

**IOWA EDUCATION AND RESEARCH CENTER FOR  
OCCUPATIONAL SAFETY AND HEALTH**

**ANNUAL REPORT  
July 1, 2006 – June 30, 2007**

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## Introduction and Executive Summary

The Heartland Center for Occupational Health and Safety, based at the University of Iowa, has served Federal region 7 (Iowa, Nebraska, Kansas, and Missouri) as a center of excellence in interdisciplinary training, education and research in occupational health and safety since 2000. Since its inception, the Center has grown from three academic training programs and a continuing education & outreach program to a Center with seven nationally recognized academic training programs, a strong regional continuing education & outreach program, and programs to support innovative student and new faculty research on National Occupational Research Agenda topics. The Center's work is supported by the National Institute for Occupational Safety and Health; the University of Iowa Hospitals and Clinics; and the Deere Foundation. The Center has benefited from strong support from workers, employers, and professionals. Highlights of how the Center has helped workers and businesses in the region and the nation include:

- Graduates are actively recruited to private and public sector positions, reflecting the great state, regional, and national need for professionals trained in occupational health and safety.
- 96% of all graduates have begun professional careers in occupational health and safety, serving 1000's of workers in diverse workplaces in the region and nation.
- Since 2003, students have published 48 peer-reviewed papers, addressing topics important to the NORA research agenda
- For the first time, the state of Iowa has master's level trained Occupational Health Nursing graduates, a need met by the Heartland Center at the University of Iowa. These highly skilled nurses are preventing illness and injury in Iowa and regionally---- Cargill Meat Solutions, Ottumwa, IA; Palo Alto County Health System, Emmetsburg, IA; Winneshiek Medical Center, Decorah, IA; Mercy Hospital, Cedar Rapids, IA; Finley Business Health, Dubuque, IA; Home Health Corporation of America, Salisbury, MD; and State Farm Insurance, Lincoln, NE
- Recent graduates have been recruited to fill the national need for PhD trained educators and researchers in occupational health and safety. They are now on faculty at the University of Utah, Western Kentucky University, Southeast Oklahoma State University and east Tennessee State University and serving the nation in positions with the Centers for Disease Control and NIOSH..
- Students are carrying out research that will make a practical difference in the health, safety and productivity of working people. These include prevention of workplace injuries among military recruits, dairy farmers, agricultural production workers and prevention of illness in workers exposed to diesel exhaust, pesticides, and nanoparticles. Since 2003, students have published 48 papers in peer-reviewed journals and disseminated these research results to workers and employers through newsletters, trade journals, and presentations
- Hundreds of professionals in the state and region are keeping up-to-date with current occupational health and safety knowledge and practices through the Center's continuing education programs.

Major innovations include reaching practicing nurses for MSN training in Occupational Health Nursing through a web-based interactive curriculum, implementing an updated curriculum in Industrial Hygiene, and expanding distance learning via *Elluminate Live* for continuing education, outreach and academic coursework.

Heartland Center website: <http://www.public-health.uiowa.edu/heartland/>

**A. Program Title: Outreach Program****B. Program Director: Kimberly J. Gordon, RN, MA, BSN, COHN-S****C. Program Description****D. Program Activities and Accomplishments****E. Program Products****F. Future Plans**

The Heartland Center for Occupational Health & Safety (Heartland Center) has a very successful outreach program reaching well into Federal Region VII (Iowa, Kansas, Missouri and Nebraska). During the last five years, Heartland Center faculty and staff have incorporated educational development, presentations, consultation and many other activities into our Outreach program. The activities reach all disciplines of our Center including industrial hygiene, occupational medicine, occupational health nursing, ergonomics, agricultural safety and health, and injury prevention.

**Educational Development**

Center outreach extends to other colleges within the University of Iowa, other institutions within Region VII, professional associations, industry and practitioners. Examples within the University include the Colleges of Engineering, Law and Medicine, the Labor Center, and the Health Protection Office. Specifically, Dan Anton, PhD, PT, ATC (Ergonomics) has worked closely with the UI College of Engineering on curriculum enhancement related to ergonomics and human factors for biomedical engineering students. Drs. Anton (Ergonomics) and Craig Zwerling (Occupational Medicine) collaborate with the Labor Center to develop and teach labor-focused short courses delivered directly to workers.

Our collaborations outside the University have involved Iowa State University, Iowa Extension Service, University of Kansas, University of Nebraska, Clarkson College, and Iowa Wesleyan College, as well as the University of South Africa and the School of Public Health at The Gambia College. For example, Kelley Donham, MS, DVM (Agricultural Safety and Health), assisted with curriculum development for doctors of veterinary medicine students at Iowa State University. Wayne Sanderson, PhD, CIH (Industrial Hygiene) helped Clarkson College (Omaha, NE) develop a curriculum for training nurses and other practitioners concerned with safety and health needs of Hispanic agricultural workers.

**Presentations**

Heartland Center faculty and staff share their knowledge in a wide variety of presentation formats. For example, Allen Occupational Health, an occupational medicine clinic in Waterloo, IA, invited Dr. Anton to lecture on *Ergonomic Interventions* at a “Daybreak Employer Breakfast” which was open to employers and workers in the area. Various faculty members have served as speakers at meetings of professional organizations such as the Iowa-Illinois Section of the American Industrial Hygiene Association, the Central States Occupational Medicine Association, the American Society of Safety Engineers (northeast Iowa chapter), and the American Association of Occupational Health Nurses (Missouri and Nebraska state chapters, Northwest, Central and Northeast Iowa chapters). Kenneth Culp, RN, PhD (Occupational Health Nursing), is in demand throughout the region to present information on the aging workforce, and Kerri Rupe, MSN, ARNP, FNP-C, COHN-S (Occupational Health Nursing) provides on-site training on injury prevention at a meat processing plant in Ottumwa, IA.

**Consultation**

We also provide an array of consultative services. William Heitbrink, PhD, CIH, and Thomas Peters, PhD (Industrial Hygiene), have been consulting with industry on control of aerosols. Fredric Gerr, MD

and Nancy Sprince, MD, MPH (Occupational Medicine) are frequently asked to provide information specific to the treatment of occupational exposures and injuries. Lar Fuortes, MD (Occupational Medicine), William Field, PhD (Occupational Epidemiology), and Stephanie Leonard, MS (Industrial Hygiene) provide consultation and community outreach to workers and families with a history of exposures related to their prior employment at US Department of Energy sites like the Iowa Army Ammunition Plant.

Ms. Leonard also provides onsite consultation and technical assistance for a variety of businesses that has the potential to directly and immediately impact work practices. She provides this service through WORKSAFE IOWA (WSI), an innovative multidisciplinary outreach program within the CPH Department of OEH that offers consultation services statewide in industrial hygiene, ergonomics, product safety, occupational medicine and occupational health nursing. Educational services are also provided to occupational health and safety professionals, employers, and employees. The WSI Occupational Medicine Associate Network (WSI Associate) is a third component of the program—a coalition of 10 hospital-based occupational medicine (OM) clinics, each serving a distinct catchment area. Through WSI, we have successfully provided outreach from all of our activity categories, and by addressing the needs of the OM clinicians, we have a trickle-down way of influencing OSH practitioners and workers.

The Heartland Center Outreach Program has developed a strong reputation in the region, and we plan to continue the ongoing work in all our categories of outreach activities. We will respond to the steady flow of invitations and requests for presentations and assistance with educational development and continue our direct consultation to employers and workers that can influence policy development and work practice changes. Dr. Anton (Ergonomics), for example, plans to conduct evaluations of ergonomic issues at two worksites, a large implement manufacturer and a manufacturer of probe covers for operating room equipment. Both consultations will be conducted with an interdisciplinary consult team including Dr. Anton, Henri Cuddihy, MD (Occupational Medicine) and Scott Guthmiller, MBA (UI HealthWorks, a WSI Associate).

### **Information Dissemination**

Information dissemination will continue to be promoted through such media as the monthly electronic newsletter (“Health and Safety Bulletin”) customized for and distributed to each WSI Associate who in turn distributes it to employers and workers in the catchment area. Up-to-date occupational safety and health information is also being provided via an exclusive WSI Associate listserv. WSI Associates utilize the information in their practice and share it with employers and workers.

### **Goals and Objectives**

We will continue our ongoing efforts in these categories, while working toward three additional objectives. Because the WSI model meets the needs of practitioners so effectively, we now plan to expand it further into Region VII. We also want to extend our reach in the area of educational development, including developing a formal link with the only NIOSH Training Program Grant recipient in our region. With a continuing emphasis on outreach to ethnic minorities, we plan to explore OSH outreach needs of American Indians in Region VII.

### **Objective 1. Expand the existing WORKSAFE IOWA (WSI) Occupational Medicine Associate Network.**

Progress toward objective:

- incorporated the Bergan Mercy Occupational Health Clinic in Omaha, NE, into the Associate Network;
- ongoing communication with an eligible (hospital-based) occupational medicine clinic in Lincoln, Nebraska;

- WSI has significantly helped the Heartland Center reach occupational health practitioners, administrators, and businesses. Working so closely with the Associates who treat the occupational health problems of workers on a daily basis allows us to identify the most-needed OSH information and smoothly translate it to practice in a timely way.

**Objective 2. Two new partnerships for curriculum development will be cultivated, with Central Missouri State University and the University of Nebraska.**

Progress toward objective:

- ongoing communication with Central Missouri State University (CMSU), which houses the only NIOSH-funded Training Program Grant (TPG) in Region VII, and the University of Nebraska.
- Wayne Sanderson (IH) presented at the CMSU Spring 2006 two-day safety conference on “*Unusual Exposures.*”
- Dan Anton, PhD, PT, ATC (Ergonomics), is moving forward with curriculum development plans for the University of Nebraska (Lincoln), in collaboration with M. Susan Hallbeck, PhD, Associate Professor of Industrial and Management Systems Engineering. Initial discussions have included the use of distance learning software (Elluminate Live) to deliver educational content, e.g. Dr. Anton providing a lecture on exposure assessment methods and Dr. Hallbeck reciprocating with one on the ergonomic design of tools. In addition, Dr. Hallbeck has requested curriculum supplementation from Center faculty member R. William Field, PhD (Occupational Epidemiology), who can provide lectures on occupational epidemiology.

**Objective 3. Work with the Aberdeen Area Tribal Chairmen’s Health Board (AATCHB), the Aberdeen Area Indian Health Service, and Tribal Universities and Colleges to determine needs related to occupational health and safety and to share information on the types of outreach activities available through the Heartland Center.**

Progress toward objective:

- As a first step, conference calls were conducted in July 2005 with Carole Anne Heart, Executive Director of AATCHB, and Francine Romero, PhD, an epidemiologist and member of the AATCHB.
- Needs assessment continues with Joe Coulter, PhD, College of Public Health Associate Dean for Diversity

**Program Plan**

These three objectives will build on our established strengths. The proposed activities will broaden our impact in the region and further diversify the institutions, practitioners, and populations that we assist.

**A. Program Title: Pilot Project Research Training Program****B. Program Director: Patrick O'Shaughnessy, PhD****C. Program Description**

The Pilot Project Research Training (PPRT) Program at the Heartland Center ERC began in July 2001 and has completed six rounds of competition and funding. Over the past year, there have been no changes in the program announcement, methods of scientific review, or program recordkeeping.

**Faculty reputation and strength:** Nancy L. Sprince, MD, MPH has directed the PPRT since its inception. Patrick O'Shaughnessy, PhD, Associate Professor of Occupational and Environmental Health, is the proposed new Director of the PPRT, beginning July 1, 2007. Dr. O'Shaughnessy is a recognized expert and grant recipient in the area of aerosol physics and nanoparticle exposure. He has been a member of the University of Iowa ERC since its inception in 2000, as a member of the Industrial Hygiene Core. He directs the key course Environmental Health and has contributed to required Industrial Hygiene courses. He has served as Secretary, Vice-Chair and Chair of the Aerosol Technology Committee of the American Industrial Hygiene Association and is a current member of the Health-Related Aerosol Working Group of the American Association of Aerosol Research. He is currently a member of the editorial review board of the Journal of Occupational and Environmental Health. Through his research projects he has provided support and mentorship for IH student research related to aerosol science and environmental engineering. He has a leadership role within the Department of Occupational and Environmental Health in his role as Associate Head for Student Affairs and Curriculum. He has published 30 papers in peer-reviewed journals. He is the Principal Investigator of a grant from NIOSH on assessment methods for nanoparticles in the workplace and the PI of a research project within the Great Plains Center for Agricultural Health, investigating new methods for evaluation of organic dust aerosols. He is thoroughly familiar with the current pilot project review processes in the ERC. He has provided thoughtful reviews of pilot grant proposals for the ERC, as well as for other pilot grant programs, including the Center for Health Effects of Environmental Contamination, the Environmental Health Sciences Research Center, and the Center for Global and Regional Environmental Research. He is experienced as a reviewer of grants for NIH and has been a member of an NIEHS Special Study Section and a member of the Center for Scientific Review Special Emphasis Panel study section.

**Collaboration with regional research training institutions:** The Heartland Center ERC serves Federal Region VII, which includes Iowa, Nebraska, Kansas and Missouri. The Research Pilot Grant Program has continued collaboration with regional academic institutions that provide training in occupational health and safety. The ERC has sought pilot grant applications from regional institutions, including the only TPG in the region at Central Missouri State University. We have presented the results of pilot projects via distance education methods (polycomm and Elluminate Live) to reach a broad regional audience.

**Program evaluation:** There has been no change in the method of program evaluation

**D. Program Activities and Accomplishments****E. Program Products**

**Summaries of the five pilot projects funded this budget period:**

1. *Determination of relation between actual contact force at hand/glove interface and the grasp force for a set of standardized pinch and pencil hold tasks; PI: doctoral candidate, U. of Nebraska*

This research aims to provide new understanding of the extent of compensation that people do to overcome loss of tactility when donning gloves. This is especially true for health care professionals in general and dental professionals in particular. The primary objective of the study is to understand the relation between the actual force and the contact force when performing tasks with thin gauge gloves. As there are no standardized test protocols to measure the force at the hand glove interface and at the glove handle interface, an initial objective is to develop a methodology to determine the force at the glove handle interface and the hand glove interface. The second objective is to determine the relationship between actual contact force and the grasp force for a set of standardized pinch and pencil holds. This study aims to provide pilot data on extent of overexertion. Since dental tasks are the main theme of this research, the results will benefit dental professionals. All the dental tasks involve forceful exertions at awkward postures. This study will provide objective data on the extent of over grasp that they do, and thus provide a basis for their improvement and possible prevention of musculoskeletal disorders of the hand.

2. *Retrospective epidemiologic study of chimney sweeps; PI: doctoral candidate, University of Iowa*

The aim of this study is to determine whether or not Chimney Sweeps employed within the United States have higher rates of occupationally-related adverse health outcomes. A pre-existing historic Chimney Sweep Registry has been relocated from Geisinger Health Care System in PA to the University of Iowa, College of Public Health. The specific aims include: 1) Compare all cause mortality rates of chimney sweeps to the U.S. population; 2) Compare the cause specific mortality rates of chimney sweeps to the U.S. population; 3) Evaluate the incidence of self-reported respiratory and cardiovascular diseases and symptoms among chimney sweeps by duration of work and by self-reported level of exposure; and 4) Evaluate whether or not work practices are related to adverse health outcomes in the study population. The proposed research addresses many of the National Occupational Research Agenda's priority areas as well as meets a regional occupational health need, while laying both the ground work for future research projects and infrastructure for training.

3. *Retrospective mortality and cancer incidence study of former doe workers at the Iowa Army Ammunitions Plant in Burlington, Iowa; PI: doctoral candidate, University of Iowa*

This is a study of former Department of Energy (DOE) workers employed prior to 1975 at the Iowa Army Ammunitions Plant (IAAAP) in Burlington, Iowa. The specific aims of the study seek to assess rates of cancer or mortality as a result of their work-related activities. A concurrent study of Department of Defense (DOD) contract workers at the plant that funds tracking the vital status of DOD workers can be used to track DOE workers at minimal additional expense. The researchers aim to perform both a retrospective mortality study as well as a cancer incidence study of former DOE workers with comparisons to the Iowa population for mortality and cancer incidence. This study will contribute to the growing body of information from studies examining the health consequences of former DOE nuclear workers. In addition, funding of the proposal will allow inclusion of the IAAAP data into the Comprehensive Epidemiologic Data Resource (CEDR) database for use in future pooled analyses of DOE workers.

4. *Evaluating Exposures and Health Risks for Pesticide Applicators and Suppliers; PI: doctoral candidate, University of Iowa*

This research team has previously collected data to measure the pesticide exposure of vector control workers in the small West African country of the Gambia. The purpose of this pilot project funding is to pay the University of Iowa Hygienic laboratory to analyze pesticide levels from passive dosimetry samples that have been collected. These results will be correlated with questionnaire results on



knowledge of pesticide handling, use, and health risks, and pesticide toxicity and efficacy, equipment, personal protection measures, and daily work activities to determine worker exposure risks.

5. *The effectiveness of exercise and naps as countermeasures to night shift and post shift sleepiness; B. Hobbs, PhD, RN, Assistant Professor, South Dakota State College of Nursing; senior faculty mentor Dr. Carter Kerk; grant period: July 1, 2006-June 30, 2007.*

Shift work and night work inverts activity/ rest patterns and affects millions of workers. Sleep loss leads to daytime sleepiness and workplace injuries. Shift workers are the second highest group at risk for car crashes due to sleepiness. This study will assess whether moderate exercise (30-minute) at 0400 or a 30-minute nap may counteract sleepiness during and following night time wakefulness. This pilot study will test this hypothesis with eight healthy subjects (2 groups of four) under three night shift conditions. Each subject will complete two 96-hour experiments which include two 9-hour shifts. Researchers will collect data on activity, alertness, sleepiness and temperature at the beginning of the experiment and periodically throughout the procedure. Each subject will experience all three conditions (no treatment, exercise, and nap); however, subjects will randomly be assigned to the two groups and the three experimental conditions. This study will offer information on the effectiveness of exercise and naps as possible counter measures to night time and post shift sleepiness. Findings will be used to calculate effect size and power for each treatment and to determine sample size needed for future studies.

## **F. Future Plans**

The aims of the program have been and will continue to be the following:

- To provide initial support for new occupational health and safety investigators to establish new areas of research that address NORA topics
- To develop research expertise, capacity and understanding in Heartland Center trainees and in research trainees from other occupational health and safety programs in the region
- To encourage investigators from other disciplines to apply their expertise to occupational health and safety research
- To provide a regional resource for research trainees and new investigators interested in pursuing new research in NORA priority areas for training institutions in Federal Region VII
- To encourage the development of translational/research-to-practice projects

## A. Program Title: Agricultural Safety & Health

## B. Program Director: Kelley Donham, MS, DVM, Director

## C. Program Description

The program plan was outlined in four components: a) Academic Training (MS), b) Research training (PhD), c) Enrichment training, and d) Continuing Education and outreach. The MS training has focused on nurses in the occupational health nursing tract, providing them with the essentials of agricultural occupational health. The PhD training focuses on preparation of researchers and program leaders in the field of agricultural health. Enrichment training focuses on introductory training of health professionals in a wide variety of health professions, including, Medical students, primary care medical residents, physician assistants, and veterinarians. The featured component of our continuing education program is the annual Agricultural Occupational Health course, a 40 hour intensive lecture/workshop course presented to a wide variety of health professionals.

Our Agricultural Health and Safety Training had formerly been a program within our Department of Occupational and Environmental Health. In order to elevate the status of the program, we proposed a new MS-PhD degree, and Certificate Program to the Graduated College of the University of Iowa. On November 15 of 2006, the Graduate Council unanimously passed these as two new graduate programs for the University of Iowa. Obtaining this status was an objective of our program, and according to our needs survey, we now have the only graduate degree programs in this field in the world

### Academic Training (MS)

#### Objectives

- a. Recruit and retain sufficient students with agricultural health career interests in order to matriculate at least five yearly (after three years).
- b. Develop at least three new preceptorship sites for agricultural health trainees that will likely lead to employment.
- c. Develop a recognized specialty track (with a certificate) in agricultural health for occupational medicine physicians, nurses, industrial hygienists, and professionals in occupational and environmental health, ergonomics, injury epidemiology and veterinary public health.
- d. Provide introductory training in ASH to students in various health sciences programs.

#### ASH Core Curriculum

The following courses are required for the MS in ASH (11 – 18 semester hours):

- Rural Health and Agricultural Medicine (175:209) – 3 hrs
- Agricultural Safety: Theories and Practice (175:196) – 2 hrs
- Current Topics in Agricultural Health (175:210) – 2 – 4 hrs
- Preceptorship in Occupational and Environmental Health – (175:203) – 1 – 3 hrs
- Thesis in Agricultural Safety and Health – (175:300) – 3 – 6 hrs

The preceptorship is designed to provide practical experience at, for example, machinery manufacturers, swine production firms, or one of our affiliated AgriSafe Network Clinics. Every student is expected to complete a thesis in an ASH topic. The number of credit hours is arranged according to the particular circumstances. Examples of recent MS thesis research topics include a noise exposure assessment in swine confinement buildings, and a musculoskeletal injury survey in a Kansas farm population. In addition to defending the written thesis, the student is expected to publish at least one paper from their research in a peer-reviewed journal.

The ASH core curriculum is to be taken in conjunction with the academic training in one of the following occupational health specialty areas: Industrial Hygiene, Occupational and Environmental Health, Occupational Health Nursing, Occupational Medicine, Ergonomics, Injury Epidemiology, or Veterinary Public Health.

### Research Training – PhD Research Training

The doctoral program in ASH trains graduate students to design, conduct, and manage agricultural health and safety research in an academic, governmental, or private research setting. The degree is a sub-track within the Department of Occupational and Environmental Health (OEH), College of Public Health. The training program is defined by the curriculum and prescribed research. The students are required to take the core courses in ASH (25-30 semester hours), plus the core PhD curriculum in one of the following Occupational Safety and Health (OSH) departmental programs: 1) Industrial Hygiene, 2) Ergonomics, 3) Injury Epidemiology, or 4) Occupational and Environmental Health. The research training includes a research methods course and a student defined research focus in an ASH topic, as guided and mentored by a faculty supervisor. Candidates for this doctorate program must have a GPA of at least 3.25, and a combined GRE score of at least 1650. Women and minorities are strongly encouraged to apply. Candidates are recruited based on their background, interest and track record in ASH, as well as background and interest in Industrial Hygiene, Ergonomics, Injury Epidemiology or Occupational and Environmental Health. Prior to admission, an interview and suitable faculty match is required.

Doctoral students must complete 72 hours of coursework including the ASH core (25-30 hours), as presented in Figure 1, and the core curriculum in one of the programs mentioned above. The research training is highly interdisciplinary. All students, regardless of their other OSH program area, take the same ASH core (listed below). Three of these programs are ERC cores. The Occupational and Environmental Health (OEH) program area, although not one of the ERC cores, is a long standing and important program of the department. The program is a strong program with many core courses in common with the ERC cores. Those students electing to the OEH emphasize a research topic that is toxicologic, or microbiologic in nature, but highly interdisciplinary and relevant to ASH.

### PhD ASH Core Curriculum (Research Training)

The following courses are required for the PhD in ASH (25 – 30 semester hours):

- Rural Health and Agricultural Medicine (175:209) – 3 hrs
- Agricultural Safety: Theories and Practice (175:196) – 2 hrs
- Current Topics in Agricultural Health (175:210) – 4 – 6 hrs
- Epidemiology of Infectious Disease – (173:255) – 3 hrs
- Advanced Agricultural Safety and Health – (175:xxx) – 2 hrs
- Preceptorship – (175:203) – 3 – 6 hrs
- Research and Dissertation in Agricultural Safety and Health – (175:300) – 6 – 8 hrs

The purpose of research training is to create the next generation of specialists and leaders in ASH research and program management. The proposed evidence of research competency will include successful completion and defense of a dissertation and preparation of at least three publishable manuscripts in peer-reviewed journals. The doctoral program in ASH will build on the academic (MS) training in ASH, which requires all MS students to complete and defend a research thesis, and publish at least one paper in a peer-reviewed journal.

Students who complete the research training program in ASH will be prepared to:

- a. identify and prioritize research needs in ASH.
- b. identify and locate information resources in ASH.
- c. keep current in scientific inquiry in ASH.
- d. use current research tools and techniques in ASH.

- e. complete and publish research in the scientific literature.
- f. anticipate and analyze policies as they relate to and affect agriculture and ASH.

## Continuing Education

### Objectives

- a. Expand the Agricultural Occupational Health certification program throughout the region and to other collaborating centers.
- b. Conduct (in conjunction with cooperating states) at least one cycle of this program for NIOSH centers in Illinois, Kentucky, and North Carolina, over the first three years of the program.
- c. Grant at least 20 new agricultural health nurse certificates or provide certificate training to at least 10 physicians over the next three years.
- d. Provide at least three hours of agricultural occupational medicine training to at least 100 physicians over the first three years of the program.

The continuing education component of the training program is directed mainly to nurses and physicians but also includes physician assistants, nurse practitioners, emergency medical technicians, respiratory therapists, physical therapists and rural mental health professionals.

The Agricultural Occupational Health Certification Program is the centerpiece of the continuing education portion of this proposal. To date, we have taught this course eight times in Iowa, and we have certified more than 164 health professionals in Agricultural Occupational Health. The certification is based on the National Committee on Agricultural Occupational Health Certificate Training, which has set standards for curriculum content. Participants also may receive approximately 40 hours of continuing nursing or continuing medical education, or three semester hours of graduate credit from The University of Iowa. Plans are underway to expand this training to other states, including Kansas, Illinois, North Carolina, and Kentucky. The course is being developed for distance learning, and exams will be accessible on the Internet. Topics for the 40-hour course include current issues in agricultural medicine and review topics selected by survey and knowledge testing of health professionals in the field.

Annual Refresher Nurse Continuing Education in ASH Nurses in our AgriSafe Network will be required to have 10 hours of Agricultural Occupational CEU's biannually. Nurses will have access to continuing education training through an agricultural health newsletter and an annual refresher course. The newsletter will be sent to the 24 AgriSafe Network clinics and all alumni of the certification workshop. It will include a section of current topics, review of current literature, case presentations, and a problem-solving exercise with a quiz.

Physician Continuing Education Training Consulting physicians in the AgriSafe Network are able to take advantage of continuing education programs offered regionally. Additionally, the Heartland Center offers training to the residency programs of a statewide clinical education network.

## Outreach

### Objectives

- a. Assist the University of Nebraska in expanding nurse and physician expertise in agricultural occupational health.
- b. Assist Kansas University and Kansas State University in introducing agricultural occupational health to the state as a follow up to statewide conferences we facilitated on agricultural health in 2001 and 2002.
- c. Work with the University of Missouri to develop distance-learning programs in agricultural occupational health nursing, so that such training would be available by year three of the proposal.

- d. Work with the ERC from Illinois, and the NIOSH Agricultural Health Centers in Kentucky and North Carolina, to train their staff and consult on developing ASH training in their regions.
- e. Work with Northeast Iowa Community College (NICC) and the National Education Center for Agricultural Safety (NECAS), to provide train-the-trainer programming in ASH for agricultural faculty in Iowa's community college system, and work to develop an articulated safety and health program between the small four-year and Community Colleges in the state, and the University of Iowa.
- f. Work with all states in Region VII to help establish agricultural occupational health clinics within their states.

## D. Program Activities and Accomplishments

### Didactic Program

For this reporting period, we have had four students in the MS specialty in agricultural Safety and Health. Three of these are occupational health nurses; Jane Nirschl BSN, Sharon Colombus BSN, and Shalome Tonelli. One student, Ralph Altmier is in the MS agricultural Health with Focus in Industrial Hygiene. Sharon Colombus, received an award of merit at a nursing conference for her poster on "Occupational Health Concerns for the Elderly Farmer.

We have also had six students in the PhD focus in Agricultural Safety and Health. Rebecca Heick is finishing her PhD research on injury risk assessment in agricultural environments (due to matriculate in 2007). Matt Murphy will defend his dissertation this spring (2007), on his subject of exposure assessment of Gambian (Africa) farmers and pesticide applicators. Rex Kuye has completed and defended his dissertation on occupational injuries and illnesses in The Gambia (Africa). He has returned to The Gambia, where he has assumed the position as Vice Principle of The Gambia College. He intends to pursue farmer injury prevention programming in the Gambia. Londa VanDerwall and Kerry Leedom both entered the program this fall and will be developing their dissertation topics this spring. Mike Human returns to work on his PhD a year after completing his MS in Agricultural Health and Safety. He had taken a position with the National Farm Medicine Center at Marshfield, WI, and will return their following completion of his PhD work focusing on noise abatement in swine confinement facilities.

### Outreach

We have conducted 15 lectures during the period on agricultural occupational safety and health for a variety of health care professionals across the state and health professions students at the University of Iowa, and Iowa State University, impacting 314 students/health professionals.

### Continuing Education

We conducted the annual Agricultural Occupational Health Certificate Course to 42 students this year (June 2006). This 40 hour course was extremely successful and determined from our evaluation where the course received a mean of 3.8/4 on all phases of student evaluation.

## E. Program Products

The program Director, KJ Donham, published the textbook; [Agricultural Medicine: Occupational and Environmental Health for the Health Professions](http://store.blackwell-professional.com/9780813818030.html), Donham KJ and Thelin A, Blackwell Publishing (<http://store.blackwell-professional.com/9780813818030.html> ). This was one of the objectives in our program. This book is now the textbook of the basic courses of our agricultural health program, and of our continuing education program.

With our affiliation with the AgriSafe Network (<http://www.agrisafe.org/>) we have facilitated the addition of eight new AgriSafe clinics in Iowa, Alabama, Illinois, Mississippi, Missouri, North Dakota, Ohio, and Wisconsin. The health professionals from all these programs have been trained by us in our outreach training program.

## **F. Future Plans**

Our plans for the next budget period include the following:

- Recruit at least 3 new nurses into the Agricultural Health/occupational health nursing MSN training program
- Recruit at least 3 new MS-PhD trainees in the Agricultural Health and or the Certificate program.
- Present our outreach 40 hour Agricultural Occupational Health course in Iowa, Illinois, and Wisconsin.

**A. Program Title: Ergonomics Training Program****B. Program Director: Dan Anton, PT, PhD, ATC****C. Program Description**

The Heartland Center for Occupational Health and Safety Ergonomics Training Program (ETP), established in 2001, provides master's (MS, MPH), doctoral (PhD), and post-doctoral trainees multi-disciplinary experiences in ergonomics and human factors. The ETP combines expertise in ergonomics/human factors from the Departments of Occupational and Environmental Health (OEH) in the College of Public Health, and Biomedical Engineering (BME) and Industrial Engineering (IE) in the College of Engineering, at the University of Iowa. The basis for the ETP curriculum is the Ergonomist Formation Model adopted by the International Ergonomics Association.

*The purpose of the ETP at the master's-level is to provide academic and practical experience that prepares MS and MPH trainees for career opportunities as an ergonomics/human factors practitioner in local, state, or federal health agencies, and in departments of industrial health and safety in commercial enterprises and academic institutions. The purpose of the ETP at the doctoral and post-doctoral level is to provide academic, research, and practical field experiences that prepare PhD and post-doctoral trainees for career opportunities as independent researchers and consultants in ergonomics/human factors.*

Core and supporting faculty continue to work hard to provide trainees ample opportunities to reach these objectives through coursework, research projects, and ergonomic consulting projects. New trainees are now following the ETP curriculum approved after the last competitive renewal of the ETP. Some of the changes that have been implemented for the master's level curriculum include required coursework in statistics and responsible conduct in research. The doctoral-level program has greater focus and includes required core courses in biomedical instrumentation, biomechanics, and design of experiments. The ETP Director reviews the plan of study for all trainees to ensure compliance with the new curriculum.

In the Heartland Center ETP, trainees who wish to specialize in ergonomics/human factors may pursue a Master of Science (MS), Master of Public Health (MPH), or Doctor of Philosophy (PhD) degree including:

- MS in OEH (with emphasis in ergonomics): 38 semester hours.
- MS in IE (with emphasis in ergonomics/human factors): 30 semester hours.
- MS in BME (with emphasis in ergonomics/biomechanics): 30 semester hours.
- MPH in Ergonomics: 40 semester hours.
- PhD in OEH (with emphasis in ergonomics): 72 semester hours.
- PhD in IE (with emphasis in ergonomics/human factors): 72 semester hours.
- PhD in BME (with emphasis in ergonomics/biomechanics): 72 semester hours.

**Master's-Level Ergonomics Training Program**

The purpose of the ETP at the master's-level is to provide academic and practical experience that prepares MS and MPH trainees for career opportunities as an ergonomics/human factors practitioner in local, state, or federal health agencies, and in departments of industrial health and safety in commercial enterprises and academic institutions. Additionally, the ETP prepares MS trainees (and PhD) to pursue certification as a Certified Professional Ergonomist (CPE) or Certified Human Factors Professional (CHFP).

At the completion of the ETP at the master's-level, graduates will be able to:

- perform work-site job analysis, classify biomechanical risk factors, and assist with prioritizing resources,
- design tasks, workstations and tools in manufacturing or office environments that follow ergonomic principles,
- modify work tasks and workstations to accommodate the injured and disabled worker, establish an ergonomics program within a company, agency, or union,
- train employees and supervisors on the basics of ergonomics,
- assist with establishment of medical surveillance programs for prevention of work-related MSDs,
- understand basics of ergonomics/human factors research methods, and
- take Part I ("Basic Knowledge" of ergonomics/human factors) of the CPE/CHFP examination

#### Doctoral and Post-Doctoral Ergonomics Training Program

The purpose of the ETP at the doctoral and post-doctoral level is to provide academic, research, and practical field experiences that prepare PhD and post-doctoral trainees for career opportunities as independent researchers and consultants in ergonomics/human factors.

At the completion of the ETP at the doctoral-level, graduates will have:

- completed advanced graduate courses in ergonomics/human factors and other advanced courses related to their specific discipline,
- conducted mentored laboratory research in ergonomics/human factors,
- conducted mentored field research in ergonomics/human factors, and
- provided ergonomic/human factors consultation services.

Those who have completed the ETP at the post-doctoral-level will have:

- participated in the preparation of at least one independent grant,
- participated in the preparation and management of research budgets,
- submitted at least one peer-reviewed manuscript as the primary author.

#### Program Plan

The duration of the ETP is approximately two years for MS and MPH trainees, three to four years for PhD trainees depending on previous coursework and/or experience, and one to two years for post-doctoral trainees. Program integration occurs in a systematic manner. In the first year of the ETP, trainees take the required core courses (MS, MPH, PhD) and participate in various research projects (MS, PhD, post-doctoral). Since the MPH is considered the primary professional degree in public health, these trainees focus primarily on ergonomics and public health coursework. In the second year, trainees complete coursework, and at the end of the year take Preceptorship in Occupational & Environmental Health (175:203, MS, PhD) or MPH Practicum Experience (170:299, MPH).

For MS trainees, the final examination is an oral defense of the master's thesis, conducted by an Examining Committee. The committee consists of three (OEH) or five (BME, IE) members of the Graduate College faculty. The committee must be comprised of at least two faculty members from the trainee's primary departmental faculty, and at least one member of the ETP Core Faculty. For MPH trainees, the final examination is an oral presentation of the Practicum project. The presentation is given to the Practicum preceptor, the trainee's advisor, an ETP Core Faculty member if the advisor is not Core Faculty, and other interested parties.

At the end of the second year, doctoral trainees must pass a Comprehensive Examination, conducted by an Examining Committee. This committee consists of at least five members of the Graduate College faculty, one of which must be a member of the ETP Core Faculty. Also, the committee must include a chair or co-chair, and at least three members from the trainee's primary department. Having satisfactorily completed this examination, the trainee is accepted as a PhD Candidate.



For PhD trainees, the final Examination is an oral defense of the trainee's dissertation research, conducted by an Examining Committee (composition similar to that for the Comprehensive Examination). The PhD degree is given upon demonstration by the trainee of comprehensive knowledge and scholarly work at the highest level.

#### Interdisciplinary Outreach Opportunities

Trainees also interact with industries, employers, managers, and workers by working alongside Core and Supporting Faculty during various outreach activities. Outreach activities include continuing education programs and ergonomic consultation services. Continuing education programs have included presentations on various ergonomics/human factors topics throughout the region, nationally, and internationally. These programs have been presented to other universities, federal and state agencies, health care organizations, industries, and various international groups and organizations.

The ETP offers trainees practical hands-on training in ergonomics/human factors research, education, and consultation while emphasizing interaction with other occupational health and safety professionals in real-world settings.

#### Trainee Performance - Academic

Numerous methods are used to evaluate academic performance of ETP trainees. The trainee's Plan of Study is the first step towards assuring the necessary breadth and depth of academic performance. The trainee's Plan of Study is developed in collaboration with the trainee's advisor (typically an ETP Core Faculty member). For all trainees, the ETP Director assures compliance of the Plan of Study with the ETP core curriculum.

Each semester, grades and trainee progress are reviewed by the trainee's advisor. If the trainee's advisor is not a member of the ETP Core Faculty, the ETP Director reviews grades as well. Trainees must receive grades of B- or better in all ETP core courses. Trainees must retake any core courses in which they obtain a grade less than B-. Verbal feedback is also obtained from instructors of extra-departmental courses and below-standard performance will be discussed with trainees as necessary. Discussions regarding academic progress are held with trainees at least once each semester. In general, interaction between a trainee and a Core Faculty member occurs weekly.

For PhD trainees, deficiencies in academic preparation are specifically identified at the Preliminary Assessment completed before the end of the trainee's 3<sup>rd</sup> semester of study (OEH), or at Qualifying Examinations (BME, IE). Success in examinations (e.g. Comprehensive Examination) is monitored closely by the trainee's Examining Committee.

#### Trainee Performance - Research

Thesis and dissertation data collection, analysis, preparation of manuscripts, and dissemination of findings at scientific meetings is closely monitored by the trainee's advisor. MS and PhD trainees must present their research to the Examining Committee, either as an MS thesis or PhD dissertation defense.

#### Qualifications of Prospective Trainees

In OEH, prospective MS and MPH trainees may have a bachelor's degree from various disciplines including, but not limited to, public health, business, engineering, psychology, nursing, physical or occupational therapy, premed, statistics, exercise science (physical education), or communications. Trainees are expected to have a cumulative grade point average (GPA) of 3.0 (based on 4.0) and a minimum Graduate Record Examination (GRE) score of 1050 (combined verbal and quantitative). In BME and IE, prospective MS trainees must have a strong math and science background, and a bachelor's degrees from disciplines such as engineering, mathematics, physical science, computer science, psychology (with a math background), statistics, or computer programming. Trainee's are

expected to have a cumulative GPA of 3.00 (based on 4.00) and an acceptable GRE score (typically a combined score of 1250 for verbal and quantitative).

Prospective trainees must have English language competency. Competency is defined as graduating from an English-speaking university or score of greater than 600 (or 250 computer) on the Test of English as a Foreign Language (TOEFL). Anyone with lower scores must take an English proficiency test and then take any recommended English classes based on the test results.

#### Selection of Trainees

Prospective trainees (MS, MPH, and PhD) can enter the ETP if they are enrolled in the Departments of OEH, IE, or BME. Prospective post-doctoral trainees can enter the ETP if they are planning on conducting research while being mentored by a Core Faculty member. Prospective trainees apply directly to the program by contacting the ETP Director.

The Core Faculty selects trainees in the ETP. Trainees are selected based on the following criteria, in order of priority: 1) prospective trainee must meet the minimal academic criteria of their home department (e.g. GPA, GRE scores), 2) prospective trainee identifies ergonomics/human factors as their primary research interest, 3) prospective trainee (PhD, post-doctoral) identifies specific areas of interest within ergonomics/human factors, or prospective trainee (MS, MPH) has experience conducting ergonomic consultations, and 4) prospective trainee's academic performance greatly exceeds the minimal academic criteria.

Prospective post-doctoral trainees will be interviewed by the Core Faculty, who will assess productivity, enthusiasm, and dedication to the field of ergonomics/human factors. The decision to offer a position in the ETP is based on the results of this evaluation process.

#### **D. Program Activities and Accomplishments**

Currently, there are two master's level and four doctoral level trainees in the Ergonomics Training Program. One new trainee, a female biomedical engineering student, was admitted to the program in 8/06. We also recruited a dentist interested in ergonomics who is Hispanic. All trainees continue to be partially funded on various extramural grants.

Since 7/1/06, the ETP has shown considerable progress. As previously noted, new trainees are now taking the new master's and doctoral curriculum. Trainee response to the new curriculum has been positive, and there have been no complaints of scheduling conflicts or excessive travel times. Course evaluations for all core Ergonomics Training Program courses have been excellent. No trainees have been placed on academic probation (defined as MS GPA <2.75 and PhD GPA <3.0). All trainees in the ETP have passed their Qualifying Examinations (BME, IE only) and Comprehensive Examinations (PhD) on the first attempt.

Three trainees are currently completing their ergonomic preceptorship (175:203) with the University of Iowa Facilities Management Department. These trainees are implementing a participatory ergonomics program with custodians. Their experiences have or will consist of ergonomic awareness training, in-depth ergonomic process training for the ergonomic team, ergonomic job analysis, and development of interventions for custodial work. Through this preceptorship, the trainees hope to be instrumental in reducing the biomechanical exposures these custodians experience, and ultimately reduce work-related musculoskeletal disorders.

Several trainees have received honors, awards, and scholarships over the past six months. One of our doctoral trainees received her Associate Ergonomics Professional (AEP) title, the precursor to the

Certified Professional Ergonomist (CPE) title. Another trainee received his doctorate 8/06. He is currently employed in the Biomechanics and Ergonomics Facility at the University of Iowa as a research scientist, and has submitted a paper for publication to the *Scandinavian Journal of Work, Environment, & Health*. Additionally, he is currently interviewing for faculty positions at several universities. Also in 2006, a trainee received the award for the Best Student Paper for the Communications Technical Group of the Human Factors & Ergonomics Society.

As previously noted, trainees have had excellent success obtaining funding for their research projects. Since 2001, 100% of ETP trainees obtaining the MS or PhD degree have had all or part of their research funded.

### **E. Program Products**

Several publications have been either published or submitted by ETP trainees and faculty. They have been published or submitted to well respected journals including the *Journal of Occupational and Environment Hygiene* and the *American Journal of Industrial Medicine*. Trainees have presented at conferences including the International Ergonomics Association and the Human Factors & Ergonomics Society meetings. Trainees continue to complete research projects in conjunction with ETP faculty.

Additionally, ETP trainees have participated in ergonomics, human factors, and occupational safety consulting projects. Recently, three trainees and the program director participated in a five-day ergonomic training program for all custodians at the University of Iowa. This awareness training is the initial event of the new participatory ergonomics program with these individuals. This multi-year participatory ergonomics project will be implemented in conjunction with the ETP faculty, trainees, and occupational safety representatives from the American Federation of State, County, and Municipal (AFSCME) International Union. Trainees are also working on projects with companies such as Rockwell Collins, Whirlpool, HNI Inc., Tyson, and others.

### **F. Future Plans**

We continue to emphasize recruitment of new trainees to the program and have updated our program announcement at the Human Factors & Ergonomics Society website. Additionally, we plan to continue our evaluation of the master's and doctoral level curriculum to ensure compliance with the Ergonomist Formation Model.

**A. Program Title: Industrial Hygiene Training Program****B. Program Director: Wayne Sanderson, PhD, CIH****C. Program Description**

The University of Iowa's Industrial Hygiene Program trains individuals to prevent occupational and environmental disease and injury in a wide variety of industrial, agricultural, and community situations. Candidates for the Master of Science (MS) and the Doctoral (PhD) degrees receive broad training and academic experience, with the flexibility to specialize in particular areas of interest. Our students experience the "real world" of industrial hygiene with a hands-on approach to learning. The program has had many graduates who have become leaders in the occupational and environmental health field. In 2005, we substantially revised our program to better train MS students for careers in industrial hygiene. The MS training program now offers a research track (thesis-option) and a professional track (preceptorship-option). The number of core industrial hygiene courses was increased from three to five. More information on our training program with a description of our courses and required curriculum is provided on our website at [www.public-health.uiowa.edu/oeh/ih](http://www.public-health.uiowa.edu/oeh/ih).

Faculty: The Industrial Hygiene program is housed within the Department of Occupational and Environmental Health of the College of Public Health. This Department includes 19 faculty members who are occupational physicians, veterinarians, toxicologists, epidemiologists, ergonomists, engineers, environmental health scientists, and industrial hygienists. All faculty teach courses required of industrial hygiene students.

The following faculty serve as primary advisors and mentors of industrial hygiene students:

Wayne T. Sanderson, PhD CIH, Associate Professor: teaches Industrial Hygiene Fundamentals, Assessing Physical Agent Hazards, and Occupational Health

William A. Heitbrink, PhD, CIH, Associate Professor: teaches Control of Occupational Hazards; Occupational Health

Thomas M. Peters, PhD, Assistant Professor: teaches Aerosol Technology; Occupational Epidemiology and Exposure Assessment

Patrick O'Shaughnessy, PhD, Associate Professor: teaches Environmental Health

**Masters (MS) Training:** Our master's level IH training program aims to impart the skills necessary for a successful career as a modern industrial hygienist in a wide variety of positions. A minimum of 43 semester credit hours is required. The curriculum is designed to allow students to complete their courses and a written thesis within two calendar years and we provide stipend and tuition support during the two-year period. At the University of Iowa, full-time graduate students take 12-15 credit hours per semester (the Graduate College does not permit a student to be enrolled in more than 15 hours in a semester). A defense of the master's thesis serves as the Master's Final Examination. The defense is an oral presentation of the purpose, methods, and results of the thesis research. An acceptable thesis is comparable to a manuscript which could be submitted for peer-reviewed publication in a professional journal. The students' Thesis Committees examine both their general IH knowledge and area of knowledge associated with their theses.

**Doctoral (PhD) Training:** The doctoral program in IH trains individuals to conduct and supervise research or to manage advanced applied programs in academic, government, or private IH settings.

The training program in IH is defined by the curriculum and by the research interests of the student and faculty supervisor. Candidates are recruited based on their academic strengths, experience, and creativity as well as their test scores, and admitted after an interview has been completed and a suitable faculty match arranged.

Doctoral students must complete 72 hours of coursework, which must include the master's-level curriculum (presented in Table C) if these courses have not previously been passed for a prior MS degree. As previously noted, the didactic training has strong interdisciplinary components, especially in occupational health, toxicology, ergonomics, epidemiology, biostatistics, and rural health and agricultural medicine. In addition to the required courses, the student and advisor select electives tailored to a particular career trajectory and research interests. The Centers at the IREH offer extremely rich resources of faculty expertise, facilities, and equipment, and IH students have opportunities to contribute to multidisciplinary research projects involving physicians, engineers, chemists, and microbiologists. Research opportunities are also available through the investigator-initiated grants of departmental faculty members.

#### Trainee Performance - Academic

- Trainees are required to complete a Plan of Study that outlines their courses for each semester of study. These Plans are developed in collaboration with their advisor and the IH Core Director.
- Student progress and grades are reviewed by the student's advisor and IH Core Director each semester.
- Instructors of extra-departmental courses are contacted whenever students have below-standard performance within their courses and trainees are required to retake the course if necessary.
- Results of PhD qualifying examinations and defense of MS theses and PhD dissertations are monitored by the Executive Committee at their monthly meetings.
- Discussions regarding academic progress are held between academic advisors and the IH Core Director at least once each semester.
- Exit interviews are held by the OEH Department Head with each trainee who graduates or leaves the program.

#### Trainee Performance - Research

- Thesis and dissertation projects are evaluated by the trainee's dissertation committee, which includes at least one Executive Committee member.
- Thesis and dissertation data collection, analysis, and defense are closely monitored by the trainee's advisor.
- Submission of work to scientific societies, professional meetings, and scientific journals is monitored by the trainee's advisor.
- Positions held, number of publications, number of grants received, and professional activities and honors of graduates will be closely monitored and evaluated.

#### Qualifications and selection of trainees

Training candidates must meet departmental requirements to be admitted to our program. Admission to degree programs within the Department of Occupational and Environmental Health is governed by the rules of the University of Iowa Graduate College. General admission criteria include a baccalaureate degree in a science or engineering discipline, a minimum cumulative GPA of 3.0 for the MS and 3.25 for the PhD, a minimum combined score on the verbal, quantitative, and analytical portions of the Graduate Record Exam (GRE) of 1600 for the MS and 1650 for the PhD. The OEH faculty evaluates applicants based on their general academic background, science background, previous work experience, clarity of focus, and promise.

In addition to meeting university requirements, prospective students must have the prerequisites specified by ABET. These prerequisites include a baccalaureate degree and candidates' undergraduate

preparation must include 63 semester credit hours in the following courses: calculus, physics, mathematics, biological, chemical and either physical sciences or engineering. We require students who are accepted into our program but lack these prerequisites to satisfy these conditions in addition to the standard IH curriculum.

#### **D. Program Activities and Accomplishments**

We applied for our continued ABET accreditation and had a site visit by ABET evaluators in October 2006. We are awaiting the report from this visit and information on our status as an ABET accredited program.

We continue to improve recruiting efforts. We recruited four MS students in 2006 and two PhD students began studies in January 2007. One of our MS students is a member of an under-represented minority group.

Two students won Iowa Governors Safety Scholarships (Lindsay Parker and Adam Riss) and Mr. Riss won the Clyde Berry Scholarship and Ms. Parker won the Ralph J. Vernon Scholarship from the American Industrial Hygiene Foundation Scholarships.

Matthew Murphy won First Runner-Up Best College of Public Health Student from the American Public Health Association. He received this award and the APHA Conference in Boston, MA in October 2006.

We graduated 2 PhD students and 5 MS students during this period.

The tuckpointing work from one PhD dissertation has had public health policy impact. California OSHA is considering regulations on the use of local exhaust ventilation to control silica exposures during mortar removal. Furthermore, this work was used to write guidelines for the use ventilated grinders during mortar removal by the Center to Protect Workers' Rights. These guidelines are publicly available. These recommendations have been further disseminated by NIOSH and the magazine "Masonry Construction".

#### **E. Program Products**

The program faculty and trainees published peer-reviewed manuscripts and presented their work at professional conferences. The training program co-sponsored the Midwest Forum on Agricultural Health and Safety on October 12, 2006

The faculty and trainees collaborated together on numerous research projects including:

- dust control method to reduce workers conducting masonry tuck-pointing
- in-home pesticide exposures of farm families in Iowa
- pesticide handling and exposures of vector control workers in The Gambia
- respirable exposures of protein enzyme manufacturers

#### **F. Future Plans**

The Industrial Hygiene Training program plans to continue working to obtain full ABET accreditation. We also plan to continue modifying and improving our courses to prepare our students for professions protecting occupational and environmental health. Our program could grow by a few more students, but our recruiting and graduation rates are expected to remain relatively constant in the near future at approximately 12 students.

**A. Program Title: Occupational Epidemiology Training Program****B. Program Director: R. William Field, PhD****C. Program Description**

The primary goal of the Occupational Epidemiology Training Program (OETP) is to provide the foundation for Occupational Epidemiology skills required for a variety of health disciplines including, occupational health, industrial hygiene, health physics, occupational health nursing, safety engineering, occupational medicine, environmental epidemiology, toxicology, environmental science, and occupational injury prevention specialists, etc. The short-term objectives for the OETP this past funding period were the recruitment of students with both a diversified background and interest, the successful development of core curricula for the OETP, and the successful completion of the first year of full instruction. In addition to the training program director, Dr. R. William Field, faculty directly teaching or serving on trainees' dissertation or thesis committees included Dr. Tom Peters (exposure assessment, nanoparticles); Dr. Wayne Sanderson (Industrial Hygiene, Occupational Epidemiology); Dr. Lar Fuortes (Occupational Medicine, Toxicology); Dr. Fred Gerr (Neurotoxicology); Dr. Nancy Sprince (Pulmonary Diseases); Dr. Peter Thorne (Asthma); Dr. Michelle West (Cancer Clusters); and others.

Upon completion of the MS or PhD degree in the OETP, a graduate will have demonstrated achievement of the following objectives:

- 1) to understand epidemiologic principles including: design and analysis of case-control and cohort studies, historical and current examples of descriptive and analytic epidemiologic studies, occupational etiologic factors in human disease and the determinants of disease in man;
- 2) to understand the principles and integration of the practice of occupational medicine, industrial hygiene and safety, occupational health nursing, ergonomics and occupational health management as related to Occupational Epidemiology;
- 3) to critically read research articles in occupational epidemiology;
- 4) to understand the most frequently used epidemiologic study designs and how to apply them to occupational epidemiology;
- 5) to assess contemporary human health issues associated with the biological, chemical and physical factors in the occupational environment and to perform a critical review of occupational factors that affect health;
- 6) to develop a research plan in occupational epidemiology;
- 7) to implement a research plan by collecting and appropriately analyzing data;
- 8) to disseminate research results, both orally and in writing;
- 9) to provide training and teach workshops in occupational epidemiology;
- 10) to understand and demonstrate the use of statistical analyses including: graphs and tables, descriptive statistics, probability, binomial and normal distributions, sampling distributions, tests of significance, confidence intervals, frequency data analysis, linear regression and correlation and nonparametric tests; and
- 11) to discuss and identify the sources, routes of entry, and effects of occupational and environmental toxicants and their effects on humans; as well as the pathophysiology of toxicant actions, including those of air and water pollutants, metals, pesticides, solvents, mycotoxins, food toxicants and other chemicals.

**D. Program Activities and Accomplishments**

The core Occupational Epidemiology course (175:220) was taught for the first time in the Spring of 2006 and was very well received by the 5 students who were enrolled in the class. Student evaluations

yielded 5.9/6 ratings, indicating positive evaluations for each item under review on the ACE forms. All students gave the highest rating for these categories: i) developed a greater appreciation for the subject matter; ii) the instructor is effective in presenting the materials; and iii) would recommend a course taught by this instructor to others. Written comments by the students included: "This is a great class. The focus on exposure assessment is excellent and is rarely covered in other courses." The Occupational Epidemiology Course is now a requirement for all industrial hygiene majors in the Department of Occupational and Environmental Health (OEH) as well as the foundation course for the OETP. Fourteen students are enrolled in the Occupational Epidemiology Class for the Spring semester 2007.

Nine OETP trainees have been recruited to date and are actively involved in the OETP, see also: <http://www.public-health.uiowa.edu/heartland/Students.htm>. The trainees are very balanced in regard to their home departments with 5 students from the Department of Epidemiology and 4 students from the Department of Occupational and Environmental Health (OEH). Seven (4 Epidemiology; 3 OEH) of the 9 trainees are working toward a Ph.D. degree and 2 trainees (1 epidemiology; 1 OEH) are working toward their M.S. degree. The first trainee in the OETP, Kainan Sun, is a Presidential Graduate Fellow who is currently completing a M.S. degree in the Department of Biostatistics and continues toward her Ph.D in the Department of Occupational and Environmental Health. Each year, the University of Iowa Presidential Graduate Fellowship Program brings twenty of the most promising doctoral students in the world to the University of Iowa. The University of Iowa provides tuition and stipend support for Ms Sun's graduate studies.

The new trainees have had a long-term interest in Occupational Epidemiology, but no training program existed prior to July 2005 to accommodate the students' interest. All the trainees are making great progress toward their degrees. The trainees that have been in the program for at least a year have clearly identified their topics for their either their dissertation or thesis and are actively performing their literature review and research. The trainees' research interests are diverse. For example, 1) Kainan Sun's dissertation topic focuses on retrospective reconstruction of radioactive particle exposure. 2) Alicia Quella is a student in the Department of Epidemiology and will be performing a retrospective cohort mortality and cancer incidence study of former DOE contract workers at the Iowa Army Ammunitions Plant. She attended the American Statistical Association's Radiation and Health Conference in the summer of 2006. 3) Julie Murphy is a doctoral student in the Department of Epidemiology. Ms. Murphy will be performing a retrospective cohort mortality study of over 1000 chimney sweeps for her dissertation. 4) Stefan Gingerich, the first M.S. student in the OETP, has initiated his thesis research that will be performed in conjunction with the Iowa Department of Public Health. 5) Kerry Leedom, DVM is narrowing down her dissertation topics, but will likely focus on farming-related infectious diseases. 6) Carissa Rocheleau's dissertation examines occupationally related parental exposure to pesticides, before and during pregnancy, as a potential risk factor for selected birth defects. Her project will also examine several candidate genes for evidence of a gene-environment interaction. 7) Londa Vander Wal has significant international experience working for the Food and Agriculture Organization of the United Nations in the field of Food Safety. The topic of her dissertation has not been decided yet, but will likely relate to the unique exposures of farmers. 8) Erin Moritz, the newest doctoral trainee in the OETP, has a background in biochemistry and molecular biology. Erin's dissertation research will examine occupational exposures to microbes present in the agricultural setting. 9) The newest trainee in the OETP is Ron Bedford. Ron has many years experience in emergency response and is currently working as a Graduate Research Assistant on a retrospective occupational cohort study within the College. He has not selected a thesis topic yet at this early stage.

During the project period, Dr. Field has served on several World Health Organization's working groups as well as served on the National Academy of Sciences Committee, "Review of the Worker and Public Health Activities Program Administered by DOE and DHHS".



## **E. Program Products**

The Occupational Epidemiology Training Program was funded starting in July 2005 so trainees have generally had insufficient time to present or publish their findings from their research. Kainan Sun has published one paper (see below) and will be submitting another paper to the Health Physics Journal in the near future. Two students, Alicia Quella and Ron Bedford have gained valuable experience working on a large-scale Department of Defense funded retrospective mortality and cancer incidence study of munitions workers. Julie Murphy has made excellent progress this year establishing the framework for the National Chimney Sweep Registry.

## **F. Future Plans**

Since the OETP has grown very quickly since 2005, the focus of the OETP Director, in addition to teaching the primary Occupational Epidemiology course, will be to spend more time working directly with trainees to assure that their research endeavors are of the highest quality. For example, the OETP director will be accompanying several of the trainees in the summer of 2007 to a cancer epidemiology workshop sponsored by the National Cancer Institute. Trips are also planned with Julie Murphy to meet with stakeholders of the chimney sweep industry to update them on the progress of the National Chimney Sweep Registry. Mentoring in other areas, such as the munitions workers study, will also continue. Because of the large number of trainees currently in the OETP and the lack of additional training funds, the primary focus for the coming year will be the recruitment of future students from underrepresented racial or ethnic groups. Notices of the training opportunity in Occupational Epidemiology have been posted on several public health jobs sites, professional organizations newsletters, and numerous Listserves including those serving the state (e.g. Iowa Department of Public Health) and national professional organizations. Information about the training program is also disseminated by the College of Medicine during their regular medical school recruitment visits.

**A. Program Title: Occupational Health Nursing Training Program****B. Program Director: Kenneth Culp, PhD, RN****C. Program Description**

Occupational Health Nursing (OHN) Curriculum at The University of Iowa College of Nursing has been designed for both the distance-based learner and the on-campus student. This MSN program is 33 semester hours prepares students for a variety of roles including clinician and nurse manager.

OHN Program Objective 1: Make available a course of study within the master's program that accommodates the distance learner and targets potential candidates outside the state of Iowa to include students from Kansas, Nebraska, Missouri, and Iowa.

- We graduated our first student from Nebraska in Fall '05
- The College of Nursing has now placed the entire MSN core (see Table I) online. These courses are now offered in both formats; one semester they are on-campus and the next these are on the web.
- The College of Public Health has now placed the epidemiology and interdisciplinary occupational health courses online.
- We have arranged occupational health practicum sites with partners in the student's home community
- All off-campus students did complete short 2-3 day on-campus activities as required by the course instructors (attendance at an Occupational Health Symposium and an on-campus training exercise in respiratory protection)

OHN Program Objective 2: Revise the curriculum based on responsiveness to NIOSH site visitors, graduates, Heartland Executive Board, and a community-based occupational health nursing advisory committee.

- We have strengthened safety and industrial hygiene content in the occupational health nursing courses.
- Toxicology is now contained in modules for both of the didactic occupational health nursing courses.
- Interdisciplinary experiences with IH and OM students has been implemented for respiratory protection labs
- Developed Toxicology Modules that are incorporated into both 96:256 and 96:258

All Occupational Health Nursing trainees (masters, doctoral and postdoctoral) are required to receive instruction in the responsible conduct of research by taking the University of Iowa course: 050:270 Responsible Conduct in Research. Responsible research conduct is taught through case studies, group discussions and readings lead by experienced research faculty. This course covers ethical issues; misconduct and fraud; proper handling of data; responsible authorship; conflict of interest; and ethical research on animals and human subjects.

All members of a research team, including the principal investigator and all other individuals (faculty, staff, or student) must complete a course entitled "Human Participants Protection Education for Research Teams." Any student or faculty member who has contact or interactions with research subjects or with their private, identifiable information must be certified in human subjects' protections.

## D. Program Activities and Accomplishments

OHN Program Objective 1: Make available a course of study leading to a new practice degree called the Doctorate in Nursing Practice (DNP).

- Interim College of Nursing Dean, Dr. Martha Craft-Rosenberg, will be meeting with the Provost's office and other representatives to discuss the DNP curriculum and we hope to forward a proposal to the Iowa Board of Regents this summer.
- We are discussing the DNP proposal with constituents whenever possible to increase awareness and rationale for this new practice degree.

OHN Program Objective 2: Strengthen faculty and curriculum resources in Occupational and Environmental Health in the College of Nursing (CON).

- This fall the CON appointed Dr. Sandra Ramey as an Assistant Professor. Dr. Ramey is being mentored in her research by the OHN Core Director and is conducting research on reducing cardiovascular risk factors in law enforcement officers. Dr. Ramey also increases the ethnic diversity of our faculty and is planning to pursue pilot funding this next Spring from the Heartland Center for her work with the Des Moines area police workforce.
- Kerri Rupe, MSN, ARNP, COHN-S will devote more teaching effort to the occupational health nursing courses and has co-authored a manuscript on injuries in meat processing workers.
- Kenneth Culp, PhD, RN has been appointed as a Fellow in the American Academy of Nursing and in the Gerontological Society of America. He has continued to publish occupational and environmental health research manuscripts. His work has focused on injury epidemiology, the aging workforce, and workplace hazards of certified nursing assistants in rural long-term care facilities.

Student accomplishments this past year included the appointment of Kristen Kusik as a graduate student intern with the Occupational Safety and Health Administration during the summer of 2006; Sharon Columbus received a first place award in the American Association of Occupational Health Nursing (AAOHN) poster contest in Albuquerque, New Mexico and Kimberly Gordon was elected to the AAOHN board of directors.

## E. Program Products

Dr. Culp co-authored two manuscripts on agricultural developments and pesticide exposure in the Gambia (Annals of Agriculture and Environmental Medicine) and a manuscript on Rural health in the Gambia (Clinical Nursing Research). He is also the PI on a study of traumatic injuries in meat processing plant workers which was recently submitted and is under review (Occupational and Environmental Medicine). In September 2006, Dr. Culp also received \$10K to study occupational hazards in direct caregivers from the John A. Hartford Foundation and the Gerontological Nursing Interventions Research Center.

OHN student Kim Gordon presented 1.5 hour CE program on "Nanotechnology Technology and Implications for Occupational Health" at the AAOHN in Albuquerque, New Mexico that was attended by 100 nurses. Several clinical posters were also presented by students at national and regional conferences including Sharon Columbus on "Clinical Screening of Senior Farmers" (AAOHN), Bethany Danner "Young Worker Safety in the Service, Restaurant, and Retail Industries" (OH Symposium, Iowa City) and Jessie Black's clinical poster on "Safety in the Construction Industry" (OH Symposium, Iowa City). Two students presented talks at a CE conference include Jayne Nirschl "Evidenced-Based

Practice in Agricultural Health” and Carissa Barrick “Preventing Chemical Burns in Battery Plant Workers” (OH Symposium, Iowa City).

Dr. Culp taught a CE program on Nursing Research and Using Biostatistics at the Northeast Iowa Association of Occupational Health Nurses (NIAOHN) this Spring and won second place at the AAOHN conference on poster “Older Workers: The Iowa Senior Workforce Study.” He has also guest lectured during the Spring and Fall 2006 semesters in a couple of other CON courses in the area of occupational health nursing (undergraduate public health course) and epidemiology (graduate course on case management).

## **F. Future Plans**

For the next budget period (7/1/07 – 6/30/08) we hope to begin development of the courses for the DNP curriculum and admit students during the summer of 2008. The first students in the program will be ARNP-prepared and will be post-MSN only. We plan to increase the diversity of our student body; of the six MSN candidates being reviewed this Spring for the OHN program, two have indicated their minority status. We have also sought to increase minority representation in our research initiatives and in course content. In the meat processing worker manuscript, 40% of the subjects were Hispanic. We are developing new modules on workforce diversity in the MSN core courses. Dr. Kathleen Hanson, our Associate Dean for Academic Affairs, is submitting a grant to strengthen rural health delivery systems in Iowa. This exciting initiative will most likely provide practicum experiences for OHN core students. Dr. Culp has also been working with nursing faculty member Dr. Dianne Huber in the development of a course for rural nursing in a training grant that was submitted to Health Resources and Services Administration (HRSA).

## **A. Program Plan – Occupational Injury Prevention Research Training Program**

### **B. Program Director – Corinne Peek-Asa, PhD, MPH**

### **C. Program Description**

The Occupational Injury Prevention Training Program (OIPP) was established in 2001 with the primary goal of training future occupational injury prevention leaders. The OIPP trains doctoral-level students in the Departments of Occupational and Environmental Health, Epidemiology, and Community and Behavioral Health, as well as in the College of Nursing. We support students on a stipend for their first two years of coursework, and then assist them in finding other sources of support for their dissertation research. We have been very successful in the recruitment of high-quality students and in finding external funds for dissertation research.

One strength of the OIPP program is the interdisciplinary faculty leadership. The OIPP Core Faculty specialize in the study of injury prevention and control and serve as primary advisors for trainees. The OIPP Core Faculty include: Dr. Corinne Peek-Asa (Professor, OEH); Dr. Craig Zwerling (Professor and Head, OEH); Dr. Nancy Sprince (Professor, OEH and Director, Heartland ERC). The OIPP Supporting Faculty provide mentoring, advising, and other resources and specializations that enrich student opportunities. The OIPP supporting faculty include: Dr. James Torner (Professor and Head, Epidemiology); Dr. John Lowe (Professor and Head, Community and Behavioral Health); Dr. Jingzhen Yang (Assistant Professor, Community and Behavioral Health; and, Dr. Risto Rautiainen (Assistant Clinical Professor, OEH).

The University of Iowa offers one of the richest curricula in injury prevention found in any College of Public Health, with five full-credit courses that focus specifically on injury control and one full-credit course focused solely on occupational injury prevention. The OIPP curriculum includes a core of seven (19 hours) courses that address injury prevention and occupational health, and eight (22 hours) courses that address methodological issues. The Core injury courses are listed in the table below. Additional courses are defined according to departmental degree requirements.

#### **Core Courses for all OIPP Trainees**

Course #	Course Name	Sem.Hrs.	Instructor
175:170	Injury and Violence Prevention	3	Dr. Peek-Asa
175:251	Injury Epidemiology	3	Drs. Zwerling and Torner
175:253	Epidemiology of Occupational Injuries	3	Dr. Zwerling
175:192	Occupational Safety	3	Dr. Rautiainen
175:230	Occupational Health	3	Dr. Sprince
175:197	Environmental Health	3	Dr. Thorne
175:180	Seminar in OEH	1	Various

Upon completion of the Occupational Injury Prevention Training Program, the doctoral-level graduates will have demonstrated achievement of the following objectives:

- Understand and apply the public health approach to occupational injury control
- Critically read research articles in occupational injury epidemiology
- Understand the most frequently used epidemiologic study designs and how to apply them to occupational injuries
- Develop a research plan in occupational injury epidemiology

- Understand the federal grant system and develop proposal writing skills
- Understand the IRB process and how to ethically conduct research and protect human subjects
- Implement a research plan by collecting and appropriately analyzing data
- Disseminate research results, both orally and in writing
- Teach courses in occupational injury epidemiology

Post-doctoral trainees, in addition to meeting the goals of the doctoral program listed above, will also:

- Participate in the preparation of at least one independent grant
- Understand the budgeting and budget oversight process
- Develop skills to supervise and manage project staff
- Serve as a primary author on at least one peer-reviewed manuscript

#### **D. Program Activities and Accomplishments**

The OIPP has been very successful on several key objectives, described below.

Trainee honors. OIPP trainees have received many honors for their work in the training program. Seven (100%) of our trainees have received external funding for their doctoral research, which demonstrates strength of students as well as faculty mentorship. Two of these students were awarded competitive pilot grants to conduct their doctoral work, and one was awarded a fellowship by the National Library of Medicine. Dr. Hope Tiesman, a Spring, 2007 graduate who won the Delta Omega Public Health Honor Society Student Research Competition. Of our three graduating trainees in the last year, two have faculty/teaching positions and one has accepted a position at the NIOSH Division of Safety Research in Morgantown, West Virginia.

Faculty honors. The OIPP faculty has also received commendation for their achievements. Dr. Corinne Peek-Asa was named the College of Public Health Distinguished Faculty for 2006. She has also been appointed as an Editor for the journal Injury Prevention and was invited to serve on the NIOSH NORA Industry Councils for Service and Retail. Dr. Nancy Sprince received the 2003 Faculty Research Award. Drs. Sprince, Lowe, and Torner were elected to the University of Iowa chapter of the Delta Omega Public Health Honor Society. Dr. Jingzhen Yang served as a Guest Professor at the Suzhou University and the Shanghai China Eastern Normal University.

Trainees theses and dissertations. In the last year, two OIPP fellows have received their doctoral degrees, and one will complete their studies in the spring. These include:

<u>Student</u>	<u>Doctoral Thesis</u>
Dr. Seongwoo Choi	Perceptual impairment and injury in rural populations
Rebecca Heick	Occupational injury in EMS: Does risk outweigh reward?
Hope Tiesman	Re-Injury to Early Career Army Soldiers: Health and Service Outcomes

New Faculty Positions. The Department of Occupational and Environmental Health is currently recruiting an additional faculty member with expertise in the school environment and injuries to individuals with disabilities.

New Courses. In addition to the five injury-related courses, including one focused specifically on occupational injury epidemiology, an additional course that addresses international road traffic safety is being developed. This course will have a strong focus on occupational motor vehicle safety.

Trainee recruitment. We continue to implement our recruitment plan, which includes a focus on students of color and under-represented groups. We have accepted one new student into the doctoral program for fall, 2007, and will continue to fund our existing OIPP doctoral trainees.

## **E. Program Products**

Publications. OIPP trainees have co-authored nine peer-reviewed publications in the last five years, four of which were printed or accepted within the last year. An additional five manuscripts are currently in preparation. OIPP faculty have published an average of 14 publications from 2005 through 2006. These articles are found in a diverse group of high-impact factor journals and address a wide variety of health issues.

Conferences/symposia: Each year, the OIPP fellows are eligible to apply for travel funds to present their work. Two OIPP fellows presented their work at the 2005 American Public Health Association annual meeting, and two additional presentations were made at the 2006 meeting. Additional presentations were made at the Society for Epidemiological Review annual meeting, the National Military Health conference, as well as several local Iowa conferences.

R2P projects. OIPP fellows are encouraged to conduct research that is scientifically rigorous and has public health implications. Dr. Rebecca Heick conducted her doctoral research on EMS providers and found a wide range of important injury outcomes. This was the first national study of its type. Dr. Hope Tiesman found in her doctoral research that soldiers who are injured in early in their military careers have a high risk for re-injury, and that soldiers with re-injuries are at significant risk for discharge from disability.

## **F. Future Plans**

The OIPP will continue to recruit, train, and mentor the highest level of students in occupational injury prevention. We will continue to offer one of the richest academic curriculums in the areas of injury prevention and occupational injury epidemiology, and we will continue to build collaborations with agencies for research. The OIPP will compete for renewed funding in the next year. We hope to grow our program to include a post-doctoral fellow, as well as continue to support three OIPP doctoral trainees.

**A. Program Title: Occupational Medicine Training Program****B. Program Director: Nancy Sprince, MD, MPH****C. Program Description**

During this reporting period, the goals and objectives of the Occupational Medicine (OM) Training Program have not changed. The overall goal of the 24-month residency program is to train well-rounded, excellent OM physicians who are qualified for the comprehensive practice of OM and can enter any of the available sectors to carry out their professional work. Objectives are achieving the ACGME and Residency Program skills, competencies and knowledge required for OM physicians. An additional goal is maintaining a fully accredited OM residency training program. The faculty includes board-certified Occupational Medicine physicians, Drs. Sprince, Cuddihy, Fuortes, Gerr, Hartley, and Zwerling, board-certified practicum supervisors, and experts in the interdisciplinary aspects of occupational safety and health, including ergonomics, industrial hygiene, occupational health nursing, and agricultural health and safety. The curriculum of the two-year residency program requires completion of the MPH degree in the College of Public Health, including general public health courses in Epidemiology, Biostatistics, Public Health Practice, US Healthcare System, Behavioral Health, and Environmental Health. Special courses important to OM physicians are also required: Occupational Health, Advanced Topics in OM, Environmental Toxicology, OM Research Seminar/Journal Club, OM seminar, and Case Studies in OM. A capstone experience, the MPH Practicum, affords the opportunity to apply knowledge from the academic coursework to a practical or research question in OM to demonstrate public health competencies important to an OM physician.

**D. Program Activities and Accomplishments**

October, 2006, the Occupational Medicine Residency Training Program was notified by the Accreditation Council on Graduate Medical Education of continued full accreditation for five years. Three new OM residents joined the program in the past year: Dr. Sudha Pandalai, Dr. Tina Stec and Dr. Raza Akbar. Dr. Pandalai received the MD degree from Ohio State University College of Medicine, while Drs. Stec and Akbar received the MD degree from the University of Iowa College of Medicine. Drs. Baldwin and Heiner advanced to their practicum year and will complete the program in June, 2007 and January 2008 respectively. Three residents completed their OM residency training programs during the past year: Drs. Dy, Hartz, and Haskins. They are practicing Occupational Medicine in the Indianapolis, Minneapolis, and Chicago areas, respectively.

Trainee honors, awards, accomplishments:

- Dr. Pandalai is a recipient of the nationally competitive Occupational Physician Scholarship Award beginning July 1, 2007.
- Dr. Baldwin is a recipient of a training fellowship from the US Air Force that has allowed him to matriculate in a civilian OM residency training program and covers his stipend.
- Two former residents passed their American Board of Preventive Medicine exams, Drs. Andrew Schaeckenbach and Theodore Koerner. The pass rate for our program graduates remains at 100%, which exceeds the national average.
- Dr. Brian Hartz was the 2006 recipient of the J. Frederic Green MD award for the resident exemplifying the attributes of commitment to the OM profession, excellent clinical skills, and excellent communication skills.
- Dr. Robin Epp received the Milford Barnes award for excellence as an MPH graduate of the University of Iowa College of Public Health and was inducted into the Delta Omega National



Public Health Honor Society. She was chosen to represent Iowa Health-Des Moines on the Board of Directors for the Wellness Council of Iowa.

Although no thesis is required for the completion of the MPH degree, the MPH practicum experience (the capstone experience) helps residents gain competency in addressing research or practical issues in OM using the scientific method. The experience results in a 20-paper and a presentation before faculty and students of the College of Public Health. During the past year, OM residents completed the following projects:

- A Federally Mandated Worker's Compensation Program in Former Nuclear Weapons Workers in Iowa: A Call for New Public Policy
- Public Health Aspects of Asbestos Exposure Among Workers and in Public Buildings
- Improving Epidemic Preparedness at the University Employee Health Clinic -An Assessment of a Recent Epidemic And Its Effect on Small Clinic.

Faculty honors, awards and appointments:

- Laurence Fuortes, M.D., was selected as the first recipient of a new University of Iowa College of Public Health award for faculty achievement in community engagement. He was selected for his leadership of numerous projects with major community service components, including programs focused on pesticide toxicology, traumatic head and spinal cord injury, and his direction of the Burlington Atomic Energy Commission Plant-Former Worker Program.
- Nancy L Sprince, MD, MPH, was named to the National Academy of Sciences/national Research Council Committee on Beryllium. She was also inducted into the Delta Omega Public Health Honor Society.
- Fredric Gerr, MD, served as a member of the NIOSH review panel (study section).
- Henri Cuddihy, MD and Patrick Hartley, MD, MPH were promoted to the rank of full Clinical Professor of Medicine in the University of Iowa College of Medicine.

Trainee Recruitment: Through individual faculty efforts of working closely with selected applicants, the OM Residency Program has increased the representation of US underrepresented minorities. Comparing the 10 residents who graduated between 2000-2004 with the 6 who graduated between 2005-2006, we see an increase of minorities from 10% to 50%. In the current group of five residents, 2 out of 5 are from minority groups.

## **E. Program Products**

The major products of the program include graduates and their placement in OM career positions to serve the occupational medicine needs of workers; publications; presentations; and continuing education and outreach. Products are listed below in the publication section.

## **F. Future Plans**

Plans include continued strengthening of the program in response to peer and ACGME review. Dr. Gerr, who has had extensive experience in residency education and in program direction as the former director of the Emory (Rollins College of Public Health) residency program in OEM, will assume leadership of the University of Iowa Occupational Medicine Residency Program July 1, 2007.

**A. Program Title: Continuing Education Program****B. Program Director: Kimberly J. Gordon, RN, MA, BSN, COHN-S****C. Program Description**

The Heartland Center Continuing Education (CE) program has a sound record of accomplishments. During the reporting period (07/01/06 to 02/28/07), 13 CE courses with 551 trainees (260 person-days) were offered. During the full reporting period (07/01/05 to 06/30/06), we held 35 CE courses with 1380 trainees (1614 person days). Compared to the 07/04 to 06/05 reporting period, these data represent a 25% increase in courses, 12% increase in trainees, 21% increase in person-days and surpasses our goal of 400 trainees. Trainees include OHNs; case managers; OM physicians; industrial hygienists; safety professionals; human resources professionals; certified medical assistants; ergonomists; agricultural safety and health specialists; and labor and labor representatives. Trainees have come from all four states in Region VII (Iowa, Kansas, Missouri, and Nebraska).

Progress toward goals/objectives:

**Goal 1 - To ensure the practitioners in Region VII receive CE from the Heartland Center.** A formal relationship with Steelman Services Inc., a distance education consultant began in June 2006. We continue to use several distance education systems that we have available: Elluminate Live; Desire2Learn; and Iowa Communications Network. An online course on respirators is under development and will be available to CE trainees in early 2007.

**Goal 2 - To conduct targeted needs assessment and respond to results with appropriate CE offerings.** Focused needs assessments with OM physicians and OHNs were completed at regional meetings providing direct insight to practitioner needs. Lacking the opportunity of a national IH meeting in our region, an online assessment was conducted. Partnering with the University of Iowa Facility Services Group (FSG) allowed us to assess the needs of professionals and workers related to safety.

**Goal 3 - To further diversify the target audience for our CE program.** Goal 3 objectives relate to increasing IH and safety trainees. The partnership with the FSG allowed us reach safety professionals with a new *Safety Best Practices* conference. A second offering is planned for 2007. Dr. Sanderson (IH) taught a new course, *Occupational Epidemiology for the Industrial Hygienist* both locally (at our Symposium) and nationally (at ACGIH 2006, and is planned for 2007).

**Goal 4 - Explore innovative ways to integrate the disciplines of the Center in CE programs.** Our annual interdisciplinary symposium incorporated faculty from our Center's disciplines surpassing the objective of involving at least three disciplines. A new feature at the 2006 Symposium was formal presentations by ERC graduate students from OIPRT, IH, and OHN.

**Faculty Reputation/Strength**

Director, **Kimberly Gordon, RN, MA, BSN, COHN-S** along with project assistant, **Colleen Gross-Advani, BA** continue to expand the number and type of CE offerings available to practitioners in Region VII. An increase in Ms. Gross-Advani's hours (to 0.75 FTE) was made possible by financial support from the UI College of Public Health Department of OEH and WORKSAFE IOWA. **Craig Zwerling, MD, PhD, MPH** continues as faculty advisor for CE.

**Courses Offered by Specialty Area**

- *Spirometry Training for Worker Screening* (07/06 & 11/06 - OHN) – successful completion of the first-ever NIOSH site visit and course audit accomplished at the July offering

- *Supervisor Training for Drug & Alcohol Abuse Testing: Initial 2-hour and Annual 1-hour (07/06 - Safety)*
- *CSOMA Occupational Medicine Fall Conference (09/06 – OM)*
- *Occupational Hearing Conservationist Certification & Recertification (09/06 – OHN & IH) – Dr. Sanderson (IH) teaches in this offering*
- *8<sup>th</sup> Annual Occupational Health Nursing Conference (10/06 OHN)*
- *WORKSAFE IOWA Occupational Medicine Associate Network Meeting and Seminar (10/06 - OM & OHN)*
- *Case Management: Care of Work-related Injuries (10/06) (Nursing)*
- *The Ergonomics of Hand-Arm and Whole-Body Vibration (11/06 - Ergo) – cancelled due to inadequate trainee numbers to meet budget*
- *Midwest Rural Agricultural Safety and Health Conference (11/06) –Respirators: What You Need to Know to Protect Farm Workers (11/06 – ASH)*
- *FMLA Issues for the Occupational Health Nurse (02/07 - OHN) – a distance based CEU via ICN*

**Needs Assessment** - see details in Goal 2 above.

#### **D. Program Activities and Accomplishments**

#### **E. Program Products**

The Heartland Center Continuing Education Program is the primary sponsor for the majority of our offerings. In addition, we jointly sponsor programs with the Central State Occupational Medicine Association (CSOMA), the Northeast Iowa Occupational Health Nurses Association (NIAOHN), WORKSAFE IOWA and the Iowa Center for Agricultural Safety and Health (ICASH). The Heartland Center maintains an active role in directing the content of all jointly sponsored programs. A complete list of CE course offerings can be found on Table 12a.

An example of a successful Research to Practice (R2P) project is a presentation by James A. Merchant, MD based on research at NASA. The NASA model for workplace wellness was presented at the WORKSAFE IOWA Occupational Medicine Associates Network Meeting and Seminar (Spring 2006). A physician attendee incorporated the concepts and paradigm with a local employer to increase the role of occupational medicine and case management in this manufacturing facility. This has resulted in a streamlined approach for the workers to access local and referral healthcare services.

A variety of unique training courses and topics have been presented using the disciplines and expertise from our center:

- *Case Management: Care of Work-Related Injuries* - this offering is created for workers' compensation case managers;
- *Occupational & Environmental Epidemiology for the Industrial Hygienist, Occupational & Environmental Health Professional* – a unique interdisciplinary offering;
- *Using Occupational Research in Practice* – a course for occupational health nurses offered via distance education using the Iowa Communications Network (ICN) ;
- *Agricultural Occupational Health Training (Session I)* was offered to distance trainees using Elluminate Live.

An impact evaluation of the 2005 Case Management conference was completed with trainees completing a post-course written evaluation the day of the training and an online follow-up survey 6 months post training. This information received helped plan the 2006 Case Management conference.

## **F. Future Plans**

With firm institutional support, expanded staff hours and a distance education consultant, we look forward to making significant strides in the breadth and quality of educational offerings provided by the CE Program. Partnerships with professional organizations will continue allowing us to meet the needs of practitioners in the region. Needs assessment data related to content areas, NORA-priority as well as sector-based areas combined with faculty expertise help us determine content areas and topics for future CE offerings. Impact evaluation of each CE offerings will help us document the impact our training has on the practice of occupational safety and health professionals and ultimately the prevention of work-related injury and illness in Federal Region VII and beyond.

**Report on Specific Improvements in OS&H resulting from ERC Programs:**

The following are specific improvements that were the result of ERC programs, including academic training programs, continuing education, outreach, research training pilot grants, and research training in NORA-related activities over the last year:

**Continuing Education programs and outreach activities, reaching 100's of regional professionals, have led to improvements in OS&H for workers in the region:**

- A presentation on diversity in the workplace resulted in an occupational health clinic incorporating the information learned into clinic policies.
- A presentation on workplace violence helped an occupational health nurse create and implement a workplace violence plan for that worksite.
- A presentation on injury prevention in masonry workers was used to implement new procedures for the workers of one company.
- A presentation related to the use of anti-inflammatory medication and muscle relaxants in injured workers with delayed recovery was incorporated into the practice of an occupational medicine physician.
- An outreach seminar via Elluminate provided a “Depression in the Workplace” tool kit to over 100 OSH practitioners within Federal Region VII.
- Impact evaluation data showed that 95% of respondents at the Case Management: Caring for Worker Injuries conference reported using the information received on the legalities of workers' compensation.
- Monthly updates in occupational health and safety, published as e-bulletins, for WORKSAFE IOWA Associates reach thousands of Iowa and regional employers.
- Information dissemination/outreach on Department of Transportation drug testing regulations improved the processes used by the occupational medicine physicians who are also MROs.

**ERC trainees' and graduates' research activities have resulted in 23 publications in peer-reviewed journals over the last year. These results have informed prevention and control measures for workers in many occupational sectors. Examples of these contributions follow (trainee/graduate names are in bold):**

- The research findings on control of silica exposure during mortar removal with shrouded hoods providing local exhaust ventilation (Collingwood S, Heitbrink WA. Field evaluation of an engineering control for respirable crystalline silica exposures during mortar removal. J Occup Environ Hyg. 2007; 4: 875-887) have informed a NIOSH group that is developing a workplace solutions document for control of these silica exposures.
- Graduate student research resulted in development of an analytical method for measuring the antibiotics tylosin and lincomycin in air samples. This method has already been applied to the evaluation of airborne antibiotics in animal confinement facilities. Reference: Murphy M, Sanderson W, Vargo J. Airborne antibiotic concentrations in animal feeding operations. J Agric Safe Health, In press
- A current national occupational health research need is for improved instrumentation to assess smaller particles in the workplace. Responding to this need, occupational health and safety researchers at the Heartland ERC compared two commonly-used portable particle counters with that of a more expensive, stationary counter. This work has been cited by the EPA and is important for verifying instruments that are useful for effectively evaluating smaller particles in

workplaces. Reference: Peters, T. M., O'Shaughnessy P, Ott D. Performance of the Grimm PDM-1108 and PDM-1109 optical particle counter. *Ann. Occup. Hygiene*, 2006. 50(8): 843-850.

- Wastewater treatment plant operators are at risk from exposure to both hazardous gases, especially hydrogen sulfide and ammonia, and endotoxins derived from sprayed water droplets. A study by Heartland ERC researchers assessed both indoor and outdoor exposure levels of these contaminants. Results led to improved control of airborne hazard through targeted use of respiratory protection in these facilities. Reference: Lee JA, Johnson JC, Reynolds SJ, Thorne PS, O'Shaughnessy PT. Indoor and outdoor air quality assessment of four wastewater treatment plants. *J Occup Environ Hyg*. 2006; 3(1): 36-43.
- Aerosol samplers have changed from those designed to collect either "total" or "respirable" dust to samplers that are now "size-selective" for a variety of dust size fractions. An innovative study led by Heartland Center investigators provided a method for correcting the results obtained from one sampling device relative to those made with a different sampler by applying calculations that incorporate the aerosol's overall size distribution. This study has importance for characterization of all airborne exposures in the workplace. Reference: O'Shaughnessy PT, Lo W-Y, Golla V, Nakatsu J, Tillery M, Reynolds S. Correction of sampler-to-sampler comparisons based on aerosol size distribution. *J Occup Environ Hyg* 2007; 4(4):237-245.
- Research results from a graduate student MS thesis demonstrated the effectiveness of an engineering control system to significantly reduce enzyme exposures in an enzyme manufacturing plant. The control system reduced workers' risk of developing occupational asthma and skin sensitization.
- Through his MS thesis research, a graduate student developed a monitoring and auditing system to assess regulatory radiation exposure compliance in the University of Iowa Hospitals and Clinics. The system showed a high rate of compliance resulting in low personnel radiation doses.

## **Appendix A: Program Curricula**

## Agricultural Safety & Health Training Program Curriculum

Students must take all required courses for the PhD, MS or MPH in one of the following academic programs:

[Industrial Hygiene](#)

[Ergonomics](#)

[Occupational Health Nursing](#)

[Occupational Injury Prevention Research](#)

[Occupational Medicine Residency](#)

In addition, students must take the following agricultural health and safety courses:

<b>Course Title</b>	<b>Course #</b>	<b>Credits</b>	<b>Semester</b>
Rural Health and Agricultural Medicine	175:209	3	Spring
Agricultural Safety: Theories and Practice	175:196	2	Fall
Current Topics in Agricultural Health (Enroll each fall semester unless waived by the Program Director)	175:210	1	Fall
Preceptorship in Occupational and Environmental Health	175:203	Arr.	Every
Thesis/Dissertation	175:300	Arr.	Every



## Ergonomics Training Program Curriculum

### Core Curriculum – Master’s Level

Master's trainees must complete nine core courses (22 semester hours, Table A). Other courses are taken to fulfill the minimum degree requirements, and these courses are dependent on the trainee's academic department (i.e. OEH, IE, or BME).

The core courses are based on the Ergonomist Formation Model, originally developed by the Committee for Harmonizing European Training Programs for the Ergonomic Profession, and adopted by the Board of Certification in Professional Ergonomics in the US (Board of Certification in Professional Ergonomics, 2004). The Model outlines the topic categories and clock hours for contact and/or studies that a trainee must have for competency as an ergonomics professional. It should be noted that other graduate (and undergraduate) courses related to these topic categories would contribute to the overall clock hours. For example, undergraduate courses in anatomy, physiology, engineering, psychology, and statistics would contribute to the clock hours required in the topic categories. Thus, it is not necessary that the core courses in the ETP comprise the total clock hours required (most three-semester hour courses have approximately 37 lecture/contact hours per semester). Although the field of engineering strongly influences the discipline of ergonomics, an engineering degree is not a prerequisite to be a CPE or CHFP.

**Table A. Required Core Courses for the Heartland Center MS/MPH Ergonomics Training Program.**

<i>Course #</i>	<i>Course Title</i>	<i>Instructor(s)</i>	<i>Semester</i>	<i>EFM</i>	<i>s.h.</i>
175:190	Occupational Ergonomics I	Anton	Fall	A,B	3
056:144	Human Factors and Ergonomics I	Lee	Fall	A,B,D	3
056:147	Ergonomics: Design and Evaluation	Schnell	Spring	A,D	3
175:295	Clinical Ergonomics	Anton	Spring	C,E	3
175:230	Occupational Health	Sprince	Fall	D,F	3
		Sanderson			
175:180	Occupational & Environmental Health Seminar*	Cook	Fall Spring	Any	1
171:161	Introduction to Biostatistics	Staff	All	C	3
	OR				
	Equivalent graduate level statistics			C	3
175:203	Preceptorship in Occupational and Environmental Health (MS)	Core Faculty	All	Any	3
	OR				
170:299	MPH Practicum Experience (MPH)	Core Faculty	All	Any	3
050:270	Responsible Conduct of Research	Anderson	All	F	0
				TOTAL	22

(EFM – Ergonomist Formation Model topic categories: A) ergonomics principles, B) human characteristics, C) work analysis and measurement, D) people and technology, E) applications, and F) professional issues; s.h. – semester hours; \*MS and MPH trainees in OEH take this seminar three times: twice for 0 s.h. and once for 1 s.h.)

**175:190 Occupational Ergonomics I: Principles and Methods.** This graduate level ergonomics course covers the principles of ergonomics with a focus on the physiological and anatomical capabilities of the worker and interaction with their work environment. The course covers anthropometry, work physiology and anatomy, basic occupational biomechanics, work-related MSDs and associated risk factors, assessment of exposure to risk factors, basic instrumentation, workplace and tool/equipment design, manual materials handling, and miscellaneous ergonomic topics.

**056:144 Human Factors and Ergonomics I.** This course is concerned with the design of human-machine systems and development of work environments by applying principles of behavioral science and systems engineering. The emphasis is on safety, human error, sensory and perceptual processes, motor skills, human – computer interaction, and experimental methodology. The course presents basic information on human characteristics, capacities, and limitations and points out the application of this information to the design of human tasks, machines, and environment. This course conveys human factors principles through a series of design exercises and case studies of actual mishaps caused by inadequate attention to human factors issues.

**056:147 Ergonomics: Design and Evaluation.** This course introduces students to the principles of ergonomics design of jobs and products in an industrial and consumer market setting. Principles of good design are thoroughly investigated. Consequences of poor job and product design are studied. Also investigated are principles of work sampling, usability studies, performance rating, sizing and planning of workstations, hand-tool design, and ergonomics design in transportation.

**175:295 Clinical Ergonomics.** This course incorporates the material learned in Occupational Ergonomics I and applies it to actual worksite and ergonomic research situations. The course covers ergonomic job analysis; assessment of exposure to risk factors including self-report surveys, observational methods, and direct measurement methods; medical management of MSDs; and lean manufacturing concepts. The course begins with practical ergonomics training using videotaped ergonomic case studies and advances to on-site ergonomic evaluations including the development and evaluation of ergonomic interventions. The student also rotates through occupational medicine and physical therapy clinics. The capstone project is an ergonomic job analysis or research study.

**175:230 Occupational Health.** The course is designed as an introduction to a wide cross section of occupational health topics and issues. The course covers the principles of occupational medicine, occupational health nursing, industrial hygiene, occupational safety, and occupational ergonomics. A portion of the course includes on-site factory visits for interdisciplinary student teams from nursing, industrial hygiene, occupational medicine, safety, and occupational ergonomics. Group projects that are related to these site visits encourage the students to work as a team in identifying and solving an array of occupational health problems.

**175:280 Occupational and Environmental Health Seminar.** This seminar course consists of presentations by faculty and staff on issues of concern in occupational and environmental health. Seminars are presented by faculty from the Colleges of Public Health, Engineering, and Medicine at the University of Iowa, as well as by experts nationally and internationally (via Polycom and Elluminate Live, interactive video or graphics-based distance learning software). The seminar provides a lively forum for interdisciplinary topics and discussion.

**171:161 Introduction to Biostatistics.** Introduction to the application of statistical techniques to biological data. Topics include descriptive statistics, normal and binomial distributions, sampling distributions, hypothesis tests, confidence intervals, contingency tables, nonparametric methods, one-way ANOVA, correlation analysis, and simple linear regression OR **Equivalent graduate level statistics course.**

**175:203 Preceptorship in Occupational and Environmental Health.** The preceptorship is a six-week practicum that provides the trainee with field experience in ergonomics. The trainee performs ergonomics work locally, nationally, or internationally. Local ergonomic work involves the WORKSAFE Iowa outreach program based in the Department of OEH. Currently, five facilities participate locally. National and international ergonomic preceptorships may consist of ergonomic consulting or ergonomic research. Regardless of preceptorship experience, the trainee works with one of the core faculty and company/institute personnel during the preceptorship.

OR

**170:299 MPH Practicum Experience.** A comprehensive and integrated application of the knowledge required by the MPH program in a practice setting in such a way as to demonstrate a professional competency in public health practice. This field course requires students to practice public health concepts and demonstrate public health competencies. This capstone course fulfills the requirement of producing a written thesis or sitting for a final comprehensive style examination.

**050:270 Responsible Conduct of Research.** The focus of this course is to outline major issues in different areas of Ethics and Science and to expand participants' ability to recognize and resolve problems they may encounter during a career in science. Topics include the social context of science, scientific misconduct, human research guidelines, authorship and publication, mentoring and training, conflict of interest, ethical treatment of animals, and ethical issues in genetic research.

Although the ETP core courses are identical for each master's trainee, the remaining curriculum varies depending on the trainee's primary academic department. Other courses are taken to fulfill the minimum MS or MPH degree requirements for each department (i.e. OEH, IE, or BME). The trainee takes additional courses (30 – 40 s.h.) and/or electives from the supporting curricula. Appropriate substitutions to core courses can be made on a case-by-case basis, subject to approval by the ETP Core Faculty.

### Core Curriculum – Doctoral Level

Doctoral trainees must complete eight core courses (15 – 16 s.h., Table B), in addition to the master's core curriculum previously described. Doctoral trainees will therefore be required to complete 17 core courses in the ETP.

**Table B. Required Core Courses for the Heartland Center PhD Ergonomics Training Program (in addition to master's requirements).**

<i>Course #</i>	<i>Course Title</i>	<i>Instructor(s)</i>	<i>Semester</i>	<i>EFM</i>	<i>SH</i>
175:294	Occupational Ergonomics II: Applications and Current Topics	Cook	Spring	A,B,F	3
051:152	Ergonomics of Occupational Injuries	Wilder	Spring	B,C	3
101:212	Biomedical Instrumentation	Gerleman	Fall	C	3
	OR				
	Equivalent graduate level instrumentation			C	
051:149	Graduate Biomechanics	Grosland	Fall	B,C	3
	OR				
101:285	Biomechanical Analysis in Rehabilitation	Yack	Spring	B,C	3
175:180	Occupational & Environmental Health Seminar*	Cook	Fall & Spring	Any	0
051:191	Graduate Seminar in Biomedical Engineering	Staff	Fall & Spring	Any	0
056:191	Graduate Seminar in Industrial Engineering	Staff	Fall & Spring	Any	0
171:162	Design & Analysis of Biomedical Studies	Staff	Spring	C	3
	OR				
22S:159	Design of Experiments (same as 07P:246)	Ansley	Fall	C	4
				TOTAL	15 or 16

(EFM – Ergonomist Formation Model topic areas; s.h. – semester hours; \*PhD trainees in OEH take this seminar three times: twice for 0 s.h. and once for 1 s.h.).

**175:295 Occupational Ergonomics II: Application and Current Topics.** This second level ergonomics course focuses on the application of ergonomic principles in the work setting. Topics covered in the course include participatory ergonomics, economics of ergonomics, workforce issues, psychosocial factors, shift work, integration of ergonomics in a business model, current legislative issues relating to ergonomics, legal aspects of ergonomics, and international perspectives in ergonomics.

**051:152 Ergonomics of Occupational Injuries.** This ergonomics and occupational biomechanics course focuses on the inter-relationship of the mechanics of workplace injuries and the mechanical demands of the associated workplace. Topics include typical acute and chronic injury scenarios and the associated occupational biomechanics. Additional topics discussed include epidemiology, surveillance, psychology, legal aspects, and cost control measures.

**101:212 Biomedical Instrumentation.** Basic electronic concepts and modes of equipment operation, instrument utilization in patient evaluation and investigative study, interpretation of measurements obtained through various instrumentation techniques, critical analysis of selected instrumentation and analysis techniques OR **Equivalent graduate level instrumentation course.**

**051:149 Graduate Biomechanics.** Understanding the human body from an engineering mechanics perspective; challenges of applying engineering principles to living systems, illustrated through real-world examples.

OR

**101:285 Biomechanical Analysis in Rehabilitation.** Link segment modeling and analysis, mechanical energy and power analysis, electromyography and muscle modeling.

**175:280 Occupational & Environmental Health Seminar, 056:191 Graduate Seminar in Industrial Engineering, and 051:191 Graduate Seminar in Biomedical Engineering.** Variety of advanced topics discussed (1 hour/week).

**171:162 Design and Analysis of Biomedical Studies.** Simple and multiple linear regression and correlation; one- and two-way layout considerations in planning experiments, factorial experiments; Tukey's, Scheffe's, Dunnett's multiple comparison techniques and orthogonal contrasts.

OR

**22S:159 Design of Experiments.** Theory and methods in the planning and statistical analysis of experimental studies; testing of hypotheses about linear contrasts among means in single-factor and multifactor, completely randomized, and repeated measurement designs.

Although the ETP core courses are identical for each PhD trainee, the remaining curriculum varies depending on the trainee's academic department (i.e. OEH, IE, or BME). Other courses are taken to fulfill the minimum PhD degree requirements for each department. The trainee takes additional courses (30 – 40 s.h.) from the supporting curricula to provide individualized expertise as the basis for his or her future research efforts. Appropriate substitutions to core courses can be made on a case-by-case basis, subject to approval by the ETP Core Faculty.

To assure the necessary breadth and depth in doctoral training, the trainee's advisor performs an incoming assessment and evaluates the trainee's background, competencies, educational objectives, and career objectives. Based on this assessment, the trainee's individual Plan of Study is developed including elective coursework. For example, trainees with a health background may take courses in IE or BME, while trainees with an engineering background may take physiology and anatomy courses. Since trainees in the various departments will likely have different backgrounds, the ETP allows the flexibility for a trainee to pursue specialization in his or her area of interest. This flexibility has been noted as an asset by all previous doctoral trainees in the ETP.

All post-doctoral trainees must take Responsible Conduct in Research (050:270), the core courses for the PhD ETP (Table B) with the exception of all of the seminars, or have had equivalent courses. Only the seminar in the post-doctoral trainee's home department is required (e.g. BME post-doctoral trainees take Graduate Seminar in Biomedical Engineering). Since most post-doctoral trainees will have had equivalent coursework in their PhD program, it is anticipated that post-doctoral trainees in the ETP will take an average of one course per semester, with their remaining time devoted to research.

### Industrial Hygiene Training Program Curriculum

**Table C. Curriculum – Industrial Hygiene Training Program**

Course Number	Course Title	Sem Hrs	Instructors	Course Description
<b>Core Courses Required for All Industrial Hygiene Students</b>				
175:231	Industrial Hygiene Fundamentals	3	Sanderson/Heitbrink	Instruction in the basic principles of industrial hygiene, stressing the recognition and evaluation of chemical health hazards.
175:232	Assessing Physical Agent Hazards	3	Sanderson/Field	Instruction in the basic principles of recognizing and evaluating hazards presented by physical agents in the occupational environment.
175:233	Control of Occupational Hazards	3	Heitbrink	Concepts from engineering applicable to control of industrial hygiene hazards, including ventilation, systems design, and use of protective equipment.
175:221	Aerosol Technology	3	Peters	Study of particle statistics and physics of aerosols including inertia, diffusion, nucleation, evaporation, condensation, optics, and electrical properties.
175:220	Occupational Epidemiology and Exposure Assessment	3	Field/Peters	Epidemiologic study designs and exposure assessment techniques to evaluate occupational and environmental health problems.
<b>Additional Courses Required for All Industrial Hygiene Students</b>				
175:230	Occupational Health	3	Sprince/Sanderson/Heitbrink	Introduction to the principles of occupational medicine, industrial hygiene and safety, occupational health, and ergonomics.
175:192	Occupational Safety	3	Rautiainen	An introduction to the principles and practices of occupational safety with a focus on interactions of safety engineering with other disciplines.
175:197	Environmental Health	3	Thorne/O'Shaughnessy	Study of human health and interactions with physical, chemical, biological, and social factors in the environment.
175:260	Environmental Toxicology	3	Thorne/Fuortes	Study of the sources, routes of absorption, and pathophysiological effects of environmental toxicants.
175:190	Occupational Ergonomics I	3	Anton	Ergonomic principles with a focus on the physiological and anatomical capabilities of workers and interaction with their environment.

171:161	Biostatistics	3	Biostatistics faculty	Introduction to descriptive statistics, probability, distributions, sampling, tests of significance, confidence intervals, and simple linear regression.
173:140	Epidemiology I: Principles	3	Lynch	Introduction to epidemiologic concepts and methods including study designs, communication, and dissemination of epidemiologic findings.
175:180	Occupational & Environmental Health Seminar	1	Cook	Guest lecturers provide presentations on a broad range of occupational and environmental health topics-opportunity for all ERC students to interact.
175:203	Preceptorship/ internship or other elective*	3	IH Faculty	Work experience using knowledge and skills acquired in the classroom; arranged with collegiate activities, government, or industry.
175:172	Independent Study Occup & Environ Health	1-3	IH Faculty	In depth pursuit of an area in occupational and environmental health requiring substantial creativity and independence.
175:201	Research in Occupational & Environmental Health	1-3	IH Faculty	Independent research which may lead to thesis or dissertation.
175:300	Thesis/Dissertation Research	1-3	IH Faculty	Research in preparation of thesis or dissertation.
050:270	Responsible Conduct in Research	0	Anderson	Introduces issues of human subject protection and ethical conduct of research
<b>Additional Courses Required for PhD Industrial Hygiene Students</b>				
171:162	Design & Analysis of Biomedical Studies	3	Zhang	Second level biostatistics course covering multiple regression, correlation, regression diagnostics, model building, and analysis of covariance.
050:270	Responsible Conduct in Research	0	Anderson	Introduces issues of human subject protection and ethical conduct of research

\*Preceptorships and internships are available at local industries. These positions enable students to work with practicing occupational safety and health professionals on their efforts to protect worker safety and health.

## Occupational Epidemiology Training Program Curriculum

The OETP offers either a MS or PhD degree in Occupational and Environmental Health or Epidemiology. Doctoral students are expected to enter the program with a MS degree or complete a MS degree as part of their graduate training.

### Degree Requirements

MS and PhD Degree - [Occupational and Environmental Health](#)

MS and PhD Degree - [Epidemiology](#)

Additional required courses follow:

Course Number	Course Title	Semester Hours	Semester Offered
173:140	Epidemiology I: Principles	3	Fall, Spring, Summer
173:160	Intro to Epidemiology Data Analysis with the Computer	2	Fall
175:180	Occupational & Environmental Health Seminar	1	Fall, Spring
175:185	Occupational Health Research Seminar	2	Fall, Spring
175:230	Occupational Health	3	Fall
173:240	Epidemiology II: Advanced Methods	3	Spring
173:241	Epidemiology II: Advanced Methods Lab	2	Spring
175:220	Occupational and Environmental Epidemiology	3	Spring
050:270	Responsible Conduct in Research	0	Fall, Spring, Summer

## Occupational Health Nursing Training Program Curriculum

The MSN degree program in occupational health nursing (OHN) is 33 semester hours. A sample full-time plan of study follows:

<p><b>Semester 1 (Fall)</b>            175:230 Occupational Health 3 s.h. - <i>Advanced Practice Core</i>            173:140 Epidemiology I 3 s.h. - <i>Core</i>            96:209 Health Systems/Economics/Policy 3 s.h. - <i>Core</i>  <b>Semester 1 Total - 9 s.h.</b></p>	<p><b>Semester 2 (Spring)</b>            96:206 Nursing Science and Inquiry 3 s.h. - <i>Core</i>            96:263 Informatics in Nursing and Health Care 3 s.h. - <i>Core</i>            96:208 Leadership for Advanced Nursing Practice 3 s.h. - <i>Core</i>  <b>Semester 2 Total - 9 s.h.</b></p>
<p><b>Semester 3 (Fall)</b>            96:256 Occupational Health Nursing 3 s.h. - <i>Didactic Specialization</i>            +96:257 Occupational Health Nursing Practicum I 3 s.h. - <i>Clinical Specialization</i>            ____:____ Elective in emphasis area 3 s.h. (see below)  <b>Semester 3 Total - 9 s.h.</b></p>	<p><b>Semester 4 (Spring)</b>            96:258 Occupational Health Nursing II 3 s.h. - <i>Didactic Specialization</i>            +96:259 Occupational Health Nursing Practicum 3 s.h. - <i>Clinical Specialization</i>            175:180 Occupational &amp; Environmental Hlth Sem. 0 s.h. - <i>Didactic Specialization</i>  <b>Semester 4 Total - 6 s.h.</b></p>

+ These courses include practicum experiences

\*\* **Suggested Elective Courses** (3 semester hours required):

### Case Management

96:170 Introduction to Case Management 3 s.h.

96:266 Advanced Case Management: Interdisciplinary Approach 3 s.h.

### Injury Prevention

175:251 Injury Epidemiology 3 s.h. (spring, odd years)

175:253 Epidemiology of Occupational Injury 3 s.h. (spring, even years)

175:192 Occupational Safety 3 s.h. (fall only)

### Agricultural Health

175:209 Rural Health and Agricultural Medicine 3 s.h. (spring only)

175:203 Preceptorship in Occupational and Environmental Health 3 s.h. (spring, summer, fall)

175:196 Agricultural Safety: Theories & Practice 3 s.h. (fall)

### Other Electives

96:213 Physiology for Advanced Nursing Practice 3 s.h.

96:222 Health Promotion and Related Interventions for Primary Care 3 s.h.

96:224 Pharmacotherapeutics for Advanced Clinical Practice 4 s.h.

175:190 Occupational Ergonomics I 3 s.h.



## Occupational Injury Prevention Research Training Program Curriculum

Doctoral trainees. Students supported by OIPP training program pursue doctoral degrees in the Departments of Epidemiology, Occupational and Environmental Health, or Community and Behavioral Health. These programs are based on sound academic practice and tailored to meet the needs of individual students' backgrounds and career objectives. A series of written and oral examinations is required, as well as a written dissertation based on the results of original investigation. Graduate work towards a PhD must include at least two semesters of residence and include a minimum of 72 semester hours of total graduate study including research for the dissertation. Departments currently expect doctoral students to complete an MS degree as part of their graduate training, and graduate studies towards an MS degree are included in the minimum requirements, with a maximum of 36 hours transferred in from an MS program. Students admitted without a master's degree normally spend their first two years getting the master's degree in their home department.

The OIPP curriculum includes a core of seven (19 hours) courses that address injury prevention and occupational health, and eight (22 hours) courses that address methodological issues. These courses are described in Table B.

**Table B: Core Courses for all OIPP Trainees**

<u>Injury and Occupational Health Courses</u>				
Course #	Course Name	Sem .Hrs.	Instructor	Description
175:170	Injury and Violence Prevention	3	Dr. Peek-Asa	A basic introduction to the theory, practice, and research on injury control
175:251	Injury Epidemiology	3	Drs. Zwerling and Torner	An advanced epidemiology course that focuses on specific methodologic problems related to injury studies.
175:253	Epidemiology of Occupational Injuries	3	Dr. Zwerling	An advanced didactic methodology course focusing on critical thinking in the field of occupational injuries. Topics include surveillance, high-risk industries, and program design and evaluation.
175:192	Occupational Safety	3	Dr. Rautiainen	An introduction to the principles and practices of occupational safety, with a focus on interactions of safety engineering with other disciplines.
175:230	Occupational Health	3	Dr. Sprince	Introduces principles of occupational medicine, industrial hygiene and safety, occupational health management, ergonomics, and occupational health nursing
175:197	Environmental Health	3	Dr. Thorne	A broad survey of the field of environmental health, including the assessment of contemporary human health issues associated with biological, chemical, and physical factors in the environment
175:180	Seminar in OEH	1	Various	Guest lectures present broad OEH topics with discussion. This seminar is an opportunity for all ERC students to interact.
<u>Methodologic Courses</u>				
Course #	Course Name	Sem	Instructor	Description

		.Hrs.		
173:140	Epidemiology I	3	Dr. Lynch	Introduction to epidemiologic concepts and methods including study designs, communication and dissemination of epidemiologic findings
173:240	Epidemiology II	3	Dr. Christchilles	Topics include bias, confounding, effect modification, matching, data sources, questionnaire design, surveys
171:161	Introduction to Biostatistics	3	Various	Introduction to descriptive statistics, probability, distributions, sampling, tests of significance, confidence intervals, and simple linear regression
171:162	Design and Analysis of Biomedical Studies	3	Dr. Zhang	Multiple regression; correlation; regression diagnostics; model building; analysis of covariance; multiple comparisons; and the use of computer for data analysis
171:241	Applied Categorical Data Analysis	3	Dr. Smith	Advanced model building and diagnostics, control of confounding and effect modification
172:150	Health Behavior and Education	3	Dr. Yang	Theories of health behavior and health education and their application to a variety of settings, including injury control
172:181	Evaluation Theory and Applications	3	Dr. Wallis	Design and methodology used in program evaluation including planning, design, collection and analysis of data
050:270	Responsible Research Conduct	1	Dr. Anderson	Introduces issues of human subject protection and ethical conduct of research

We have approved OIPP curricula in each participating department. Each department has allowed the OIPP to develop a combination of courses that include the required core OIPP courses in injury prevention and occupational health in addition to the existing required courses for the departmental specialization. Substitutions to the required curricula are considered by the Executive Committee on a case-by-case basis. A summary of departmental requirements for OIPP trainees is included in Table C. In Table C, an "R" denotes a course that is required for the trainee. An "RE" denotes a course that is required within a set of electives. For example, OEH students may choose to take two additional injury-related courses from a list of three courses that address disaster management, ergonomics, and agricultural health.

**Table C: Requirements for Doctoral Students in the Occupational Injury Prevention Fellowship, by department**

**R = required RE = required within a set of electives**

	Occupational and Environmental Health	Epidemiology	Community and Behavioral Health
<b><u>Injury Prevention and Control courses</u></b>			
Injury Prevention and Control	R (required)	R	R
Injury Epidemiology	R	R	R
Epidemiology of Occupational Injuries	R	R	R
Research Methods in Disaster Studies	RE (required within a set of electives)	RE	RE
Domestic Violence	RE	RE	RE

**Occupational and Env. Health courses**

Environmental Health	R	R	R
Occupational Safety	R	R	R
Occupational Health	R	R	R
Occupational Ergonomics	RE	RE	RE
Agricultural Health	RE	RE	RE
Seminar in Occupational and Env Health	R	R	R

**Epidemiology courses**

Epidemiology I: Principles	R	R	R
Epidemiology II and lab	R	R	R
Epidemiology III		R	
Introduction to Epi Data Analysis	RE	R	
Writing a Research Proposal	RE	R	RE

**Biostatistics courses**

Introduction to Biostatistics	R	R	R
Design and Analysis of Biomedical Studies	R	R	R
Research Data Management	RE	R	
Statistical Methods in Epi I	R	R	R
Statistical Methods in Epi II	RE	RE	
Longitudinal Data Analysis	RE	RE	

**Community and Behavioral Health courses**

Health Behavior and Education	R	R	R
Evaluation I: Theory and Applications	R	R	R
Evaluation II: Design and Methods	RE	RE	R
Introduction to Health Promotion			RE
Community Development in Public Health			R
Social Sciences and Health			RE
Designing and Implementing Interventions			RE
Health Communications			RE
Persuasion and Health			RE
Qualitative Research for Public Health			R

**Other courses**

Responsible Conduct in Research	R	R	R
Human Pathophysiology	R	R	

Dissertation Hours	12	10	12
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Total Hours	72	81	77
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## Occupational Medicine Curriculum

Each Occupational Medicine (OM) resident must complete all MPH in OEH requirements plus additional requirements listed below (including three courses/seminars and an Occupational Medicine Clinic weekly session) which must be taken by OM residents in both Fall and Spring semesters. Total semester hours must total at least 39 to meet MPH degree requirements.

### MPH Practicum 170:299 (3 s.h.)

The MPH Practicum course (170:299) will consist of a five-week rotation in one of the approved rotations for occupational medicine residents in their practicum year or another 200 hour experience, if approved by the course director (Prof. Atchison) and the resident's advisor. All Occ Med residents must meet with Drs. Gerr and Sprince and their advisor to choose a topic and draft a plan for this course, including background/rationale, aims, and methods.

Residents will complete the 39 s.h. required for the MPH with a focus in OEH by choosing relevant electives (suggested electives are listed below). A waiver from the graduate program's Pathology requirement should be requested in the resident's plan of study, since Pathology is a course taken in medical school.

<b>MPH / OM Resident Requirements &amp; Course Information</b>		
<b>Number</b>	<b>Course Title</b>	<b>Hours</b>
<b>MPH Required Courses</b>		
170:101	Introduction to Public Health Practice	3
171:161	Introduction to Biostatistics	3
172:101	Introduction to Health Promotion and Disease Prevention	3
173:140	Epidemiology I: Principles	3
174:102	Introduction to the US Healthcare System	3
175:197	Environmental Health	3
175:180	Occupational & Environmental Health Seminar – required both Fall & Spring semesters	0/1
050:270	Responsible Conduct in Research	0
170:299	MPH Practicum	3
<b>Additional Requirements for OM Residents</b>		
175:230	Occupational Health	3
175:260	Environmental Toxicology	3
175:185	Occupational Health Research Seminar - required both Fall & Spring semesters (4 s.h. total)	2/2
175:285	Advanced Topics in Occupational Medicine	2
	Clinical Case Studies in Occupational Medicine -- Register for 175:171 - Problems in OEH - special permission code 098	2
	Occupational Medicine Seminar - required both Fall & Spring semesters - no registration required	0
	Occupational Medicine Clinic -- Wednesday morning or afternoon session, depending on remaining class schedule	0

<b>Summary of Requirements</b>	
<b>MPH Required Courses</b>	<b>22 s.h.</b>
<b>Additional Requirements for OM Residents</b>	<b>14 s.h.</b>
<b>Elective</b>	<b>3 s.h.</b>
<b>Total</b>	<b>39 s.h.</b>

**Suggested electives include the following (in order of course number):**

**175:111 International Health**

Topics include urgent health problems and among disadvantaged populations in developed countries. Biological, social, cultural, and political aspects of international health problems and applications of research methods from epidemiology, environmental health, and the social sciences.

**175:170 Injury Prevention and Control**

Will introduce students to the theory, research, and practice of injury control. Topics include concepts that form the foundation of the study of injury control and prevention, the data available, risk factors, and prevention approaches.

**175:175 Research Methods in Disaster Studies**

This course introduces students to the epidemiologic study of disasters and their health outcomes. It will focus on research to reduce health effects from disasters and discusses disaster response and preparedness research.

**175:190 Occupational Ergonomics I**

This course covers the principles of ergonomics with a focus on the physiological and anatomical capabilities of the worker and interaction with their work environment.

**175:192 Occupational Safety**

This course covers the principles and practices of Occupational Safety. Specific applications in industrial and other occupational settings are presented, and interactions with other disciplines are emphasized.

**175:195 Global Environmental Health**

Global Environmental Health utilizes the latest interactive video technology to bring together international experts to address current problems, including trans-boundary movement of pollutants, vectors of infectious agents, global warming and climate change, and many others.

**175:196 Agricultural Safety: Theories and Practice**

General theories and practice of injury prevention are presented from various fields, including industrial safety, engineering, regulation, education, epidemiology, and social psychology. Applications from these fields are considered for strategic application in agriculture.

**175: 209 Rural Health and Agricultural Medicine**

Introduces students to health care delivery issues, environmental health problems and occupational medical problems commonly encountered by practicing rural physicians. The course is conceptual so that principles can be applied to rural-agricultural areas.

**175:210 Current Topics in Agricultural Health**

Agro-terrorism, antibiotic resistance, and genetically modified organisms are examples of current issues studied, affecting the health of agricultural populations. Current scientific literature is the primary information resource used.

**175:231 Industrial Hygiene I: Recognition**

This course is designed to provide students with specialized instruction in the basic principles of industrial hygiene, stressing the recognition of chemical health hazards and in-depth coverage of physical health hazards.

**175:232 Industrial Hygiene II: Evaluation**

The course provides theoretical and practical experience with air sampling concepts and methods, and discusses their application to industrial hygiene hazard evaluation of chemical, physical, and biological agents.

**175:233 Industrial Hygiene III: Control**

The course presents concepts from physical sciences applicable to control of industrial hygiene hazards. Two-thirds of the course is devoted to engineering ventilation controls; one-third is devoted to non-ventilation controls, program management issues and skills.

**175:251 Injury Epidemiology**

How epidemiology can be applied to injury prevention and control: surveying the literature, specific methodologic problems in injury epidemiology, critical evaluation of research articles.

**175:252 Environmental Policy**

This course surveys the major issues in environmental health and related public policy, focusing on similarities/differences between US and international regulatory efforts. The role of government, industry, academia and advocacy groups is discussed.

**175:253 Epidemiology of Occupational Injuries**

Detailed study of the epidemiologic literature on occupational injuries and their prevention. Will focus on research methods in this field.

**175:270 Special Topics in Toxicology**

The genesis of toxicology as the science of poisoning and its application to murder, magic and medicine is explored. The use of natural products for gaining power, hunting, warfare, religion, and witchcraft is also investigated.

**175:294 Occupational Ergonomics II**

This course focuses on the application of ergonomic principles in the work setting. Ergonomic topics include: participatory issues, economics, workforce issues, psychosocial factors, shift work, integration in a business model, legislative issues, legal aspects, and international perspectives in ergonomics.

**175:295 Clinical Ergonomics**

This experiential course prepares the student for conducting independent on-site ergonomic evaluations. The course includes the development and evaluation of ergonomic interventions within an industrial setting and a rotation through the occupational medicine clinic.

## MS Degree Occupational and Environmental Health

This program prepares graduate level students for professional careers in environmental and occupational health. The degree requires a minimum of 38 semester hours and prepares students for career opportunities in local, state, or federal health agencies, in departments of industrial health and safety in commercial enterprises, and in academic institutions.

### Prerequisites

A baccalaureate degree is required. Undergraduate preparation should include previous course work in mathematics, biological, chemical and either physical sciences or engineering (prerequisites depend on requirements of the chosen specialty area).

### Required Courses

175:197	Environmental Health	3 s.h.
175:230	Occupational Health	3 s.h.
175:260	Environmental Toxicology	3 s.h.
175:180	Occupational & Environmental Health Seminar	1 s.h. *
171:161	Introduction to Biostatistics	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
050:270	Responsible Conduct in Research	0 s.h.

\*Enroll in OEH seminar three times: twice for 0 s.h. and once for 1 s.h.

One of the following:

069:133	Introduction to Human Pathology Offered Fall semester only	4 s.h.
096:114	Human Pathophysiology: Organ Systems Offered Fall semester only for OEH students	3 s.h.
096:115	Human Pathophysiology: Cellular/Neurology/Immunology Offered Spring semester only for OEH students	3 s.h.
		<b>19-20 s.h.</b>

### Thesis

Completion and acceptance of a master's thesis is required. A maximum of 6 semester hours will be allowed for thesis credit hours (175:300). Additional thesis credit hours may be allowed for students who take more than 38 semester hours.

### Electives

Elective courses must be chosen to fulfill the minimum MS degree requirement of 38 semester hours. Students and advisors should select courses most appropriate to the individual student's professional goals.

**Total Semester Hours Required for MS Degree (Minimum) 38 s.h.**

## PhD Degree Occupational and Environmental Health

This program prepares graduate level students in professional and academic careers in environmental and occupational health. Graduates will be able to assume responsibility for the development and basic administration of environmental and occupational health programs, and will qualify for beginning faculty positions in academic environmental health departments.

### Prerequisites

A baccalaureate degree is required. Although enrollment directly into the PhD program is possible, completion of the MS program is recommended as a first step toward the PhD degree. Undergraduate preparation should include previous course work in mathematics, biological, chemical and either physical sciences or engineering (prerequisites depend on requirements of the chosen specialty area).

### Required Courses

175:197	Environmental Health	3 s.h.
175:230	Occupational Health	3 s.h.
175:180	Occupational & Environmental Health Seminar	1 s.h.*
171:162	Design and Analysis of Biomedical Studies	3 s.h.
171:161	Introduction to Biostatistics	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
050:270	Responsible Conduct in Research	0 s.h.
		<b>16 s.h.</b>

\*Enroll in OEH seminar three times: twice for 0 s.h. and once for 1 s.h.

One of the following:

069:133	Introduction to Human Pathology	4 s.h.
096:114	Human Pathophysiology: Organ Systems	3 s.h.
096:115	Human Pathophysiology: Cellular/Neurology/Immunology	3 s.h.
		<b>3-4 s.h.</b>

### Elective Credits

A minimum of **24** additional credit hours must be acquired from attendance in non-research-related courses. These would include any courses offered in a classroom setting or the equivalent web-based course. Students and advisors should select courses most appropriate to the individual student's professional goals.

### Research Credits

The remaining credits needed to achieve the 72 required for this degree may be acquired by any combination of the research-related courses given below or other class-based courses.

175:300	Thesis/Dissertation
175:201	Research in Occupational and Environmental Health
175:172	Independent Study in Occupational and Environmental Health

**Total Semester Hours Required for PhD Degree (Minimum) 72 s.h.**



**MS Degree  
Occupational and Environmental Health  
Industrial Hygiene Subtrack**

The overall goal of the industrial hygiene MS program is to train individuals to prevent occupational disease and injury in industry, environmental, and occupational sectors. The MS curriculum is designed to prepare students philosophically and technically to practice the art and science of industrial hygiene. The Accreditation Board for Engineering and Technology (ABET) accredits this program.

### Prerequisites

A baccalaureate degree is required. Undergraduate preparation must include at least 63 semester hours in science, mathematics, engineering, and technology and 21 semester hours in communications, humanities, and social sciences.

Two options are available for obtaining this MS degree:

- **Research Option – this option involves writing a master’s thesis**
- **Professional Option – this option involves a semester-long practical experience**

### Research Option (thesis option)

#### Required Courses

175:231	Industrial Hygiene Fundamentals	3 s.h.
175:232	Assessing Physical Agent Hazards	3 s.h.
175:233	Control of Occupational Hazards	3 s.h.
175:221	Aerosol Technology	3 s.h.
175:220	Environmental and Occupational Epidemiology	3 s.h.
175:230	Occupational Health	3 s.h.
175:192	Occupational Safety	3 s.h.
175:190	Occupational Ergonomics I	3 s.h.
175:260	Environmental Toxicology	3 s.h.
175:197	Environmental Health	3 s.h.
171:161	Introduction to Biostatistics	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
175:180	Occupational & Environmental Health Seminar	1 s.h. *
050:270	Responsible Conduct in Research	0 s.h.
		<b>37 s.h.</b>

\*Enroll in OEH seminar three times for 0 semester hour credit.

### Thesis

Completion and acceptance of a master’s thesis is required. A maximum of **6** semester hours will be allowed for thesis credit hours. Additional thesis credit hours may be allowed for students who take more than 43 semester hours.

### Electives

Additional elective courses may be taken as desired to increase understanding in an area of interest. Students and advisors should select courses most appropriate to the individual student’s professional goals.

### Final Examination

The final examination for this option will consist of a defense of the MS thesis.

**Total Semester Hours Required for MS Degree (Minimum) 43 s.h.**

## Professional Option (non-thesis option)

### Required Courses

175:231	Industrial Hygiene Fundamentals	3 s.h.
175:232	Assessing Physical Agent Hazards	3 s.h.
175:233	Control of Occupational Hazards	3 s.h.
175:221	Aerosol Technology	3 s.h.
175:220	Environmental and Occupational Epidemiology	3 s.h.
175:230	Occupational Health	3 s.h.
175:192	Occupational Safety	3 s.h.
175:190	Occupational Ergonomics I	3 s.h.
175:260	Environmental Toxicology	3 s.h.
175:197	Environmental Health	3 s.h.
171:161	Introduction to Biostatistics	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
175:180	Occupational & Environmental Health Seminar	1 s.h.*
050:270	Responsible Conduct in Research	0 s.h.
		<b>37 s.h.</b>

\*Enroll in OEH seminar three times for 0 semester hour credit.

### Preceptorship

Completion of a Preceptorship in industrial hygiene is required. A maximum of **3** semester hours will be allowed for preceptorship credit hours. The preceptorship will be a practical experience that utilizes industrial hygiene principles.

### Electives

At least one **3** semester hour elective course must be taken to fulfill the minimum number of semester hours required for this degree option. Students and advisors should select courses most appropriate to the individual student's professional goals.

### Final Examination

The final examination for this option will consist of a defense of the preceptorship experience. A report will be prepared and defended orally that summarizes the experience.

**Total Semester Hours Required for MS Degree (Minimum) 43 s.h.**

**PhD Degree  
Occupational and Environmental Health  
Industrial Hygiene Subtrack**

The PhD program trains individuals to conduct and supervise research or to manage advanced applied programs in academic, governmental, or private industrial hygiene settings. The overall goal of the program is to contribute to occupational disease prevention and injury prevention in industrial, environmental or agricultural sectors.

### Prerequisites

A baccalaureate degree is required. Although enrollment directly into the PhD program is possible, completion of the MS program is recommended as a first step toward the PhD degree. Undergraduate preparation must include at least 63 semester hours in science, mathematics, engineering, and technology and 21 semester hours in communications, humanities, and social sciences.

### Required Courses

175:231	Industrial Hygiene Fundamentals	3 s.h.
175:232	Assessing Physical Agent Hazards	3 s.h.
175:233	Control of Occupational Hazards	3 s.h.
175:221	Aerosol Technology	3 s.h.
175:220	Environmental and Occupational Epidemiology	3 s.h.
175:230	Occupational Health	3 s.h.
175:192	Occupational Safety	3 s.h.
175:190	Occupational Ergonomics I	3 s.h.
175:260	Environmental Toxicology	3 s.h.
175:197	Environmental Health	3 s.h.
175:180	Occupational & Environmental Health Seminar	1 s.h. *
171:161	Introduction to Biostatistics	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
171:162	Design and Analysis of Biomedical Studies	3 s.h.
050:270	Responsible Conduct in Research	0 s.h.
		<b>40 s.h.</b>

\*Enroll in OEH seminar three times: twice for 0 s.h. and once for 1 s.h.

### Elective Credits

A minimum of **12** additional credit hours must be acquired from attendance in non-research-related courses. These would include any courses offered in a classroom setting or the equivalent web-based course. Students and advisors should select courses most appropriate to the individual student's professional goals.

### Research Credits

The remaining credits needed to achieve the 72 required for this degree may be acquired by any combination of the research-related courses given below or other class-based courses.

175:300	Thesis/Dissertation
175:201	Research in Occupational and Environmental Health
175:172	Independent Study in Occupational and Environmental Health

**Total Semester Hours Required for PhD Degree (Minimum) 72 s.h.**

## MPH Degree Occupational and Environmental Health Subtrack

### Objective

The MPH in occupational and environmental health program aims to prepare graduate level students for professional careers in environmental and occupational health. It targets students who already have a graduate or professional degree or have public health experience. The graduates of the program will have a broad overview of the public health perspective on occupational and environmental health and will be ready to hold a wide variety of jobs in that area.

### Prerequisites

An undergraduate degree is required. The cumulative grade point average should be a minimum of a 3.0 on a 4.0 scale. Although no specific major is required, prerequisite coursework includes one semester each of college algebra and biology.

### MPH Core Courses

The following course work is required for all MPH students. Students are expected to earn  $\geq$ B- (2.67) on each core course and must earn a  $\geq$  B (3.0) cumulative grade point average on all core courses. When necessary, a student may repeat a course to achieve this standard.

170:101	Introduction to Public Health Practice	3 s.h.
171:161	Introduction to Biostatistics	3 s.h.
172:101	Introduction to Health Promotion and Disease Prevention	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
174:102	Introduction to the U.S. Healthcare System <b>or</b>	3 s.h.
174:200	Introduction to Health Care Organization and Policy	3 s.h.
175:197	Environmental Health	3 s.h.
		<b>18 s.h.</b>

### Practicum Requirement

170:299	MPH Practicum Experience	<b>3 s.h.</b>
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The experience from this course, including a final written report and oral presentation constitutes the final examination for the MPH.

### Bioscience Requirement\* or elective if previous course taken in bioscience

Any one of the following courses may be used to meet this requirement:

069:133	Introduction to Human Pathology	4 s.h.
069:270	Pathogenesis of Major Human Diseases	3 s.h.
096:114	Human Pathophysiology: Organ Systems	3 s.h.
096:115	Human Pathophysiology: Cellular/Neurology/Immunology	3 s.h.
		<b>3-4 s.h.</b>

\*If a student has had such coursework in the past, a bioscience course does not need to be taken, but the hours are replaced with three more hours of electives.

**Required Courses**

175:180	Occupational and Environmental Health Seminar	1 s.h.*
050:270	Responsible Conduct in Research	0 s.h.
	Additional required courses	13-14 s.h.
		<b>14-15 s.h.</b>

\*MPH students take OEH seminar three times: twice for 0 s.h. and once for 1 s.h. If completing the MPH in a one-year course of study, the seminar will be taken two times: once for 0 s.h. and once for 1 s.h.

**Summary of requirements**

MPH Core Courses	18 s.h.
Practicum Requirement	3 s.h.
Bioscience Requirement or Elective	3-4 s.h.
Required Courses	14-15 s.h.
<b>Total</b>	<b>39 s.h.</b>

**Total Semester Hours Required for MPH Degree (Minimum) 39 s.h.**

## MPH Degree Ergonomics Subtrack

### Objective

The MPH with an ergonomics focus draws from the multi-disciplinary expertise and interests of faculty members from the Colleges of Public Health, Engineering, and Medicine. The interdisciplinary ergonomics program will require approximately two years of study. Students enrolled in this public health specialty will receive academic, practical, and research experience in the field of ergonomics. The objectives of the ergonomics focus are for students to have 1) a thorough understanding of the physical environment and risk factors at the workplace that contribute to human error and musculoskeletal injuries and illness, 2) knowledge of the engineering and administrative methods of controlling these risk factor, and 3) the ability to conduct ergonomics/human factors research and/or provide ergonomics/human factors consultation services at a basic level. Graduates of the MPH in ergonomics may work for industry, unions, government agencies, or pursue further academic training.

### Prerequisites

An undergraduate degree is required. The cumulative grade point average should be a minimum of a 3.0 on a 4.0 scale. Although no specific major is required, prerequisite coursework includes one semester each of college algebra and biology.

### MPH Core Courses

The following course work is required for all MPH students. Students are expected to earn  $\geq$ B- (2.67) on each core course and must earn a  $\geq$  B (3.0) cumulative grade point average on all core courses. When necessary, a student may repeat a course to achieve this standard.

170:101	Introduction to Public Health Practice	3 s.h.
171:161	Introduction to Biostatistics	3 s.h.
172:101	Introduction to Health Promotion and Disease Prevention	3 s.h.
173:140	Epidemiology I: Principles	3 s.h.
174:102	Introduction to the U.S. Healthcare System <b>or</b>	3 s.h.
174:200	Introduction to Health Care Organization and Policy	3 s.h.
175:197	Environmental Health	3 s.h.
		<b>18 s.h.</b>

### Practicum Requirement

170:299	MPH Practicum Experience	<b>3 s.h.</b>
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The experience from this course, including a final written report and oral presentation constitutes the final examination for the MPH.

### Required Courses

175:180	Occupational and Environmental Health Seminar	1 s.h.*
175:190	Occupational Ergonomics I	3 s.h.
175:230	Occupational Health	3 s.h.
056:147	Ergonomics: Design and Evaluation	3 s.h.
175:295	Clinical Ergonomics	3 s.h.
056:144	Human Factors and Ergonomics I	3 s.h.
050:270	Responsible Conduct in Research	0 s.h.
		<b>16 s.h.</b>

\*MPH students take OEH seminar three times: twice for 0 s.h. and once for 1 s.h. If completing the MPH in a one year course of study, the seminar will be taken two times: once for 0 s.h. and once for 1 s.h.

### Elective Courses

Three semester hours are required. Electives may be chosen from the following list or may include any related course approved by the student's advisor.

175:192	Occupational Safety	3 s.h.
175:231	Industrial Hygiene I: Recognition	3 s.h.
175:251	Injury Epidemiology	3 s.h.
175:253	Epidemiology of Occupational Injuries	3 s.h.
		<b>3 s.h.</b>

### Summary of requirements

MPH Core Courses	18 s.h.
Practicum Requirement	3 s.h.
Required Courses	16 s.h.
Elective Courses	3 s.h.
<b>Total</b>	<b>40 s.h.</b>

**Total Semester Hours Required for MPH Degree (Minimum) 40 s.h.**

## **Appendix B: Publications**



Heartland Center Faculty and Student Publications  
by Training Program  
July 1, 2006 – June 30, 2007

Industrial Hygiene

Achutan C. Occupational noise levels during emergency relief operations in the aftermath of Hurricane Katrina. *J Occup Environ Hyg* 2007 Apr; 4(4): D33-35.

Bunton B, **O'shaughnessy P**, Fitzsimmons S, Gering J, Hoff S, Lyngbye M, **Thorne PS**, Wasson J, Werner M. Monitoring and modeling of emissions from concentrated animal feeding operations: overview of methods. *Environ Health Perspect.* 115(2):303-7, Feb 2007

Burkholder J, Libra B, Weyer P, Heathcote S, Kolpin D, **Thorne PS**, Wichman M. Impacts of waste from concentrated animal feeding operations on water quality. *Environ Health Perspect.* 115(2):308-12, Feb 2007

Charles LE, Burchfiel CM, Fekedulegn D, Kashon ML, Ross GW, **Sanderson WT**, Petrovitch H. Occupational and other risk factors for hand-grip strength: the Honolulu-Asia Aging Study. *Occup Environ Med.* 63(12):820-7, Aug 2006

Chew GL, Wilson J, Rabito FA, Grimsley F, Iqbal S, Reponen T, Mulienberg ML, **Thorne PS**, Dearborn DG, Morley RL. Mold and endotoxin levels in the aftermath of Hurricane Katrina: a pilot project of homes in New Orleans undergoing renovation. *Environ Health Perspect.* 114(12):1883-9, Dec 2006

Curwin BD, Hein MJ, **Sanderson WT**, Striley C, Heederik D, Kromhout H, Reynolds SJ, Alavanja MC. Urinary pesticide concentrations among children, mothers and fathers living in farm and non-farm households in Iowa. *Ann Occup Hyg.* 51(1):53-65, Jan 2007

George CL, White ML, Kulhankova K, Mahajan A, **Thorne PS**, Snyder JM, Kline JN. Early exposure to a nonhygienic environment alters pulmonary immunity and allergic responses. *Am J Physiol Lung Cell Mol Physiol.* 291(3):L512-22, Sep 2006

Gilchrist MJ, Greko C, Wallinga DB, Beran GW, Riley DG, **Thorne PS**. The potential role of concentrated animal feeding operations in infectious disease epidemics and antibiotic resistance. *Environ Health Perspect.* 115(2):313-6, Feb 2007

Grassian VH, **O'shaughnessy PT**, Adamcakova-Dodd A, Pettibone JM, **Thorne PS**. Inhalation exposure study of titanium dioxide nanoparticles with a primary particle size of 2 to 5 nm. *Environ Health Perspect.* 115(3):397-402, Mar 2007

Groves WA, Grey AB, **O'Shaughnessy PT**. Surface acoustic wave (SAW) microsensor array for measuring VOCs in drinking water. *J Environ Monit.* 8(9):932-41, Sep 2006

Hanley KW, Petersen M, Curwin BD, **Sanderson WT**. Urinary bromide and breathing zone concentrations of 1-bromopropane from workers exposed to flexible foam spray adhesives. *Ann Occup Hyg.* 50(6):599-607, Aug 2006

Heederik D, Sigsgaard T, **Thorne PS**, Kline JN, Avery R, Bonlokke JH, **Chrischilles EA**, Dosman JA, Duchaine C, Kirkhorn SR, Kulhankova K, Merchant JA. Health effects of airborne exposures from concentrated animal feeding operations. *Environ Health Perspect.* 115(2):298-302, Feb 2007

**Heitbrink W**, Bennett J. A numerical and experimental investigation of crystalline silica exposure control during tuck pointing. *J Occup Environ Hyg.* 3(7):366-78, July 2006

**Heitbrink WA**, Evans DE, **Peters TM**, Slavin TJ. Characterization and mapping of very fine particles in an engine machining and assembly facility. *J Occup Environ Hyg.* 4(5):341-51, May 2007

McConnell R, Berhane K, Molitor J, Gilliland F, Kunzli N, **Thorne PS**, et al. Dog ownership enhances symptomatic responses to air pollution in children with asthma. *Environ Health Perspect.* 114(12):1910-5, Dec 2006

Old LT, **Heitbrink WA**. Wet abrasive blasting with a win nozzle--a case study. *J Occup Environ Hyg.* 4(6):D55-9, Jun 2007

**O'Shaughnessy PT**, Lo J, Golla V, Nakatsu J, Tillery MI, Reynolds S. Correction of sampler-to-sampler comparisons based on aerosol size distribution. *J Occup Environ Hyg.* 4(4):237-45, Apr 2007

Pacheco KA, McCammon C, **Thorne PS**, O'Neill ME, Liu AH, Martyny JW, Vandyke M, Newman LS, Rose CS. Characterization of endotoxin and mouse allergen exposures in mouse facilities and research laboratories. *Ann Occup Hyg.* 50(6):563-72, Aug 2006

**Peters TM**, Ott D, **O'Shaughnessy PT**. Comparison of the Grimm 1.108 and 1.109 portable aerosol spectrometer to the TSI 3321 aerodynamic particle sizer for dry particles. *Ann Occup Hyg.* 50(8):843-50, Nov 2006

**Peters TM**, Ott D, **O'Shaughnessy PT**. Comparison of the Grimm 1.108 and 1.109 portable aerosol spectrometer to the TSI 3321 aerodynamic particle sizer for dry particles. *Ann Occup Hyg.* 50(8):843-50, Nov 2006

Rao CY, Riggs MA, Chew GL, Muilenberg ML, **Thorne PS**, Van Sickle D, Dunn KH, Brown C. Characterization of airborne molds, endotoxins, and glucans in homes in New Orleans after Hurricanes Katrina and Rita. *Appl Environ Microbiol.* 73(5):1630-4, Mar 2007

**Sanderson WT**, **Madsen MD**, **Rautiainen R**, Kelly KM, **Zwerling C**, Taylor CD, Reynolds SJ, Stromquist AM, Burmeister LF, Merchant JA. Tractor overturn concerns in Iowa: perspectives from the Keokuk county rural health study. *J Agric Saf Health.* 12(1):71-81, Aug 2006

**Thorne PS**. Environmental health impacts of concentrated animal feeding operations: anticipating hazards--searching for solutions. *Environ Health Perspect.* 115(2):296-7, Feb 2007

Vanderpool RW, Byrd LA, Wiener RW, Hunike ET, Labickas M, Leston AR, Tolocka MP, McElroy FF, Murdoch RW, Natarajan S, Noble CA, **Peters TM**. Laboratory and field evaluation of crystallized DOW 704 oil on the performance of the Well Impactor Ninety-Six f Fine particulate matter fractionator. *J Air Waste Manag Assoc.* 57(1):14-30, Jan 2007

### Ergonomics

**Anton D**, **Gerr F**, Meyers A, **Cook TM**, Rosecrance JC, Reynolds J. Effect of aviation snip design and task height on upper extremity muscular activity and wrist posture. *J Occup Environ Hyg.* 4(2):99-113, Feb 2007

Brewer S, Van Eerd D, Amick BC 3rd, Irvin E, Daum KM, **Gerr F**, Moore JS, Cullen K, Rempel D. Workplace interventions to prevent musculoskeletal and visual symptoms and disorders among computer users: a systematic review. *J Occup Rehabil.* 16(3):325-58, Sep 2006  
Donmez B, Boyle LN, **Lee JD**. Safety implications of providing real-time feedback to distracted drivers. *Accid Anal Prev.* 39(3):581-90, May 2007

Garg A, **Gerr F**, Katz JN, Marras WS, Silverstein B. Low back pain and the workplace. *JAMA.* 298(4):403-4, July 2007

**Gerr F**, Monteilh CP, Marcus M. Keyboard use and musculoskeletal outcomes among computer users. *J Occup Rehabil.* 16(3):265-77, Sep 2006

**Lee JD**. Technology and teen drivers. *J Safety Res.* 38(2):203-13, Feb 2007

Marshall DC, **Lee JD**, Austria RA. Alerts for in-vehicle information systems: annoyance, urgency, and appropriateness. *Hum Factors.* 49(1):145-57, Feb 2007

McGehee DV, Raby M, Carney C, **Lee JD**, Reyes ML. Extending parental mentoring using an event-triggered video intervention in rural teen drivers. *J Safety Res.*38(2):215-27, Mar 2007

Missen CC, **Cook TM**. Appropriate information-communications technologies for developing countries. *Bull World Health Organ.* 85(4):248, Apr 2007

Neyens D, Boyle L, Hanley P. Injury severity resulting from driver distraction-related crashes and policy implications for teenagers. *Accid Anal Prev.* Submitted.

Neyens D, Boyle L. The effect of distractions on the crash types of teenage drivers. *Accid Anal Prev* 2007; 39:206-212.

Owens EF Jr, DeVocht JW, **Wilder DG**, Gudavalli MR, Meeker WC. The reliability of a posterior-to-anterior spinal stiffness measuring system in a population of patients with low back pain. *J Manipulative Physiol Ther.* 30(2):116-23, Feb 2007

Rosecrance J, Rodgers G, Merlino L. Low back pain and musculoskeletal symptoms among Kansas farmers. 2006. *Am J Ind Med* Jul; 49(7): 547-556.

### Occupational Epidemiology

Bonner MR, Bennett WP, Xiong W, Lan Q, Brownson RC, Harris CC, **Field RW**, Lubin JH, Alavanja MC. Radon, secondhand smoke, glutathione-S-transferase M1 and lung cancer among women. *Int J Cancer.* 119(6):1462-7, Sep 2006

Didion SP, **Lynch CM**, Garaci FM. Cerebral vascular dysfunction in tallyho mice: A new model of Type II Diabetes, *Am J Physiol Heart Circ Physiol* 292(3):H1579-83, Mar 2007

Hoppin JA, Umbach DM, London SJ, Lynch CF, Alavanja MC, Sandler DP. Pesticides and adult respiratory outcomes in the agricultural health study. *Ann N Y Acad Sci.* 2006 Sep; 1076:343-54.

Lynch SM, Rusiecki JA, Blair A, Dosemeci M, Lubin J, Sandler D, Hoppin J, **Lynch CF**, Alavanja MC. Cancer incidence among pesticide applicators exposed to cyanazine in the Agricultural Health Study, *Environmental Health Perspectives*, 114(8): 1248-52, Aug 2006

Schairer C, Brown LM, Chen BE, Howard R, **Lynch CF**, et al. Suicide after breast cancer: an international population-based study of 723,810 women. *J Nat Cancer Inst.* 98(19):1416-9, Oct 2006

**Sprince N**, Park H, **Zwerling C**, Whitten P, **Lynch C**, Burmeister L, Thu K, Gillette P, Alavanja M. Risk factors for low back injury among farmers in Iowa: A case-control study nested in the agricultural health study. *J Occup Environ Hyg.* 4(1):10-6, Jan 2007

Sun K, Majdan M, **Field DW**, Field RW. Field comparison of commercially available short-term radon detectors. *Health Phys.* 91(3):221-6, Sep 2006

Thyagarajan B, Anderson KE, Folsom AR, Jacobs DR Jr, **Lynch CF**, Bargaje A, Khaliq W, Gross MD. No association between XRCC1 and XRCC3 gene polymorphisms and breast cancer risk: Iowa Women's Health Study. *Cancer Detect Prev.* 2006;30(4):313-21.

### Occupational Injury Prevention

Allareddy V, **Peek-Asa C**, Yang J, **Zwerling C**. Risk factors for rural residential fires. *J Rural Health,* 23(3):264-9, Summer 2007

Kyriacou DN, Monkkonen EH, **Peek-Asa C**, Lucke RE, Labbett S, Pearlman KS, Hutson HR. Police deaths in New York and London during the twentieth century. *Inj Prev.* 12(4):219-24, Aug 2006

**Peek-Asa C**, Casteel C, Allareddy V, Nocera M, Goldmacher S, OHagan E, Blando J, Valiante D, Gillen M, Harrison R. Workplace violence prevention programs in hospital emergency departments. *J Occup Environ Med.* 49(7):756-63, July 2007

**Peek-Asa C**, Casteel C, Kraus JF, Whitten P. Employee and customer injury during violent crimes in retail and service businesses. *Am J Public Health.* 96(10):1867-72, Oct 2006

**Rautiainen R**, Lehtola M, Day L, Salminen S, Schonstein E, Suutarinen J. Interventions for preventing injuries in the agriculture industry. *The Cochrane Collaboration. Occupational Health Field. Systematic review protocol. The Cochrane Library,* Jan 2007, Issue 1.

Tiesman H, Young T, **Torner JC**, McMahon M, **Peek-Asa C**, Fiedler J. Effects of a rural trauma system on traumatic brain injuries. *J Neurotrauma* 2007; 24(7): 1189-1197, Jul 2007

Tiesman H, **Zwerling C**, **Peek-Asa C**, **Sprince N**, Cavanaugh JE. Non-fatal injuries among urban and rural residents: the National Health Interview Survey, 1997-2001. *Inj Prev.* 13(2):115-9, Apr 2007

Yang J, **Peek-Asa C**, Allareddy V, Phillips G, Zhang Y, Cheng G. Patient and hospital characteristics associated with length of stay and hospital charges for pediatric sports related injury hospitalizations in the US, 2000-03. *Pediatrics,* 119(4):e813-20, Apr 2007.

### Occupational Health Nursing

**Culp K**, Kuye R, **Donham KJ**, **Rautiainen R**, Umbarger-Mackey M, Marquez S. Agricultural-related injury and illness in The Gambia: a descriptive survey of a rural nursing service and area farmers. *Clin Nurs Res.* 16(3):170-88, Aug 2007

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*Agricultural Safety and Health (ASH)*

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