methods	2 RAs 25% for 2 mos, 1 RA 25% for 4 mos	3								In progress
2004-3	Pesticide Toxicity to Lung Epithelium as a Factor in Chemically-Induced Asthma	Daniel Tessier, Faculty	UIC	7/03-7/04	$13,069.94	N/A	Asthma & COPD	1 RA 50% for 6 mos	1								In progress
2004-4	Effectiveness of Standing Conditions in Reducing Fatigue & Discomfort	Stephanie Opel, Graduate Research Student	University of Wisconsin, Milwaukee	7/03-7/04	$8,994.91	Pending	Intervention Effectiveness										In progress

Table 3: Summary of Pilot Project Research Grant Awards

Lorraine M. Conroy | 010-52-7262

								Project Outcomes									
Project #	Project Title	Principal Investi-gator	Institu-tion	Project Period	Award amount	IRB Status	Primary NORA Topic	Student Funding	# stu-dents funded	# proposals generated	# additional funding generated	# presentations given	# of reports/abstracts/posters/papers generated	# publications generated	# of supple-mental funding	# of findings/data toward degree	Miscell-aneous Project Outcomes
2004-5	Enhancing the Detection of PAH Metabolites	An Li, Faculty	UIC	7/03-7/04	$10,443.36	Pending	Exposure Assessment Methods	1 RA 25% for 12 mos	1								In progress
Total FY 2004:	5				$63,244			3	5	0	0	0	0	0	0	0	5

NORA Research Support

Goals and Objectives

We proposed to conduct interdisciplinary field research in the NORA priority areas of Mixed Exposures, Asthma and Chronic Obstructive Pulmonary Disease, and Exposure Assessment Methods. The overall project will lead to development of larger, multidisciplinary projects (program projects) in the areas of asthma and other respiratory disease as a result of complex mixed exposures arising from work in welding and agriculture.

We planned and are conducting coordinated research across disciplines in our center involving multidisciplinary research in two general work environments, welding and swine confinement. While the exposure in both settings are different, the work settings are related in that they both result in mixed exposures (irritant gases and particulates) and work in these areas is associated with asthma and other respiratory disease. The welding setting results in exposure to predominantly low molecular weight compounds while the swine confinement setting results in exposure to a mixture of low and high molecular weight compounds.

The specific activities included two field tests involving faculty and trainees from each of the academic programs. One is a field study in a welding work setting and the other will be in swine confinement. The objectives of each study are: 1) to quantify exposure to particulate and gases; 2) to further develop emission factors as a function of process variables; 3) to apply the emission factors to the development of a predictive model for personal exposure; 4) to assess respiratory health of workers in these settings; and 5) to begin testing the use of exhaled air condensate as a biomarker for exposure and as an indicator of lung response mechanisms.

Background and Literature Review

Asthma is a multifactorial disease, exhibiting a variety of clinical manifestations due to both intrinsic (i.e., genetic) and extrinsic (i.e., environmental and occupational) factors. Occupational asthma occurs as a result of exposure to specific respiratory hazards in the workplace. It accounts for up to 28% of all adult-onset asthma and is currently the most common form of work-related lung disease [1,2]. Occupational asthma commonly results in the necessity of workers leaving their jobs, their diminished health and well-being, and significant changes in quality of life.

Occupational asthma typically develops de novo from chronic exposure to a known sensitizing agent, although the exacerbation of existing asthmatic conditions is also common. Symptoms develop following a latency period that ranges from months to years [2]. This latency period following chronic low-dose exposure distinguishes occupational asthma from reactive airways dysfunction syndrome (RADS), which classifies asthma-like symptoms and airway responsiveness following acute, high-dose exposures to respiratory irritants [3]. There is significant overlap, however, between occupational asthma, RADS, and other respiratory ailments resulting from occupational exposures, given the limited means by which the lung can respond to injury [4]. The duration of exposure dictates the progression of occupational asthma and the subsequent outlook for recovery. Removal from the exposure situation within a short time from the development of asthma symptoms increases the chance of full recovery, whereas prolonged exposure results in chronic airway hyperresponsiveness and functional impairment.

There are over 250 identified occupational respiratory hazards that can lead to the development of occupational asthma [5]. Metal fumes, organic and inorganic chemicals, plant & animal proteins, and grain dusts all are known causative agents.

Agents responsible for occupational asthma are broadly categorized into high molecular weight (> 5000 Daltons) and low molecular weight (< 5000 Daltons) compounds. Examples of the former are animal proteins, enzymes, grain dusts and flours, while examples of the latter include metals, drugs, and chemicals. The high molecular weight agents and some of the low molecular weight agents function through immunogenic mechanisms to induce asthma, as evidenced by the production of specific IgE [3]. Other, non-IgE mediated immunogenic responses also are hypothesized [1]. For the majority of low molecular weight compounds, however, atopy is not a factor, and evidence of IgE mediated responses is absent or inconsistent at best [3, 6].

In a recent review article in Environmental Health Perspectives [3], Lombardo and Balmes succinctly summarize the state of research for occupational asthma in general: *"Current understanding of the mechanisms by which many agents cause occupational asthma is limited, especially for low molecular weight sensitizers and irritants."*

Background: Welding as a Model

Welding is a common job function in heavy- and light-industry workplace settings, and is shown to be a significant risk factor in the development of occupational asthma [7-9]. Studies show, for example, a four-fold increase in the incidence of asthma among U.S. welders compared to the general U.S. population [8], and a two-fold increase in airway responsiveness in welders versus nonwelders in the same workplace setting [7].

Many types of welding processes are utilized depending on the specific purpose of the task, therefore there are many potential causative agents of occupational asthma from welding. In general, welding fumes are complex mixtures of respirable particulates, chiefly condensed metals, metal oxides, and organic compounds [7]. Condensed metal vapors of chromium and nickel stand out as putative causes of occupational asthma based on epidemiological studies for certain forms of welding [8, 9]. Manganese is also a major component of welding fumes.

A review of the recent literature (1980-2000) indicates that research on the relationship between welding fumes and occupational asthma is primarily epidemiological; little research has been conducted to date on the basic toxicity of welding fume constituents or potential mechanisms of toxicity as they relate to occupational asthma, although there is good evidence that direct toxicological mechanisms may be involved [10, 11]. Many studies quantify exposure to welding fume as respirable or total particulate or look at a few specific metals. Little research has been devoted to more complete characterization of the complex welding exposure, especially related to differences in welding processes.

Background: Swine Confinement Facility Environment

Swine confinement workers are exposed to a number of agents that are hazardous to the respiratory tract. Indeed, pulmonary function (FEV1) has been shown to decrease over time in swine confinement workers as compared to farmers who handle grains and to non-farmers. Cigarette smoking increases the decrement in lung function in all three groups, with swine confinement workers being the most affected. Infectious organisms, antigenic materials (from the animals and insect parts), endotoxins, gases, and other particulate matter with adsorbed chemicals such as pesticides are present in the indoor environment of swine confinement facilities. These agents have been linked to asthma and decrements in lung function in a number of occupational groups.

Although it is clear that the pathogenesis of respiratory tract irritation and asthma has to do with an inflammatory process in the airways, the exact mechanism of action for occupational exposures leading to

asthma has not been elucidated. As asthma becomes recognized as a syndrome, rather than a specific disease entity, it is important to examine the pathogenesis of the various pathways that lead to the clinical picture of cough, wheezing, shortness of breath, and mucous secretion that may be reversed with beta-adrenergic inhalers. An understanding of the pathogenesis of this syndrome may come from knowledge about the chemical mediators present in the lung secretions of individuals who are exposed to agents know to cause inflammation in the respiratory tract.

Preliminary Work at the Occupational and Environmental Health and Safety Education and Research Center at the University of Illinois at Chicago

An initial *in vitro* study conducted by our group (Tessier and students, including NIOSH trainees) indicates that metal exposure may have a direct toxic effect on lung epithelial cells but may also result in immunological mediators being released, i.e., an indirect pathway for the immune response following exposure to metals. Another study of welding exposure conducted by our group (Wadden, Scheff, Conroy, Franke, and 10 trainees) resulted in the development of workplace emission rates and emission factors as a function of production variables, such as number of welders, number of welding-minutes, length of weld, etc.

Another pilot study involved preliminary evaluation of exhaled air condensate as a biomarker for metals exposure (conducted by Forst and a NIOSH trainee). The study involved measuring metal concentrations in exhaled air and comparing these values to those found in blood and urine. This preliminary study was conducted on non-occupationally exposed non-smokers. The study provides a baseline for metal detection in exhaled air condensate and an initial evaluation of the relationship of metal concentrations in exhaled air condensate and in blood and urine.

Progress

The projects are currently being conducted and will result in preliminary data related to each of the objectives as well as technical and feasibility information about these work settings. The results of these coordinated projects will be a systematic evaluation of the technical issues (limits of detection, expected concentrations, health status, etc) and the feasibility issues (costs for analysis, limits of detection, willingness of employers and employees to participate in this type of research, etc) of conducting larger health studies of these working populations in these work settings. This program will foster research collaboration among many faculty members in the ERC, including collaborative work between Chicago and Urbana partners. It will also provide trainees with excellent research training opportunities and will foster cross-disciplinary interaction.

Student research projects (currently underway and planned) are shown in Table 1. The table shows those projects resulting from the interdisciplinary field studies that are part of the NORA Support activities as well as related projects in the ERC supported by the Pilot Projects Research Training program and other extramural funding.

Table 1. Student Research Projects

Project	Setting	Trainee	Funding
personal exposure and workplace characterization	welding	Julie Plavka, IH Trainee (MS)	ERC NORA
personal exposure and workplace characterization	swine confinement	IH Trainee (MS)	ERC NORA
Biomarkers for metals exposure	welding	Anjali Kalra, OM Trainee	ERC NORA
PAH biomarkers	welding	Rajiv Vij, IH student (non-trainee,	ERC PPRTP

		MS)	
cytokines- blood, EBC	welding, swine confinement	IH student, MS	ERC NORA
eNO, eCO	welding, swine confinement		ERC NORA
lung function	welding, swine confinement		ERC NORA
occupational history and respiratory health (questionnaire)	welding	Robert Miser, OM Trainee	ERC NORA
occupational history and respiratory health (questionnaire)	swine confinement	OHN Trainee	ERC NORA
cellular toxicity and signaling in vitro	welding	Laura Pascal, IH Training (PhD)	American Lung Association
laboratory characterization of welding fume	welding	Laurel Berman, IH Trainee (PhD)	ERC PPRTP

Field Study

The field research part of the study in a welding facility is complete. A local manufacturing facility agreed to allow us to conduct the research at their site. Human subjects approval was gained and 38 subjects were recruited. The study involved collecting a series of biological samples before and after work and monitoring exposure to metals and irritant gases during work. Two groups of workers are being studied, a welding group and a non-welding group. Data analysis is under way and publications are being prepared. We are also preparing extramural research proposals and expect to submit one in October 2003. At least two others are planned for February 2004. The field study in a swine confinement facility is also progressing. We have identified a facility that is willing to participate. We are awaiting approval for human subject research before recruiting subjects. A series of biological samples will be collected before and after work and exposure to organic dust, endotoxin, and ammonia will be monitored during work.

Welding Emissions Chamber Project Development Report

Bi-weekly meetings are attended by Dr. Serap Erdal, Laurel Berman, Srinivas Durgam, and Todd Schooonover. The objective of the project is to develop a chamber in which welding can be studied in a controlled environment. A secondary objective is to design a versatile chamber that may be utilized in other emission and possibly detection method validation studies.

The first phase of the project was to assess the relevant literature. Literature was collected and reviewed on welding and other emission studies, emission chamber design, construction and testing, welding process studies, studies of welding fume composition, welding fume exposure and control studies, and studies related to the effects of varying welding parameters. Literature was reviewed and put into a spreadsheet matrix to enable comparison among studies and provide reference to studies by individual parameters or study results. Particularly applicable are AP-42 Development of Particulate and Hazardous Emission Factors for Electric Arc Welding and publications by the American Welding Society (AWS).

The second phase of the project was emission chamber design. The chamber went through three major iterations. The first was based on the Batelle welding chamber and was determined inappropriate due to inability to characterize airflow well. The second iteration was designed after the ANSI/AWS chamber

and incorporated a bottom which enclosed the welding area. This design was determined to be inadequate in terms of air supply to the welding area and inability to create and study a uniformly distributed welding fume. The current design is similar to the ANSI/AWS test chamber but will include a long exhaust duct designed to capture and uniformly distribute all welding fumes and gases. This allows for representative sampling of the welding fume generated from the welding process.

The chamber design allows for a variety of validation and sampling methods prior to actual emission studies. The chamber capture efficiency will be tested using an aerosol generator and sulfur hexafluoride gas. These will be generated inside the operating chamber while air outside of the chamber is monitored to test for complete capture. The chamber will be flow tested in the area of the duct targeted for sample extraction. Flow testing will be done using the pitot traverse and rotating vane anemometer methods to determine flow uniformity and average. Flow rate can also be determined using the sulfur hexafluoride tracer gas.

Several sampling strategies will be executed in the emission chamber. Welding fume will be sampled isokinetically to ensure representative collection of metal particulate. Isokinetic samples will be collected for metals speciation analysis by ICP-MS, size fraction metals gravimetric analysis, and total metals gravimetric analysis. Gaseous nitric oxide and ozone emissions from the welding process will also be monitored. Welding fume emissions will be converted to emission factors as a function of welding minutes and type and mass of wire consumed.

One IH PhD trainee and one MS student are working on this project.

Molecular Responses on Lung Epithelial Cells In Vitro Following Chromium and Manganese Exposure.

Condensed vapors of heavy metals are a significant hazard of welding activities, associated with an increased risk for developing respiratory disease. Chromium, nickel and manganese are predominant metals in welding fumes, and were therefore the focus of the present study. Molecular and cellular effects of heavy metal exposure to lung epithelial cells in vitro were investigated using cytotoxicity assays, immunoblot analysis of protein phosphorylation and immunochemical detection of the inflammatory cytokines IL-6, IL-8 and TNF-alpha. We show that chromium(VI) and manganese, but not nickel, are cytotoxic to normal human lung epithelial cells (SAEC and BEAS-2B) in vitro, at concentration ranges correlated to concentrations of these metals found in welding fumes. Chromium(VI) and manganese (0.2 – 200 mM) caused cytotoxic effects within one hour post-treatment, with a maximal effect of 64% and 60% loss of cell viability, respectively following 24 hrs exposure. The toxic effect was associated with increased levels of intracellular phosphoprotein levels and subsequent release of inflammatory cytokines IL-6 and IL-8. Therefore, the observed effects of chromium(VI) and manganese in lung epithelial cells demonstrate a mechanism through which cytotoxicity of these metals can result in inflammatory responses in the lung, a hallmark of various respiratory diseases.

Seminar Series

We developed and are delivering a research seminar series that was included into our weekly interdisciplinary seminar. In the first year, we invited four recognized researchers and/or policy makers to present on topics related to the proposed interdisciplinary research. In order to include the widest possible audience for these research seminars, we presented the seminars via computer link to remote sites (University of Illinois campuses in Urbana, Rockford, Peoria, and Quad Cities). We have invited another four speakers for the second year of the program with the first presentation scheduled for October 2003.

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An Li and Xiaoyu Liu. Combined Effects of Aging and Cosolvents on Sequestration of Phenanthrene in Soils (submitted).

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Dorevitch, S., Persky, V. and Scheff, P.: Housing Demolition and Air Pollution: Working with a Local Public Housing Environmental Task Force to Minimize Exposure. Paper #74522 for presentation at the annual meeting of the American Public Health Association, San Francisco CA, Nov. 15-19, 2003.

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Presentations ([t] indicates NIOSH trainee or former trainee; [s] indicates IH student or former student)

Laurel Berman [t] (Serap Erdal). Multi-Media Emissions Inventory for Polychlorinated Biphenyls in the Great Lakes Basin. Presented at the Annual Meeting of the International Association of Great Lakes Reserachers, Chicago, Illinois, June 22-23, 2003.

Amy Carollo [t] (Serap Erdal). An Evaluation of the Hazardous Waste Remediation Standards for the Midwestern States. National Meeting of the Air & Waste Management Assoc., Baltimore, June 23-27, 2002. (5th place, Annual AWMA Lake Michigan States Section Student Paper Competition)

Laurel Berman [t] (Serap Erdal). Multi-Media Emissions Inventory for Polychlorinated Biphenyls in the Great Lakes Basin. National Meeting of the Air & Waste Management Assoc., Baltimore, June 23-27, 2002. (3rd place, Annual AWMA Lake Michigan States Section Student Paper Competition)

Steve Lacey [t], L. M. Conroy. Dust Exposure Modeling at a Food Processing Facility. Amer.Indust.Hygiene Conf., San Diego, June 1-6, 2002. (Best Paper Award for Exposure Modeling).

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Rocio P. Jimenez [t], Linda Forst. Peer Educational Based Occupational Eye Injury for Latino Farm Workers. Amer.Indust.Hygiene Conf., San Diego, June 1-6, 2002.

Lezah P. Brown [t], Serap Erdal. Investigation of Sampling Performance of Thoracic Samplers in a Woodworking Facility. Amer.Indust.Hygiene Conf., San Diego, June 1-6, 2002.

Laura E. Pascal [t], Daniel M. Tessier. Cytotoxicity of Heavy Metals in Welding Fumes as a Factor in Occupational Asthma. Amer.Indust.Hygiene Conf., San Diego, June 1-6, 2002.

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J. L. Paulin [t], D. M. Tessier. erbB-2 Tyrosine Kinase Activity in the Prostate Cancer Cell Line LNCaP Following Treatment by Select Pesticides. Amer.Indust.Hygiene Conf., San Diego, June 1-6, 2002.

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Amy N. Carollo [t] and Serap Erdal. Scientific and Regulatory Basis for the Risk-Based Hazardous Waste Cleanup Levels Established by the Midwestern States. American Industrial Hygiene Association Chicago Section student paper competition, March 6, 2002.

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Jae-Kil Jang [s]. Optimization of silica gel chromatographic clean-up function procedure for analyzing PAHs and PCBs in sediment. American Industrial Hygiene Association Chicago Section student paper competition, March 9, 2000 (1st place winner for best graduate student poster).

Felice Norlock [t]. Source apportionment of indoor PAHs in urban residences American Industrial Hygiene Association Chicago Section student paper competition, March 9, 2000.

Lorraine Lardizabal [t]. Advanced monitoring for fenceline toxic emissions: an evaluation of the UV-DOAS. Amer. Industrial Hygiene Assoc. Chicago Section student paper competition, March 9, 2000.

Cara Casten [t]. Air toxics in Hamilton County, OH. American Industrial Hygiene Association Chicago Section student paper competition, March 9, 2000.

Priority Organic Pollutants in the Sediment of the Milwaukee Harbor Estuary. Invited speaker, research seminar, the Department of Earth and Environmental Sciences. University of Illinois at Chicago. Feb. 10, 2000.

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Mills [s], W.J. and Scheff, P.A.: Data Analysis and Evaluation of Ambient Air PCB and PCDD/DF Concentrations in the Vicinity of a PCB Incineration Project. Presented at the International Conference on Environmental Engineering 99-ICEE, University of Murcia, September 9-10, 1999, Cartagena, Spain.

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Jae-Kil Jang and An Li. Temporal Trend and Spatial Distributions and Source Identification of PAHs and PCBs in Lake Calumet Area, Chicago. American Industrial Hygiene Conference & Exposition. San Diago, CA. June 1-6, 2002.

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An Li and Jae-Kil Jang. Temporal Trend and Spatial Distributions of PAHs and PCBs in Lake Calumet Area, Chicago. 24th Midwest Environmental Chemistry Workshop, Minneapolis, MN, Oct. 5-7, 2001.

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Felice Norlock and An Li. Large Volume Injection PTV-GC-MS Analysis of Polycyclic Aromatic Hydrocarbons in Environmental Samples. Society of Environmental Toxicology and Chemistry, 21st Annual Meeting, Nashville, TN. Nov. 22-26, 2000.

An Li and Xiaoyu Liu. Sequestration of Phenanthrene by Soils in Mixtures of Water and Methanol. Society of Environmental Toxicology and Chemistry, 21st Annual Meeting, Nashville, TN. Nov. 22-26, 2000.

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Occupational Health Nursing Faculty and Trainees

(Total Publications = 103; 87% in peer review publications)
(* Denotes graduate of UIC OHN Program)

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Agricultural Safety and Health Academic

The following are publications/presentations that relate to the academic program since it was initiated. There has not been adequate time for students to publish their work. Publications should be available within the next year.

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CONTINUING EDUCATION AND OUTREACH

Papers and Abstracts:

Nickels, L Including Pshycho-social Issues in a Systems Approach to Health and Safety, NSC, San Diego, CA October, 2002

Nickels, L. Zanoni, J Health and Safety for Community Home Care Workers, Best Practices Conference: Ideas That Sizzle, Baltimore, MD October 2002

Nickels, L., Zanoni, Community and Home Care Workers: Best Practices in Health and Safety Training, Best Practices Conference, Pittsburgh October 2000

Nickels, L., Zanoni,J Community and Home Care Workers: A Conference on Injury and Illness Prevention. APHA 1999

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Zanoni, J., Nickels, L., Forst, L., Bauer, S., Skinner, S., Eye Injury Prevention with Community Health Educators. Baltimore, MD. 2002

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Zanoni, J., Nickels, L., Conroy, L., Duvall, K., Hinkamp, D., Rossol, M., Scrimshaw, S., Health in the Arts (HARTS) Conference. Chicago, IL, 2000.

Zanoni, J., Nickels, L., Goldfarb, E., Kurzee, R., HUD Environmental Training Courses Best Practices Award. Chicago, IL, 2000.

Zanoni, J., Nickels, L., Siquera, C., Levenstein, C., Morelia, First Conference on Occupational and Environmental Health under the Framework of Integration of the Americas. Michocan, Mexico, 2000.

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