JOHNS HOPKINS EDUCATION and RESEARCH CENTER for OCCUPATIONAL SAFETY and HEALTH

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Submitted by:

Jacqueline Agnew
Education and Research Center Director
Johns Hopkins University
Bloomberg School of Public Health
Baltimore, MD 21215
jagnew@jhsph.edu

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LIST OF ABBREVIATIONS

AAOHN	American Association of Occupational Health Nurses
ABET	Accreditation Board for Engineering and Technology
ABIH	American Board of Industrial Hygiene
ABOHN	American Board for Occupational Health Nurses
ACGIH	American Conference of Governmental Industrial Hygienists
ACGME	Accreditation Council for Graduate Medical Education
ACHMM	Academy of Certified Hazardous Materials Managers
ACOEM	American College of Occupational and Environmental Medicine
AIHA	American Industrial Hygiene Association
AIHce	American Industrial Hygiene Conference and Expo
ANA	American Nurses Association
ASAC	Applied Science Accreditation Commission
ASSE	American Society of Safety Engineers
ATSDR	Agency for Toxic Substances and Disease Registry
BOES	Biomarkers of Occupational Exposure and Susceptibility
CAFO	Concentrated Animal Feeding Operation
CDC	Centers for Disease Control and Prevention
CE	Continuing Education
CEPH	Council on Education for Public Health
CHMM	Certified Hazardous Materials Manager
CME	Continuing Medical Education
DISCOVER	Disease Investigation through Specialized Clinically-Oriented Ventures in Environmental Research
DOE	Department of Energy

DrPH	Doctor of Public Health
ERC	Education and Research Center for Occupational Safety and Health
GPMR	General Preventive Medicine Residency
HBCUs	Historically Black Colleges and Universities
HST	Hazardous Substance Training
IJHN	Institute for Johns Hopkins Nursing
JHH	Johns Hopkins Hospital
JHU	Johns Hopkins University
MAAOHN	Maryland Area Association of Occupational Health Nurses
MARCOM	Mid-Atlantic Regional Conference on Occupational Medicine
MdCOEM	Maryland College of Occupational and Environmental Medicine
MHS	Master of Health Science
MNA	Maryland Nurses Association
MSN/MPH	Master of Science in Nursing and Master of Public Health
MWAOHN	Metropolitan Washington Association of Occupational Health Nurses
NCHS	National Center for Health Statistics
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NORA	National Occupational Research Agenda
NRSA	National Research Service Award
OEH	Occupational and Environmental Hygiene
OEHN	Occupational and Environmental Health Nursing
OEMR	Occupational and Environmental Medicine Residency
OIP	Occupational Injury Prevention
OSH	Occupational Safety and Health

OPSF	Occupational Physicians Scholarship Fund
OSHA	Occupational Safety and Health Administration
PhD	Doctor of Philosophy
PI	Principal Investigator
PPE	Personal Protective Equipment
PPRT	Pilot Project Research Training Grant
PSA	Petroleum Safety Authority (of Norway)
R2P	Research to Practice
ROHC	Regional Occupational Health Conference
ScD	Doctor of Science
SVAOHN	Seneca Valley Association of Occupational Health Nurses
TPG	Training Project Grant/Grantee
UAW	United Auto Workers
UM	University of Maryland
USAF	United States Air Force

ABSTRACT

The Johns Hopkins Education and Research Center (ERC) was established in 1977 in response to the need for interdisciplinary training programs that would help meet the need for a professional workforce dedicated to worker safety and health. Since that time, the center has prepared leaders in occupational safety and health research and practice in the following disciplines. Master's and doctoral training is provided in Occupational and Environmental Hygiene (MHS, PhD, DrPH, ScD), Occupational and Environmental Health Nursing (MPH, MSN/MPH, PhD, DrPH), Biomarkers of Occupational Exposure and Susceptibility research training (PhD, DrPH), Occupational Injury Prevention (PhD) and residency training in Occupational and Environmental Medicine. Continuing Education and Outreach components (including Hazardous Substance Training) bring the strengths of the core programs to practicing occupational safety and health professionals in Region III and beyond.

Annual trainees per program have averaged 10 in Occupational and Environmental Health Nursing, six to eight in Occupational and Environmental Medicine, 20 in Occupational and Environmental Hygiene, eight to 10 in Biomarkers research, and five to six in Occupational Injury Prevention. The Continuing Education program reaches working occupational safety and health professionals, totaling 5,402 in a total of 236 courses over this five-year period.

This ERC has also had a significant impact on the training capacity of other institutions and thereby has enhanced the overall preparation of the occupational safety and health workforce throughout the nation. The Pilot Project Research Training Program has, since 2001, funded 50 projects, 21 of which were to students and junior faculty at 10 universities outside of Johns Hopkins. Additionally, several program graduates now serve in university faculty positions. Others hold significant leadership positions at the national level.

The school and ERC programs maintain accreditation by all respective organizations. The school was recently reaccredited by the Council on Education for Public Health. Additionally, the Occupational and Environmental Medicine program successfully completed the ACGME accreditation review and has been reaccredited for the maximum of five years. Likewise, the Occupational and Environmental Hygiene program was reaccredited through ASAC-ABET.

Faculty members have extensive interdisciplinary research support and productive publication records that frequently include students as co-authors. Over the recent grant period, faculty and students produced more than 170 publications on work that was related to their role in the ERC. Additionally, ERC faculty hold leadership positions in professional societies and serve on major advisory and policy making committees. Their proficiency and recognition as national and international experts comprise a major strength of the center.

There are approximately 120 million workers in the United States whose work-related health, quality of life and productivity are affected directly or indirectly by the expertise of safety and health professionals. The health needs of workers are best met by integrated teams of professionals, trained to work in an interactive setting, to provide care, set policy, design and manage safety and health programs, and conduct research that discovers new knowledge to advance the body of knowledge in this field. The Johns Hopkins Education and Research Center trains occupational hygienists, nurses, physicians, injury epidemiologists and specialized researchers to achieve this goal and also provides educational and outreach opportunities to practicing community partners. Thus, this ERC, through its interdisciplinary training mission,

builds the national capacity to evaluate risks, detect and assess vulnerable populations, and deliver cost-effective and state-of-the-art care to prevent and mitigate health threats in the workplace.

HIGHLIGHTS/SIGNIFICANT RESULTS

Over this project period the Johns Hopkins Education and Research Center (ERC) continued to make major contributions to the field of occupational health and safety. Consistent with the program objectives, we have prepared outstanding occupational professionals in the disciplines of occupational and environmental medicine, occupational and environmental health nursing and occupational and environmental hygiene, as well as researchers in the field of occupational injury prevention and in the application of biomarkers in the practice of occupational health. In all, 42 students have graduated from the doctoral programs and 45 have received MHS, MPH, or MSN/MPH degrees. Another 16 students have completed the Occupational and Environmental Medicine Residency. In addition, we have reached an extraordinarily large proportion of practicing professionals: 5,557 from Region III and across the nation. As described below, we feel the faculty, graduates and ERC as a whole have positively impacted the health and safety of workers.

Of note during this period was the expansion of our ERC academic programs in number and capacity. In 2002, we added a new ERC component, Biomarkers of Occupational Exposure and Susceptibility (BOES), a unique training program that prepares researchers with the knowledge and skills necessary to apply molecular and biochemical biomarkers in occupational settings. This is an exceptionally innovative program that is in keeping with the evolution of science as it relates to the practice of occupational safety and health. The increasingly powerful ability to detect early biological changes, genetic markers of susceptibility and effects of gene-environment interaction has strong implications for applying these technologies in occupational settings. By incorporating this new program into the ERC, we have been able to train almost twice as many scientists (as previously) with expertise in this area. Because of our interdisciplinary educational approach, we have increased awareness of the issues related to the application of biomarkers in clinical practice and health surveillance, as well as in research. The relevance of this ERC component became apparent earlier this year when we collaborated with the University of Pennsylvania to present a multidisciplinary conference titled “Genes in the Workplace: The Right Fit?,” which included perspectives from occupational and environmental medicine, occupational and environmental health nursing, law, labor, ethics, industry and science.

A second ERC program, Occupational Injury Prevention, was added to the center in 1990 as a special component, non-core program. As with the Biomarkers program, it built on the strengths that already existed in the school; this meant collaborating with our school’s Center on Injury Prevention, the oldest and largest such program in the country. The ERC program expanded the injury center’s research and teaching activities into the area of workplace injury prevention. With the supplemental award that we received over the recent grant period, we were able to significantly increase the level of research productivity of students and faculty alike, and we graduated nine new occupational injury researchers, who now work in state and federal government and private sector positions. We are particularly proud that several graduates accepted faculty positions in universities and are playing an integral role in the education and training of the next generation of occupational injury epidemiologists. Additionally, the research accomplishments demonstrated by the Occupational Injury Prevention program are very closely aligned with the two newest NIOSH initiatives – the sector-based National Occupational Research Agenda and Research to Practice (R2P). The occupational injury prevention group, led by Professor Susan Baker, has focused on the full

spectrum of the transportation industry, addressing worker injury risks associated with all aspects of aviation and surface (sea and roadway) transportation. With regard to translating research findings to practice (R2P), the Occupational Injury Prevention program is noted for developing and improving safety equipment and devices, often in collaboration with others such as the Johns Hopkins School of Engineering and the Applied Physics Laboratory.

The third new program development in the Johns Hopkins ERC has occurred more recently, in 2006, with the addition of a Continuing Education program in Hazardous Substance Training. This has allowed us to establish a strong group of training partners, initiate needs assessments, and offer courses in Region III. As mentioned above, our Continuing Education program now reaches significantly more participants – approximately threefold the number per year compared to times prior to this project period.

The availability and accessibility of the school's highly sophisticated Distance Education Division has enabled us to develop Internet versions of academic and continuing education course offerings. The division is very responsive to requests for assistance in translating face-to-face courses to Web format; thus, we have greatly increased enrollment in courses such as *Fundamentals of Occupational Health* and *Principles of Occupational and Environmental Hygiene*. The availability of on-line versions of many of the basic public health courses and departmental core courses has made it possible for more part-time students to take part in our programs. We have also expanded our use of distance technologies in continuing education. Seminars and conferences can now be converted into more enduring forms by recording them for Web-based presentation or CD versions, for which we offer continuing education credits.

Each of the ERC core programs has expanded its focus to also address environmental health issues that extend beyond workplace settings. This is consistent with the direction of several professional societies and other academic programs. The transition within our programs has enhanced opportunities for collaboration with other researchers; it has had a synergistic effect on our research training programs and has promoted efficient use of resources.

The past years have seen the development of several other training and research centers in the school and university. Examples include the MidAtlantic Public Health Training Center, the Center for Public Health Preparedness, the Center for a Livable Future, the Center for Urban Environmental Health, and the Global Tobacco Institute. We interact with these centers on a regular basis and leverage resources to present training, fund students and faculty, and collaborate on research. Due to the presence of these partners, additional facilities, laboratories and other resources are available to ERC members.

A major strength of our ERC continues to be our strong focus on research training and doctoral education. The Biomarkers of Exposure and Susceptibility and Occupational Injury Prevention programs are exclusively dedicated to training doctoral students. The Occupational and Environmental Hygiene and Occupational and Environmental Health Nursing programs also have high proportions of doctoral students and have a longtime history of leadership in doctoral education. In the recent project period, the school better distinguished the DrPH degree program from that of the PhD. The orientation of the DrPH degree toward scholarly approaches to problem solving and issues related to public health practice can help fill gaps in occupational health practice and research. The DrPH has become a popular degree program for a subset of OEH and OEHN students.

Other ERC accomplishments were associated with our decision to use NORA funds for doctoral student support and to increase our research training capacity. With regard to the former, we were able to fund four to six additional doctoral students per year, each engaged in research related to the NORA priority areas. The program made it possible to leverage the resources of the existing ERC programs. To increase our research training capacity, we provided limited support to junior faculty, also encouraging them to focus their research programs on topics relevant to the National Occupational Research Agenda. At least two examples of successful faculty development stand out. Dr. Alison Geyh received funds that helped build her research program and positioned her to advise doctoral students. Dr. Virginia Weaver also received support that helped her secure competitive funding for her program in biomarker research. Now, in addition to her current position as director of the Occupational and Environmental Medicine Residency, Dr. Virginia Weaver is advising students whose research interests relate to her expertise.

We also have had an impact on the research training capacity of other institutions. The Pilot Project Research Training Program has, since 2001, funded 50 projects, 21 of which were at other universities. While almost 90% of the Johns Hopkins projects went to doctoral students, approximately two-thirds of the projects at other universities were awarded to junior faculty. This suggests that we have enriched the early research careers of faculty who will now train and support students.

Another means by which we have developed research training capacity in the field of occupational safety and health has been our high rate of doctoral student graduation, thus producing future faculty in the field. Graduates of each program have gone on to teaching careers, nationally and internationally. At least fifteen graduates of the ERC during this grant period have entered faculty positions at other academic institutions. As an example, one graduate of the OEHN program now holds the position of director of the Occupational Health Nursing Program at another ERC. Also of note is the significant number of graduates who have entered or returned to the military or government agencies, including NIOSH and OSHA.

We have strengthened our relationships with surrounding academic programs in occupational safety and health. This was demonstrated by our collaboration with the University of Pennsylvania, and various faculty are working with schools in the area.

With regard to minority recruitment, we have also enjoyed increasing success. For example, the proportion of minorities entering our Occupational and Environmental Medicine program exceeds 50%. We have also been more active in professional interactions with regional universities that are considered Historically Black Colleges and Universities (HBCUs). Our faculty are involved in school wide efforts to support minority recruitment and retention; this has inherent benefits to ERC recruiting.

Finally, our dedication to interdisciplinary training continues to be a thread through every program. The organizational and physical proximity of the ERC programs furthers this goal, but our faculty members are the true drivers of this philosophy. One of the prominent examples is a large study of former Department of Energy workers that has been ongoing for several years. This project has brought together researchers and clinicians from all of the core disciplines and has led to interactions with other universities as well.

OUTCOMES/RELEVANCE/IMPACT

There are approximately 120 million workers in the United States whose work-related health, quality of life and productivity are affected directly or indirectly by the expertise of occupational safety and health professionals. The health needs of workers are best met by integrated teams of professionals, trained to work in an interactive setting to provide care, set policy, design and manage safety and health programs, and conduct research that advances the body of knowledge in this field. The Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC) trains occupational hygienists, nurses, physicians, injury epidemiologists and specialized researchers to achieve this goal, and also provides educational and outreach opportunities to practicing community partners. Thus, this ERC, through its interdisciplinary training mission, builds the national capacity to evaluate risks, detect and assess vulnerable populations, and deliver cost-effective and state-of-the-art care to prevent and mitigate health threats in the workplace.

TECHNICAL REPORT

Background for the Project

The Johns Hopkins Education and Research Center (ERC) was established in 1977 in response to the need for interdisciplinary training programs that would prepare occupational health professionals who would meet the need for a professional workforce dedicated to worker safety and health. The center has evolved over time in response to changing demands in the field, and now consists of the programs described below. This report presents several new initiatives that were developed over the project period (July 1, 2002 to June 30, 2006).

The ERC is directed by Dr. Jacqueline Agnew and includes five academic programs and a Continuing Education program (directed by Ms. Mary Doyle). The academic programs are: Occupational and Environmental Medicine (directed by Dr. Virginia Weaver), Occupational and Environmental Health Nursing (directed by Dr. Sheila Fitzgerald), Occupational and Environmental Hygiene (formerly Industrial Hygiene; directed by Dr. Patrick Breysse), Occupational Injury Prevention (directed by Professor Susan Baker) and Biomarkers of Occupational Exposure and Susceptibility (directed by Dr. Paul Strickland). The first three programs have existed since the inception of the ERC and have grown since that time. Occupational Injury Prevention was added in 1990 and was expanded in 2001 through the award of a NIOSH supplemental initiative that focused on research training. Biomarkers in Occupational Exposure and Susceptibility, the newest program, was added in 2002. Additional components of the ERC are the Pilot Project Research Training program, directed by Dr. Peter Lees, who is also the center deputy director, and a recently added Hazardous Substance Training program that rests within the overall Continuing Education program. While we do not offer a specific core program in occupational safety, training in the principles of safety, safety management and ergonomics are incorporated into the curriculum of ERC students.

The Occupational and Environmental Medicine program offers Occupational Medicine Residency training – a two-year program consisting of an MPH combined with one year of practice. The Occupational and Environmental Health Nursing program offers masters degree programs that lead to the MPH or MSN/MPH degrees, and also PhD, DrPH and ScD doctoral programs. The Occupational and Environmental Hygiene program offers a professional MHS degree, as well as doctoral degrees (PhD, DrPH, ScD). Over this time period, training in the Occupational Injury Prevention and in the Biomarkers programs has been directed exclusively to doctoral degrees (PhD, DrPH, ScD).

The ERC is located in the Johns Hopkins Bloomberg School of Public Health on the East Baltimore campus of Johns Hopkins University, where the Johns Hopkins Hospital, School of Medicine and School of Nursing also reside. All ERC components, with the exception of the Occupational Injury Prevention program, sit in the Department of Environmental Health Sciences in the Division of Occupational and Environmental Health and the Division of Environmental Health Engineering. The Occupational Injury Prevention program is located nearby in the Department of Health, Policy and Management. The geographic proximity of these program elements has fostered interdisciplinary collaboration and communication among students and faculty. Interaction with the Schools of Nursing and Medicine are similarly facilitated by their nearby locations. The Johns Hopkins University is fully accredited by the Middle States Commission on Higher Education, and the School of Public Health is accredited

by the Council on Education for Public Health. The Occupational Medicine Residency program and the Occupational and Environmental Hygiene program have been recognized for their excellence by full-term accreditation by their respective credentialing bodies.

Specific Objectives

The mission of the ERC is to provide an integrated, interdisciplinary approach to training researchers and practitioners in the field of occupational health. The ultimate objective of this project is to protect the health and safety of all working individuals. Additionally, as the only ERC in Region III, the center is dedicated to meeting regional and national needs through occupational safety and health practitioner and researcher training.

In support of these overall objectives, the specific goal of the ERC is to maintain programs of excellence in: occupational and environmental hygiene, occupational and environmental medicine, occupational and environmental health nursing, occupational injury prevention, biomarkers of occupational exposure and susceptibility, pilot project research training, NORA-related training, continuing education and outreach. The success of the center in meeting these objectives is presented, by program, in the Results section.

Results

See the following sections for results by program. Discussion and Conclusions follows.

Results: National Occupational Research Agenda (NORA) Research Training
Director: Jacqueline Agnew, MPH, PhD

Background and Program Objectives

During this grant period, the National Occupational Research Agenda (NORA) program targeted three broad areas: 1) development of junior faculty for their roles as research mentors; 2) continuing education/outreach to address the translation of NORA-related research to practice; and 3) doctoral student support and training. The latter is our primary objective in order to train as many future occupational safety and health (OSH) researchers as possible.

Accomplishments over the Project Period

Accomplishments related to the goals of this supplemental program are presented below according to the three program goals.

Goal 1 – Development of junior faculty for their roles as research mentors:

Four to six faculty received partial funding each year from this program, representing the programs in Occupational and Environmental Hygiene (OEH), Occupational and Environmental Medicine (OEM), Occupational and Environmental Health Nursing (OEHN) and Biomarkers of Exposure and Susceptibility (BOES). Each conducted research in at least one NORA priority area and were provided funding in an effort to increase the interdisciplinary research training capacity within this ERC. As faculty in their early research careers, they have been provided support through this supplemental funding to increase the interdisciplinary research training capacity within this ERC. These individuals are listed in the table below, with their respective areas of interest. An additional member of our faculty, Ms. Mary Doyle, guides the Continuing Education and Outreach efforts that bring research findings and interpretation to practicing professionals. All are involved in interdisciplinary projects that include students.

NORA-funded faculty and areas of research and research training

NAME	AREA OF EXPERTISE/RESEARCH
S. Fitzgerald (OEHN)	Vulnerable worker populations, workplace violence
V. Weaver (OEM and BOES)	Exposure assessment methods, mixed exposures, surveillance research methods
M. Cadorette (OEHN)	Medical surveillance and research methods
A. Geyh (OEH)	Particulate matter, air pollution, metals, and exposure assessment
R. De Castro (OEH)	Exposure measurement, statistical modeling
M. Doyle (CE)	Educational program development and needs assessment.

Goal 2 – Continuing education/outreach to address the translation of NORA-related research to practice:

Under the direction of Mary Doyle, the Continuing Education/Outreach program has brought cutting-edge research findings and their interpretation to practicing professionals. Of note is the involvement of Ms. Doyle in planning and conducting professional conferences and presentations to professional organizations in the region, such as the:

- Chesapeake and Potomac Sections of American Industrial Hygiene Association;
- Three regional chapters of the American Association of Occupational Health Nurses;
- Chesapeake (Md.) and Delmarva (Del.) sections of ASSE; and
- Maryland section of the American College of Occupational and Environmental Medicine (ACOEM)

Many of these activities could not have been conducted without the additional NORA funding that was provided to support Ms. Doyle's efforts.

Goal 3 – Doctoral student support and training:

Our primary application of NORA funding was the support of doctoral students in each of the academic research training programs. All pre-doctoral students in those programs focused on NORA research topics and received full or partial support in the form of stipends and/or tuition. This funding was critically important because it enabled us to prepare nine more future researchers in the field of OSH than otherwise would have graduated from our institution.

Additionally, we were able to provide limited supplies for use in training students in techniques for laboratory and epidemiological studies, and for presenting study results within the school and at professional meetings. We were also able to provide out-of-state travel support so that two doctoral students could conduct the negotiations required for acquisition of their study data.

Publications and other achievements of the students and faculty who received support from this supplement are described in their respective program sections of this report.

NORA training support had a major impact on the scope of this ERC and the number of students we were able to support. Additionally, these funds enhanced our training capacity for the grant period and for future years.

Results: Pilot Project Research Training (PPRT)
Director: Peter S.J. Lees, PhD, CIH

Background and Program Objectives

The goal of the Pilot Project Research Training (PPRT) program, directed by Dr. Peter Lees, is to enhance the research training capacity of the Johns Hopkins Education and Research Center and other institutions with occupational safety and health training programs in Region III through direct support of pilot project research activities. Funds have been used to support short-term research projects that explore the feasibility of new or improved areas of study, as well as to enable new investigators to obtain data to successfully compete for support through conventional research funding sources. In the course of meeting this goal, another objective has been to promote interdisciplinary interaction and collaboration with Training Program Grantees (TPGs) and other institutions with occupational safety and health research training programs in Region III. Eligibility has been restricted to pre-doctoral students, post-doctoral fellows, or junior faculty within or external to Johns Hopkins University.

The specific allocation of funds depends on the merits of the proposed projects and needs that are not covered through other means. The mechanism for evaluation of merit and need was modeled after the NIH process and was adopted for the Pilot Project Research Training program when it was originally funded in 1999. The following are examples of research activities that are appropriate for PPRT funding:

- Collection of preliminary data in support of a subsequent extramural grant application
- Feasibility studies to test and develop new methods, approaches and applications
- Travel costs to field sites for data collection
- Data entry or computer costs for data analysis
- Costs for printing and reproduction of data collection instruments

Accomplishments over the Project Period

The PPRT program has recently completed its seventh year of funding. During the current grant period (which began in 2001 to synchronize with the overall ERC grant period) 79 pilot project applications have been received and 50 projects funded. These are listed in Appendix B.

Researchers from 10 different institutions have received awards. For those outside Johns Hopkins, a greater proportion have been awarded to junior faculty compared to pre-doctoral students or OEM residents (15 vs. seven) in contrast to awards made to investigators within Johns Hopkins (three vs. 25). We thus feel that the program has enhanced the training capacity of other institutions.

During this project period, award recipients have represented a variety of occupational health professionals – occupational medicine, occupational and environmental hygiene, occupational and environmental health nursing, injury prevention and ergonomics, and biomarkers – and their research topics have represented at least 20 of the 21 areas addressed by the National Occupational Research Agenda (NORA).

Pilot Project symposia were held on a biannual basis and were successful and well-attended. In addition, symposia are sometimes coupled with other events, such as the 2004 PPRT Symposium, at which Dr. John Howard, director of NIOSH, presented the keynote address. The symposia have increased awareness of the NIOSH-supported program and highlighted the NORA priority topics.

Recipient institutions represented five of the six regional TPGs with graduate programs and five institutions outside of the NIOSH funding umbrella. Over the project period, knowledge of the program has grown considerably – both within the Johns Hopkins ERC and within other institutions, as evidenced by overall growth in the total number of applications per year. We have regularly received requests for program announcements both from the existing cadre of awardee institutions and, increasingly, from additional institutions. The review and selection process has, therefore, become more competitive.

In summary, the PPRT program has, during this project period, demonstrated success in achieving all objectives. It has reached and supported investigators from all core OSH disciplines, both within and external to Johns Hopkins, and the number of junior faculty awards suggests that research training capacity is being enhanced in Region III. Support for pre-doctoral students has helped expedite their progress and decrease their time to completion (and consequent expenses related to time and funding).

Results: Occupational and Environmental Hygiene (OEH)
Director: Patrick Breysse, PhD, MHS

Background and Program Objectives

The objectives of the Occupational and Environmental Hygiene (OEH) training program are to: 1) provide high quality interdisciplinary master's-level professional education with a research/problem-solving perspective (including the five core areas of public health as specified by the Council on Education for Public Health (CEPH); 2) provide courses in occupational and environmental hygiene and related fields that are critical to the training of other ERC core students and students in other disciplines; 3) prepare doctoral students for careers as independent investigators with OEH research skills; and 4) be an occupational and environmental health resource regionally, nationally and internationally. The OEH program includes master's (MHS) professional training and doctoral (PhD, ScD and DrPH) programs. This program continues to be accredited by the Accreditation Board for Engineering and Technology (ABET).

Accomplishments over the Project Period

Changes within the profession have resulted in important adjustments to the OEH program objectives and outcomes, and even to the program's name. These changes reflect an important evolution within the profession: to include the practice of "environmental hygiene" along with the more traditional "occupational hygiene." This is supported by our experience that many recent graduates are expected to assume broader responsibilities in their place of employment. Program objectives and outcomes have been changed to include environmental hygiene concepts, and the program was renamed from its original title of Industrial Hygiene to Occupational and Environmental Hygiene. During this project period, 37 OEH students completed degrees: 17 doctoral (15 PhD and two DrPh) and 20 master's (MHS). In addition, there are 13 doctoral (12 PhD and one DrPh) and five MHS students currently enrolled in the OEH program.

The evolution of the program to include both occupational and environmental hygiene training and content required an expansion of supporting faculty, the recruitment of new faculty, changes to existing courses, the addition of new courses, and a revamping of student recruitment activities. New courses that have been added to provide expanded and more advanced training for doctoral students include:

- *Introduction to the Chemistry of Ambient Air Pollution* – 182.617 (2 units); Geyh
- *Water and Health* – 182.638 (4 units); Halden
- *Advanced Topics in Airborne Particles* – 182.616 (2 units); Kesavan
- *Food and Waterborne Diseases* –182-640 (3 units); Schwab
- *Environmental and Occupational Law and Policy* –180.629 (4 units); Silbergeld

Additionally, we now include risk assessment as an important program component, with two courses as a part of the required curriculum.

OEH program faculty teach nine courses aimed at master's students. These courses have been developed over time as a direct result of ERC funding. In addition, these courses are taken by students in other ERC programs and throughout the school.

Other program strengths relate to faculty accomplishments and activities over this period. For example, Dr. Breysse served on the NIOSH Safety and Occupational Health Study section. Drs. Breysse and Lees served in leadership roles in major industrial hygiene professional associations (ACGIH and ABIH), and a graduate of the program (Lindsay Booher) was elected president of AIHA. Dr. Peter Lees was promoted to full professor with tenure, and Dr. Alison Geyh was promoted from assistant scientist to assistant professor during the last five-year program period. A new assistant professor, Dr. Frank Curriero, was also recruited to the Division of Environmental Health Engineering. Dr. Curriero is a biostatistician with a research interest in spatial and longitudinal data analysis. In addition, supporting faculty members Drs. Schwab (promoted to associate professor) and Silbergeld have played increasingly important roles as doctoral student advisors. Drs. Schwab and Silbergeld have developed a growing research program on the occupational and environmental health risks associated with concentrated animal feeding operations (CAFOs), and they serve as advisors for doctoral students in the OEH program.

Significant accomplishments also include maintaining a high level of research funding. During the grant period, the NIEHS/EPA-funded Center for Childhood Asthma in the Urban Environment (PI: Breysse) successfully re-competed for funding, and the program faculty (Geyh and Breysse) have received significant new funding from the EPA for a Particulate Matter Research Center. These two grants alone provide more than $300,000 in annual research support to the program. These resources provide important opportunities for doctoral research. Additionally, in collaboration with the Departmental of Epidemiology, faculty are participants in a newly funded initiative titled Disease Investigation through Specialized Clinically-Oriented Ventures in Environmental Research (DISCOVER). The OEH program has also expanded its affiliation with the U.S. Army Edgewood Chemical Biological Center, and projects, such as a study on nanoparticles and respiratory protection, are underway.

The importance of interdisciplinary interaction has been strongly reinforced through normal research and professional practice activities in the OEH program, the EHS department and the school as a whole. For example, OEH faculty routinely collaborate on research with faculty from other ERC programs, as well as with faculty from Toxicology, Physiology, Epidemiology, Biostatistics, Health Policy and Management, Pulmonary Medicine, Pediatrics and the Asthma and Allergy Center. In addition, OEH program faculty participate in a wide range of interdisciplinary centers and institutes. These important collaborations and interactions have provided opportunities to enrich student training and student research by providing research and practice opportunities. For example, OEH students receive support for their research from the Center for a Livable Future. Students have also collaborated with OEH and Occupational and Environmental Medicine faculty to help develop respiratory selection guidance for pandemic flu outbreaks as a part of the Mid-Atlantic Public Health Training Center and the Center for Public Health Preparedness. Finally, students have also collaborated with medical faculty through the Center for Childhood Asthma in the Urban Environment.

As previously mentioned, the publication record of students and faculty documents our highly interdisciplinary research track record that includes extensive student involvement both at the master's and the doctoral levels. This interaction includes research collaboration across the ERC component programs. For example, OEH students and faculty have collaborated with faculty from the Biomarkers of Occupational Exposure and Susceptibility (BOES) program on studies of ultraviolet light exposure, butadiene, PAH and persistent organochlorine compound

exposures. Faculty and students from the OEH program have also collaborated with Occupational and Environmental Medicine and Occupational and Environmental Health Nursing faculty and students on the Department of Energy-funded Former-Worker studies at Los Alamos and Sandia National Laboratories.

Throughout this five-year grant period, the OEH program faculty and students have maintained a strong publication record, producing more than 50 publications as a result of our NIOSH grant support. Publications are listed in Appendix A to this report.

The program has met with success in our goal to admit a diverse student body, thereby promoting increased diversity within the profession. During this funding period, six minority students successfully completed the OEH program, and there are currently three minority students in the program. The OEH program works with the school's Director of Diversity to help recruit minorities. In addition, the dean's office has recently committed funds for every department in the school to support two minority doctoral students. Two OEH doctoral students successfully applied for National Research Service Awards (NRSA) for minority student funding, and one student is currently supported by the school's minority scholarship fund.

Members of the OEH program actively contributed to the ERC's Continuing Education program. Examples include conducting an annual *CIH Review* course and co-sponsoring the local AIHA section Professional Development Conference. Faculty members also have conducted extensive local, regional, national and international outreach activities.

Results: Occupational and Environmental Health Nursing (OEHN)
Director: Sheila Fitzgerald MSN, RN-C, PhD

Background and Program Objectives

The OEHN program, directed by Dr. Sheila Fitzgerald, is located in the Division of Occupational and Environmental Health within the Department of Environmental Health Sciences. The disciplines represented in this division include nursing, medicine, law, epidemiology, biostatistics and laboratory science. The result is an interdisciplinary training climate that focuses on prevention, intervention and evaluation, and a research focus on occupational and environmental health problems.

The primary goal of the OEHN program is to prepare nurses to function as consultants, researchers, managers and educators in industry, academia and a variety of new occupational health service models. This is accomplished by offering an academic program of excellence that leads to the graduate degrees of MPH, MSN/MPH, PhD, or DrPH. The ScD option exists but is rarely pursued. An additional goal of the OEHN program is to serve as a resource to Region III nurses, educational institutions and organizations, such as labor, government, private sector organizations and occupational health services. This is accomplished through the interdisciplinary preparation of nurses, many of whom remain in the region in positions that draw on the skills unique to the OEHN program. Over this grant period, the program has made many contributions – regionally, nationally and internationally – through its outreach and continuing education efforts.

Accomplishments over the Project Period

During this funding period, 21 OEHN students completed degrees: eight Doctor of Philosophy (PhD), six Master of Public Health (MPH) and seven Master of Science in Nursing and Master of Public Health (MSN/MPH). One MPH student, three MSN/MPH students and five doctoral students (three PhD and two DrPh) are currently in different phases of their degree programs.

The recent change in NORA to a sector-based approach has somewhat reorganized our focus but will not alter the objectives of the research conducted by students and faculty. At this time, faculty research interests primarily address the services as well as the healthcare and social assistance sectors (e.g., nail salon workers, health care workers and service employers of young workers).

During this grant period, Dr. Maureen Cadorette joined the OEHN program faculty as an assistant scientist, thus expanding and strengthening opportunities for students and furthering the program objectives. Dr. Cadorette took over as a course director of *Principles of Occupational Health*, thus increasing the visibility of the OEHN program. She is also formatting this course for on-line delivery. Similarly, Dr. Agnew became the co-director of the flagship course of the ERC curriculum, *Occupational Health*. Our program advising capacity and access to practice and research opportunities have also increased. Dr. Cadorette successfully obtained and initiated a DOE Former Workers Program at Sandia National Laboratories, building on the existing project at Los Alamos Laboratories and creating opportunities for interdisciplinary practice and research experiences for students and faculty alike.

In addition to ERC activities, faculty have made notable contributions to the educational mission of the school. Dr. Fitzgerald is chair of the Affirmative Action Committee. Dr. Agnew is an associate director of the MPH program and serves on its Executive Board, and she was also recently elected to the Faculty Senate.

The program has graduated doctoral students at a rate of one-per-year. Their success since graduation is having a direct impact on the field of occupational and environmental health nursing nationally and internationally. Four program graduates now hold academic positions as junior faculty in occupational health nursing programs, and a fifth has worked part-time in such a program. These educators are now preparing the next generation of occupational practitioners, researchers and educators, who will follow in the steps of the current occupational health nursing cohort.

The MSN/MPH option for OEHN students has led to closer working relationships with the Johns Hopkins University School of Nursing. It carries the advantage of providing time in the curriculum for practicum experiences. During this funding period, we identified more opportunities for preceptorships and practicum experiences for OEHN students in occupational and environmental health settings. Many have promoted the translation of didactic coursework to practice (e.g., the development of government testimony to protect farm workers against pesticide exposure, the creation of an educational program for first responders potentially exposed to methamphetamine, and the development of a breastfeeding program in the workplace). We have identified a cadre of former graduates of the OEHN program and other colleagues in the Baltimore-Washington metropolitan area who have been instrumental as role models and mentors to our students. These individuals provide opportunities for our students to work with interdisciplinary teams in their respective settings; for example, the Maryland Department of Health and Mental Hygiene, the Occupational Safety and Health Administration (OSHA), the Agency for Toxic Substances and Disease Registry (ATSDR) and the Farm Worker Justice Fund.

The MPH has remained the appropriate degree for some – especially if the student has extensive work experience and does not plan a career that requires an MSN. An advantage to the MPH degree, taken alone, is the flexibility it allows with regard to elective courses. OEHN students in the MPH program have been able to take additional occupational safety and health (OSH) courses or add an area of focus that complements their occupational safety and health competencies (such as management, policy and finance courses).

We have taken an active role in the transition of the doctoral program to two distinct degrees: the PhD and DrPH. We have ensured balance in requirements across both programs, and we have been successful in melding the programs so that the OEHN component is the same for all. Doctoral students in the OEHN program remain a single cohesive cohort. Students appreciate the choice in programs, and we have found it relatively easy to help students identify the best program for them. The quality of students is exceptional. For example, a DrPH student received the Maryland Nurses Association's (MNA's) "Nurse of the Year" award, and another provides consultation on occupational hazards to healthcare personnel to the American Nurses Association (ANA).

We continue to participate actively in the ERC Continuing Education program. In the spring of 2006, we presented a panel discussion for nurses in Region III titled *Lessons from Katrina: Keeping Responders Safe and Healthy*. We videotaped the seminar and it is available on-line or via disk for nursing contact hours.

The program faculty have made significant contributions to professional societies in the region – another means of reaching and developing the occupational and environmental health workforce. Dr. Fitzgerald is the educational director for the local AAOHN chapter, and Ms. Doyle serves on the regional conference committee for the annual conference of three AAOHN chapters in Region III. At the national level, Dr. Agnew serves on the NORA Liaison Committee of NIOSH.

OEHN program members (including students) have played a significant role by representing occupational health and nursing in several of the new centers and institutes that have emerged in this school and university. Dr. Agnew and Ms. Doyle are members of the MidAtlantic Public Health Training Center, conducting outreach to public health professionals on occupational and environmental health topics and directing a supplement to the grant on environmental health and nursing. Dr. Agnew is also a member of the Center for Public Health Preparedness, representing nursing and bringing a focus on the health of responders to disasters. Both are also involved in the outreach program of the Center in Urban Environmental Health. One doctoral student works extensively with the Johns Hopkins Urban Health Institute, bringing expertise in occupational and environmental health to the center's community-based participatory research efforts. As our academic settings become more complex and interface increasingly with community partners, it is important to ensure that occupational health nursing remains involved at the forefront of these new initiatives.

As the above activities indicate, the OEHN program and its members have made significant contributions to occupational safety education, research and practice. Mechanisms have been put in place that will ensure that these successes continue.

Results: Occupational and Environmental Medicine Residency (OEMR)
Director: Virginia Weaver, MD, MPH

Background and Program Objectives

The purpose of the OEMR program, directed by Dr. Virginia Weaver, is to train physicians who will be leaders in occupational and environmental medicine. We expect that our graduates will be able to manage and improve the health of populations through: 1) the development and implementation of programs to reduce or mitigate occupational or environmental exposure; 2) the direction of clinical care and health management of individuals exposed to potentially harmful chemical, physical and biological agents in a variety of occupational and non-occupational settings; 3) the application of new technologies, new research findings and new management techniques to improve the health of working populations; and 4) the application of population health skills to improve population health status and minimize disability. The OEMR is a two-year program that includes an academic year in which the MPH degree is obtained, followed by a practicum year of rotations at key training sites in the mid-Atlantic region. The program is an important and well-integrated part of the Education and Research Center for Occupational Safety and Health (ERC) training program at the Johns Hopkins Bloomberg School of Public Health. NIOSH funding is one of three primary sources of financial support for this program and is critical to its future.

Accomplishments over the Project Period

The OEMR has had several significant accomplishments during the period covered by this report. During 2002-2007, we had 11 students earn MPH degrees and 16 students graduate from the full program. These 16 residents all participated in research and have since taken job positions in a variety of settings. The program is fully accredited to April 2012, after receiving a full five-year accreditation approval at the last ACGME site visit in 2007, and is approved to have six residents in each year of the program. We continue to attract the most qualified applicants in the country, as evidenced by the large number of trainees who have received OPSF scholarships.

During the past five years, there have been several changes and improvements to the program curriculum. Additional courses in epidemiology and a higher level biostatistics course are now required. *Fundamentals of Occupational Health* was offered on-line for the first time in 2000, but was greatly expanded for the 2002 academic year. In 2006, the *Clinical Occupational and Environmental Medicine* course was refocused and retitled *Clinical Occupational and Environmental Toxicology*, to better meet the needs of our residents in preparation for the extensive clinical toxicology portions of the certifying examination of the American Board of Preventive Medicine. In addition, to better prepare our residents for research, we developed a joint Journal Club in occupational and environmental epidemiology with the Department of Epidemiology. This joint Journal Club occurs once per month and brings together faculty, trainees and students from both departments as well as from the OEMR. Finally, during the summer, our trainees participate in the educational offerings of the General Preventive Medicine Residency (GPMR) at Johns Hopkins – including the seminars, which provide them with content in preparedness, health services, health care funding and other preventive medicine topics.

Residents are also eligible to pursue the newly developed MPH Concentration in Epidemiological and Biostatistical Methods for Public Health and Clinical Research. This

concentration requires many additional courses, with great depth in epidemiology and biostatistics, participation in a required seminar series, completion of a research project and publication of a paper. This again highlights our capability for excellent research training.

We have made substantial progress in the development of a shortened (15- to 18-month) training program for residents with an MPH degree who lack specific courses that are required by the OEMR. In recent years, the OEMR has seen an increased interest in training from such physicians. On-line course options are allowing us to offer these physicians a practicum year position when it is preceded by three to six months of coursework.

Several core rotations in the practicum year have been refined to provide residents with management and programmatic skills that are increasingly required in U.S. workplaces. The four-month rotation at Johns Hopkins Hospital and the University of Maryland (JHH-UM) now provides more clinical continuity and allows a resident to gain experience with workers employed in many different settings. As faculty and residents have looked at job opportunities following the completion of residency and assessed the competencies that make residents attractive candidates for employment, the rotations have been adjusted to include more clinical occupational medicine, including musculoskeletal medicine.

We require a research experience for all two-year residents, and this has greatly increased the research skills that our trainees acquire. In addition, we had one physician (Dr. Jyme Schafer) stay for a third, research year in 2002-2003. She worked with Dr. Brian Schwartz on an analysis of original data that resulted in two publications. Programmatic support for faculty has permitted them to concentrate on mentoring residents, which may be the most important factor in persuading residents of the value of a career in research. The OEMR has a long record of training academicians.

Graduates of our OEMR continue to be heavily recruited, and during the past five years have been successfully placed in a number of important positions.

To help meet the growing needs for research and research training in occupational health and medicine, the Division of Occupational and Environmental Health performed a national search and recruitment for two new faculty during 2004-2005. This culminated in the hiring (in August and October 2005, respectively) of Dr. Sining Chen and Dr. Ana Navas-Acien. Dr. Chen, who has a PhD in biostatistics, will help meet the growing need of trainees for biostatistical support, especially in view of the increasingly complex data that are acquired in occupational and environmental epidemiologic studies and clinical research. Dr. Ana Navas-Acien, MD, PhD, is trained in preventive medicine and received her PhD in occupational and environmental epidemiology. She will be available to serve as a research mentor to OEMR trainees.

Over the past five years, the OEMR developed and implemented a system of competency-based education, as required by the ACGME. This process entailed: 1) review of different competency systems and development of a unique set of competencies for the OEMR (based largely on the competencies developed by the American College of Occupational and Environmental Medicine); 2) development of an instrument (a standardized written spreadsheet) containing all of the competencies; 3) field testing of the competencies in the different rotations; and 4) final development of forms and implementation in both years of the residency and in all rotations. We assess competencies with a custom-designed Access program linked to the ACGME identification number of the competency. The competencies developed for the residency stress the interdisciplinary nature of the field, and each rotation has competencies that specifically require interaction with other occupational health professionals. In the coming

years, the OEMR expects to be in the forefront of efforts to develop new evaluation methods for resident training.

In summary, the OEMR program offers unequaled educational preparation for physicians who are entering the field of occupational safety and health. They are serving, and will continue to serve, a vital function in the protection of worker health.

Results: Occupational Injury Prevention (OIP)
Director: Susan Baker, MPH (PhD Hon.)

Background and Program Objectives

The objective of the Occupational Injury Prevention program, directed by Professor Susan Baker and co-directed by Dr. Keshia Pollack, is to train occupational injury prevention researchers and educators using the public health model. Through integration of current teaching and research training activities, this training program produces independent researchers who can take an integrated epidemiological approach to occupational injury control. Graduates bring a new public health perspective to injury prevention in the workplace, and they assume the roles of faculty, researchers and instructors to train the next generation of occupational injury prevention professionals. As identified by the Institute of Medicine report, the most urgent need in occupational safety is for doctoral graduates in occupational injury prevention who are prepared to provide the leadership and research skills necessary to advance the field. Previous program graduates have filled key positions at NIOSH, NCHS and various universities, among other settings.

Students are trained in epidemiologic research methods through coursework and development of their independent research. They gain experience in teaching and acquire a strong background in the causes and prevention of occupational injury, as well as in basic injury control methods. By working closely with their advisors, other faculty and student colleagues, they acquire the knowledge and skills that allow them to excel in this specialized area of public health.

Accomplishments over the Project Period

During this period, nine doctoral trainees (eight PhD and one ScD) have graduated from this program. Two PhD students are continuing the program.

Our trainees have excelled in research (both their own and collaborative projects) and teaching. Many have given presentations at national conferences, at least four of which have been chosen as the best paper at the conference. During this period, the ERC-supported work of the OIP faculty and/or students resulted in or contributed to at least 44 published manuscripts (see Appendix A).

All trainees have directly participated in one or more projects or research efforts as part of their training. This training has taken the form of: 1) work with faculty on existing projects; 2) the development of students' own projects, culminating in dissertation research; and 3) work and research experience as part of collaborative arrangements with outside groups. In recent years, students participated in the following research projects in addition to their dissertation research:

- Taxi Shield Compliance Evaluation Study, part of a taxi intervention effectiveness study being conducted by NIOSH;
- Prioritization of injuries in the U.S. Army, followed by a systematic review of the literature on sports injuries among military personnel;
- A study of work limitations in a cohort of individuals with severe leg injuries;

- Research with the Air Force Safety Center on alcohol-related predictors of motor vehicle crashes among USAF personnel;

- Strengthening the role of public health at contaminated worksites;

- Stakeholder influence, scientific review and the delayed adoption of health-protective standards; and

- Injuries to correctional officers and mechanisms to reduce them through modification of potential weapons, a collaborative project with the Johns Hopkins University Applied Physics Laboratory.

Other student accomplishments include the following. A former student with NIOSH funding has made important contributions to our understanding of commercial fishing vessel sinking and survivability in Alaskan waters. She is now interim director of the NIOSH Anchorage, Alaska, office and has authored five NIOSH reports on hazards within the commercial fishing industry. Another former student and U.S. Air Force officer helped clarify the role of cardiovascular fitness and physical activity to unintentional injury to military forces. Another of our 2006 graduates, Dr. Keshia Pollack, successfully competed for a National Research Service Award from NIH and was subsequently awarded a postdoctoral fellowship in Research and Evaluation at the University of Pennsylvania School of Education Campbell Collaboration/Robert Wood Johnson Foundation, where she worked on obesity prevention and violence prevention. As mentioned below, Dr. Pollack is now a tenure-track faculty member in this program. Three other graduates also secured tenure track positions at universities.

Dr. Pollack was appointed in 2006 as an assistant professor in the Department of Health Policy and Management, and plans are in place to mentor her into the position of co-director of this program. Her expertise includes the epidemiology and prevention of workplace injuries, specifically among vulnerable populations.

The leadership and research expertise of the full-time core faculty are evidenced by their significant national and international professional activities. Published papers, review articles and books that have contributed to advances in occupational injury prevention indicate their high level of research productivity; many of these constitute landmark contributions to the field. With grant support from NIOSH, faculty and/or students have authored or co-authored nearly 45 publications on occupational injuries during this time period. (For a list of publications, see Appendix A) The accomplishments of the faculty are also reflected in their leadership roles in national organizations, in their numerous presentations at national and international conferences, and in awards recognizing their work.

The geographic location of the school has made it possible to interact with researchers and government officials from the Washington, D.C., region. However, we have also attracted visiting scholars from Alaska, Utah, Massachusetts, and Washington State. Additional collaborations with regard to research and training experiences have existed with: the Applied Physics Laboratory of JHU; the U.S. Army Center for Health Promotion and Preventive Medicine; Liberty Mutual Research Institute for Safety; the Office of the Chief Examiner of Maryland; the Maryland Institute for Emergency Medical Services and Systems; the Veterans Administration; and the Daimler Chrysler-UAW Health and Safety Committee.

To summarize, the Occupational Injury Prevention program has a foremost reputation for preparing highly needed researchers and educators in the field. Graduates, although early in their careers, have already demonstrated the value of the program through their productivity and significant leadership. It is unfortunate that, with the loss of NIOSH supplemental support, the growth and success of this program will be difficult to sustain.

Results: Biomarkers of Occupational Exposure and Susceptibility (BOES)
Director: Paul Strickland, PhD

Background and Program Objectives

We were pleased to add a new program in 2002, Biomarkers of Occupational Exposure and Susceptibility (BOES), which demonstrates the ERC's responsiveness to contemporary issues in OSH. The program was initially approved in 2002, and was renewed in 2004 with the enthusiastic support of its reviewers. The objective of this research training program has been to expand the opportunities for students to utilize state-of-the-art molecular and biochemical methods to measure biomarkers of importance in occupational health research. It bridges and complements the disciplines of epidemiology, toxicology and occupational health in its goal to develop tools for identifying individuals with high exposure and at high risk for disease development. Molecular approaches to estimating toxin exposure and understanding disease causation are assuming a greater role in risk assessment methodology, and are increasingly important in making decisions regarding health and exposure screening. We have considered this to be an innovative and important addition to the ERC training program.

The objective of the BOES program is to provide interdisciplinary research training for PhD or DrPH degree candidates in the development and application of biological markers in human populations exposed to occupational and environmental hazards. This has enabled us to graduate highly qualified doctoral students with the knowledge and skills necessary to develop, evaluate and apply molecular and biochemical biomarkers of exposure, effect and susceptibility in occupational settings. The subject matter of doctoral research projects has focused on current problems in occupational health that are amenable to study by molecular and biochemical biomarkers, and reflects the expertise of the program-affiliated faculty.

Upon completion of this program, graduates:

- are familiar with the subject areas relevant to the use of biomarkers in occupational and environmental health: molecular epidemiology; biostatistics; toxicology; industrial hygiene; health policy and administration; environmental law and ethics; and labor-management relations.

- have an understanding of major occupational and environmental diseases, including molecular methods of monitoring, surveillance and prevention.

- demonstrate knowledge of the elements of the workplace and general environment and their interactions, including: industrial processes; demography of the population; and physical, chemical, biological and psychological hazards in the environment.

- demonstrate skill in communication of the general concepts of the application of biomarkers in occupational and environmental health in both written and oral presentations.

- recognize deficiencies in the research literature and are able to critically evaluate work in progress as well as published reports.

- recognize and develop hypotheses in the field of occupational/environmental health that can be quantified and tested.

- demonstrate knowledge and ability in the application of biomarker methodology, including design techniques, analysis, and interpretation.

- understand and evaluate major types of occupational and environmental health standards, including their limitations and implications for maintenance of health; have knowledge of the standard-setting process; and understand the role that biomarkers play in this process.

Accomplishments over the Project Period

BOES core faculty have advised an average of six doctoral students per year, whereas these faculty advised an average of only three-to-four doctoral students per year prior to the beginning of NIOSH funding in 2002. More importantly, the BOES program has provided a more defined curriculum for these students, as well as opportunities for interaction between students and faculty with related interests through affiliation with an ERC. The program has had a significant impact on the entire ERC by providing new educational opportunities in areas of importance, such as: the better identification of causal factors; the more precise delineation of dose-effect relationships; the development of techniques for the earliest identification of adverse effects; contributions to the scientific basis of monitoring (including biologic monitoring and surveillance); the ethical use of biomarkers in occupational settings; the evaluation of preventive measures (including health promotion); and an understanding of important pathophysiologic mechanisms involved in the development of occupational disease. This knowledge is applicable in risk assessment, biomonitoring, disease etiology and the diagnosis and prevention of human diseases of occupational origin.

In addition to benefiting the training of all ERC students, the program graduated eight doctoral (PhD) students, who demonstrate the competencies listed above. Additionally, one student completed an MHS degree. Five PhD students are continuing the program.

Examples of previous and ongoing biomarker research conducted by program students and faculty are presented below, according to exposures of concern:

Combustion Products

- Biological monitoring of PAH-DNA adducts in structural and wildland firefighters
- Development of a rapid method to measure 1-OH-pyrene-glucuronide in human urine
- Biological monitoring of PAH exposure in steel plant workers by urinary 1-OH-pyrene
- Use of urinary 1-OH-pyrene to assess PAH exposure interventions in coke oven workers
- Biological monitoring of ambient air pollution by urinary 1-OH-pyrene in children/mothers
- Urinary 1-OH-pyrene to assess diesel exhaust exposure among adolescents in Harlem
- Monitoring of PAH exposure in toll booth workers from mobile sources
- Assessment of dietary PAH exposure in populations with high risk of esophageal cancer

Lead

- Assessment of urinary and plasma ALA in lead-exposed children
- DMSA-chelatable lead levels and bone lead levels in organolead manufacturing workers
- Neurobehavioral function and bone lead levels in former organolead workers
- Biomarkers of lead exposure and blood pressure in former organolead workers

- Biomarkers of lead exposure and neurobehavioral test scores in Korean lead workers
- Biomarkers of lead exposure and longitudinal decline in cognitive function

Pesticides

- Serum organochlorine levels and risk of non-Hodgkin lymphoma in nested case-control study
- Serum organochlorine levels and risk of breast cancer in nested case-control study
- Serum cholinesterase inhibition as an index of organophosphate exposure and NHL risk
- Serum organochlorine levels as a function of location of residence in Washington County, Md.

Benzene/Benzidine

- Benzene exposure assessed by urinary t,t-muconic acid in urban children
- Environmental tobacco smoke exposure assessed by urinary cotinine in urban children
- Confounders of urinary t,t-muconic acid measurements to assess benzene exposure
- Mutations induced in the glycophorin A locus of erythrocytes in benzene-exposed workers
- Hematotoxicity and specific chromosomal aberrations among workers exposed to benzene
- Hemoglobin and albumin adducts of benzene-oxide among workers exposed to benzene
- Metabolites of benzidine in human urine and benzidine-DNA adducts in urothelial cells

Radiation

- Development of methods to measure DNA photoproducts induced in skin by UV radiation
- Assessment of urocanic acid in urine as a marker of recent exposure to UV radiation

Disease Vectors

- Application of anti-tick saliva antibodies to assess tick exposure and risk of Lyme disease
- Seroprevalence of Lyme disease in outdoor workers in New Jersey and Assateague Island
- Tick avoidance behavior in military personnel and anti-tick saliva antibodies

Dietary Toxins

- Development of methods to measure aflatoxin-DNA adducts in human urine
- Development of methods to measure aflatoxin-albumin adducts in human plasma
- Development of rapid method to measure heterocyclic amine metabolites in human urine
- Use of biomarkers of aflatoxin exposure to assess dietary interventions
- Modulation of urinary 1-OH-pyrene by dietary PAH exposure

Genetic Polymorphisms and Susceptibility

- Influence of glutathione S-transferase genotype on risk of breast cancer
- Effect of N-acetyltransferase 2 genotype and diet on breast cancer risk
- Influence of NQO1 genotype and phenotype on benzene poisoning
- Development of genotyping method using mass spectrometric analysis of DNA fragments
- Organ distribution and expression of cytochromes P450 1A1 and 1B1 in human tissues
- Ethnic variation of common polymorphisms in metabolic genes

- Correlation between N-acetyltransferase phenotype and genotype in Chinese males
- Induction of cytochrome P450 activity in humans by dietary pyrolysis products

Gene-Exposure Interactions

- Interaction between plasma aminolevulinic acid and ALAD genotype in lead-exposed workers
- Interaction between DMSA-chelatable lead and ALAD genotype in lead-exposed workers
- Influence of ALAD genotype on blood lead and zinc protoporphyrin levels in lead workers
- Impact of genetic polymorphisms on the level of PAH-DNA adducts in humans
- Interaction between bone lead and vitamin D receptor genotype in former organolead workers
- Influence of CYP1A2 activity on urinary heterocyclic amine levels in humans
- Impact of NAT2 phenotype on benzidine urinary metabolites and urothelial DNA adducts in exposed workers.
- Assessment of urocanic acid in urine as a marker of recent exposure to UV radiation

We have continued to improve our course offerings and training in the area of molecular and population genetics as intended for this project period. This program has expanded the research opportunities in the area of genetic susceptibility to diseases of occupational or environmental origin. The strength and reputation of the full-time core faculty in the BOES program is demonstrated by their significant local, national and international professional activity. The faculty publication lists indicate a high level of research productivity, as evidenced by published papers, review articles and book chapters. These publications are augmented by numerous presentations at national and international conferences and participation on professional committees of national and international organizations.

In summary, the BOES program has proven to be an innovative addition to the ERC. It stimulates interdisciplinary research training in an area that is rapidly advancing, and it has allowed us to include in the center faculty and students who did not previously have these opportunities due to lack of funding. Graduates of the program are prepared with in-depth knowledge of the application new technologies and their implications, and they are using this knowledge to contribute to research, education and policy making in the field of occupational health.

Results: Continuing Education/Outreach (CE)

Director: Mary Doyle, MPH, RN, COHN-S/CM

Background and Program Objectives

The Johns Hopkins Education and Research Center (ERC) Continuing Education (CE) training program, directed by Ms. Mary Doyle, is an interdisciplinary effort coordinated across multiple departments at the Johns Hopkins Bloomberg School of Public Health. The program prepares occupational safety and health (OSH) professionals for practice and research roles that reflect not only the competencies required for those areas of the field but also the changing climate in technical practices, regulations, compliance, health care delivery and corporate culture. The goal of the program is to address these objectives by offering short courses and seminars to practicing professionals such as physicians, nurses, industrial hygienists, safety engineers and sanitarians. In addition, our ERC CE training program serves as a resource to private, state, local and federal government personnel working in Region III and nationally to ensure occupational and environmental safety and health.

Accomplishments over the Project Period

During the past training grant period, the CE program trained 5,402 occupational health and safety professionals in a total of 236 courses, which represents a more than 20% increase in trainees over the last grant period. The courses, seminars and workshops have covered broad and innovative topics and have increased the visibility of the program during the past project period. Specifically, these accomplishments were achieved by cultivating numerous external and internal partnerships within the OSH community, as well as by seeking opportunities to provide continuing education training tailored to the specific needs of various groups (detailed below).

As program director, Ms. Doyle is responsible for establishing the vision and strategic plan for the CE program. This is accomplished by her close affiliation with the ERC academic program directors and all ERC faculty to assess the needs of practicing professionals and to develop course offerings, both new and recurring. In addition to planning the types and content of courses, identifying expert faculty for courses and developing and analyzing evaluations, she is solely responsible for the logistics and financial management of the program. She oversees all applications for continuing education credit from each respective discipline, and a significant amount of her time is devoted to establishing partnerships and planning major conferences. For example, Ms. Doyle served on the planning committee for the Regional Occupational Health Conference (ROHC) for three local chapters of the American Association of Occupational Health Nurses, which was held on October 28, 2006. In addition, Ms. Doyle and Mr. Keith Choi, CE program assistant, provided all administrative support for this conference. Another effort during this grant period was the year-long planning and implementation of the 5th Mid-Atlantic Regional Conference on Occupational Medicine (MARCOM V), which occurred on October 13, 2007. Together with Sheila Fitzgerald of the OEHN program, Mary Doyle and Keith Choi served on the planning committee for this conference.

External Partnerships

Ms. Doyle has greatly strengthened the CE program by developing and expanding numerous external partnerships within Region III occupational and environmental safety and health professional organizations. Examples are the Chesapeake and Potomac sections of the American Industrial Hygiene Association (AIHA), the Chesapeake section of the American Society of Safety Engineers (ASSE), the Chesapeake and National Capital Chapters of the Academy of Certified Hazardous Materials Managers (ACHMM), the Maryland College of Occupational and Environmental Medicine (MdCOEM), the Metropolitan Washington, Maryland Area, and Seneca Valley Associations of Occupational Health Nurses (MWAOHN, MAAOHN and SVAOHN), and state and local organizations, such as the Maryland Department of the Environment, the Maryland Board of Environmental Sanitarians, and county public health departments. Partnerships with these various organizations have enhanced the CE training program by providing speakers, trainers, advisory board members, course participants and assessment of needs for course topics. Examples of this include (as detailed above) Ms. Doyle's and others' participation with the Regional Occupational Health Conference (ROHC) for three local chapters of the American Association of Occupational Health Nurses, and with the 5th Mid-Atlantic Regional Conference on Occupational Medicine (MARCOM V).

During the grant period, Ms. Doyle also served on several planning committees for local, national and international meetings and conferences involving occupational and environmental safety and health professionals, which included her taking the lead in the planning and implementation of a post-9/11 conference on worker training needs for new threats (in 2002) and a multidisciplinary conference on the ethical issues of genetic testing in the workplace (in 2006). The proceedings from the worker training conference were published by NIOSH, and the recommendations from the conference were published in the peer reviewed literature.

Partnerships with other academic institutions, particularly Education and Research Centers (ERCs) and Training Project Grants (TPGs) – such as the University of North Carolina at Chapel Hill, the University of Pennsylvania School of Nursing, the Oregon Labor Safety and Health Education Program at the University of Oregon and the Maryland Center for Environmental Training at the College of Southern Maryland – have increased the visibility of the CE program and have enabled us to offer conferences and seminars that have attracted a broader group of occupational and environmental safety and health professionals (for example, registered sanitarians and hazardous materials managers). Collaborations with these organizations were as follows:

- The University of North Carolina at Chapel Hill and the Johns Hopkins ERCs co-sponsored the "Best Practices in Occupational Safety and Health, Education, Training, and Communication: Ideas that Sizzle" conference in October 2002;

- The Johns Hopkins ERC CE organized the October 2002 "Best Practices" pre-conference "Worker Training in a New Era: Responding to New Threats" in collaboration with a planning committee representing academia, labor, NIOSH and the military; and

- In March 2006, the Johns Hopkins ERC, the Oregon Labor Safety and Health Education, the National Human Genome Institute and the University of Pennsylvania nursing program co-sponsored an interdisciplinary conference titled "Genes in the Workplace: The Right Fit?," which included perspectives from occupational medicine, occupational health nursing, law, labor, ethics, industry and science.

Internal Partnerships

Within the Johns Hopkins Bloomberg School of Public Health, Ms. Doyle has established links between the ERC and several other important centers relevant to professional continuing education training. These centers, which have grown in number in recent years, include the Institute for Johns Hopkins Nursing, The MidAtlantic Public Health Training Center and the Center for Public Health Preparedness.

Response to Requests for Training and Consultation

Ms. Doyle and faculty in the CE training program have also defined training opportunities with local public health agencies and organizations, private companies and international organizations to provide specialized training for specific occupational and environmental health professionals. Examples of these opportunities are listed below:

- Prompted by requests from sanitarians-in-training for a course to help them prepare for the registration exam administered by the Maryland Board of Environmental Sanitarians, Ms. Doyle met numerous times with the board and the Maryland Environmental Health Directors to plan a new course to meet that need. In the past two years, 73 newly hired sanitarians-in-training participated in the *Principles of Environmental Health/Registered Sanitarian Review Course*, which the ERC CE program developed and directed. Course content focused on a broad overview of the field, which is necessary to successfully sit for the state examination.

- In January 2005, Ms. Doyle designed and implemented a two-week course on chemical risk assessment and management for members of the Petroleum Safety Authority (PSA) of Norway. The course also included a tour of U.S. occupational and environmental safety and health agencies, professional associations and private companies to discuss best practices with leaders in the field.

- ERC faculty worked with occupational safety and health management from BP Solar to design and deliver an ergonomic training program for the industrial engineers at their Frederick, Maryland plant in February 2006. Ergonomic principles were reviewed and specific industrial work processes at the plant were analyzed to assist the engineers in ameliorating existing problems and to design ergonomically safe assembly lines in new areas of the plant. ERC Director Jacqueline Agnew and Ms. Doyle collaborated with a Pilot Project Research Training (PPRT) grant recipient to implement this training.

New Course Development

Needs assessments from various professional organizations representing occupational and environmental safety and health professionals have been instrumental in identifying course topics for the CE program. These topics are then discussed with the internal and external advisors of the program to develop the ERC CE training plan.

During this grant period, we have utilized several new course methods and plan to expand these efforts with NIOSH support, especially in the area of distance education. Creating DVDs and Web streaming videotaped conferences and seminars have significantly increased the numbers of OSH professionals who are able to access our training.

Although the foundation of our Continuing Education program is built on the various courses that will prepare OSH practitioners for professional certification in their specialty area, we are continually assessing which new and innovative courses are needed to keep practitioners current in the knowledge and trends key to their field. During the grant period, we developed several exciting new courses and seminars. Each has the appropriate continuing education credits for their specialty. The courses are outlined below under their respective academic program areas.

Occupational and Environmental Hygiene

During the grant period, the Johns Hopkins ERC CE program co-sponsored a five-day *CDC National Lead Poisoning Prevention Training* course that included nationally known plenary speakers and highly qualified faculty. The four training track topics, with six modules in each, included: Primary Prevention; Program Management; Case Management; and Data and Surveillance. This course was offered twice a year.

Ms. Doyle developed the new course *Principles of Environmental Health/Registered Sanitarian Review* in response to requests from numerous sanitarians-in-training who were experiencing difficulty passing the State of Maryland Registered Sanitarian examination. This two-week course provided an introduction to the concepts and principles of environmental health for public health practitioners. Students who took the October 2004 pilot training review course had a 78.5% pass rate on the state board examination, compared with a 38.5% pass rate for students who did not take the course.

Occupational and Environmental Health Nursing

In addition to the course *Overview of Occupational Health Nursing*, which assists occupational health nurses to prepare for the American Board for Occupational Health Nurses (ABOHN) Board certification exam, two other courses are considered core continuing education offerings for nurses: *Occupational Spirometry* and *Occupational Hearing Conservation*. While these courses are open to all, registered nurses and nurse practitioners are the predominant registrants.

In 2004, we were approached by Abbott Laboratories Global Occupational Health Services to develop a strategy to offer continuing education credits for the occupational health nurses employed by the lab worldwide. For the past two years, our ERC CE program, the Institute for Johns Hopkins Nursing (IJHN) and Abbott have co-sponsored a worldwide Web-based bimonthly continuing education program open to Abbott Laboratories nurses and ERC students. Each session is one hour in length and is recorded and available for 30 days after the session. Post-session evaluations are coordinated by the ERC CE program and are completed via the Web using SurveyMonkey.com.

We recently developed a new seminar series that will have a broader appeal to include practicing public health and community health nurses. Our first seminar was “Lessons from Katrina: Keeping Responders Safe and Healthy,” which was videotaped and formatted both as a DVD and Web stream on the ERC CE Web site for distance learning and continuing education credit. A panel discussion was held after the presentations, and highlights included: a description of one nurse’s story as a member of a Katrina response team; discussions by two nurses employed by Federal Agencies – the Occupational Safety and Health Administration (OSHA) and the Agency for Toxic Substances and Disease Registry (ATSDR) – who responded

to the disaster; and a psychologist who is experienced at providing essential recommendations regarding responses to stress and responder health.

Occupational and Environmental Medicine

During the grant period, the new course *Occupational and Environmental Medicine Update* was developed by ERC faculty in collaboration with the Maryland College of Occupational and Environmental Medicine (MdCOEM), the local chapter of the American College of Occupational and Environmental Medicine. This half-day course was offered twice a year, on a Saturday, at the Bloomberg School of Public Health. Highly qualified speakers were chosen from a variety of settings, including private practice, government agencies and academia. Continuing Medical Education (CME) credits were obtained from the School of Medicine or ACOEM. Each session addressed an average of three "hot topics" in the area of occupational medicine research or practice, as identified by a needs assessment survey of MdCOEM members. Time was also allotted for networking among members and guests.

During the grant period, Drs. Cliff Mitchell, Brian Schwartz and Virginia Weaver regularly taught in the *Occupational Medicine Board Review* course held in collaboration with ACOEM. This has been a very successful course, but may have to be reevaluated now that Dr. Mitchell has left the ERC to work for the state of Maryland.

Occupational Injury Prevention

The Johns Hopkins Education and Research Center served as a network training partner with the National Healthy Homes Training Center to offer a multidisciplinary two-day *Essentials of Healthy Homes Practitioners Course*. This training highlights the connections between health and housing, and how to identify the root causes that result in environmental hazards that threaten the health of residents. The course brings together a wide variety of people who share perspectives and experiences in a series of exercises that keep the training lively and engaging. The training complements hazard-specific training in lead-based paint, radon, mold, pests and asbestos by identifying root causes of health problems in a home and linking them to housing problems related to ventilation, moisture, contaminants and structural design. Course participants learned how enhanced healthy homes maintenance, repair and renovation activities will help preserve the integrity of our nation's limited housing stock. Ms. Doyle participates in regular meetings and conferences with the National Center for Healthy Housing to develop and evaluate curricula for this course and plans for the center.

Biomarkers of Occupational Exposure and Susceptibility

While the development of genetic sciences has advanced faster than ever in the past decade, issues surrounding ethics and the legal rights of workers regarding their genetic information are also critical concerns to our society. As discussed above (in External Partnerships), Johns Hopkins ERC faculty collaborated with Oregon Labor Safety and Health Education, the National Human Genome Institute and the University of Pennsylvania Nursing Program to co-sponsor an interdisciplinary conference titled "Genes in the Workplace: The Right Fit?" in March 2006. This invited scientific forum provided an environment for researchers, clinicians, labor advocates, industry leaders and policymakers to discuss current advances in genetic science and to address ethical, legal and communication concerns from a trans-disciplinary approach. Papers were presented representing different stakeholder perspectives that included occupational medicine, occupational health nursing, law, labor, ethics, industry and science. Distinguished panels responded to each paper.

Results: Hazardous Substance Training (HST)

Director: Mary Doyle, MPH, RN, COHN-S/CM

Background and Program Objectives

The Continuing Education program in Hazardous Substance Training (HST) received initial approval and funding in the final year of this project period, July 2006. It is an interdisciplinary effort within the Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC) and builds on the strengths of the Continuing Education and Outreach programs. Faculty from the ERC core programs of Occupational and Environmental Health Nursing, Occupational and Environmental Medicine and Environmental Health Engineering play key roles in this program.

All occupational health and environmental personnel must be adequately prepared to evaluate, manage and or/or handle hazardous substances and natural disasters based on their level of training. The HST program provides public health professionals from a variety of sectors with the skills needed to develop strategies to protect persons, property and the environment. The terrorist attack of September 11, 2001 and natural disasters such as Hurricane Katrina demonstrate the relevance of hazardous substance training to public health. In response to such events, we have developed a plan for continuing education training that addresses variable needs across sectors. This HST program builds on that plan, as well as the past training experience of this ERC.

The HST program has the following long-term objectives:

- Develop and implement a program of instruction for the future;
- Coordinate training activities with agencies responsible for cleanup, enforcement and training of personnel who deal with hazardous substances;
- Implement Web-based modules, short courses and continuing education programs for private, state and local health and environmental professionals involved in evaluating, managing and handling hazardous substances; and
- Conduct evaluations to demonstrate that the regional needs for training professionals are being met.

The core faculty of this new program are listed below. In addition to Ms. Doyle, Drs. Cadorette and Schwab received partial support from this grant. In coming years, we expect to rely more heavily on their experience and expertise; their anticipated roles include input with regard to the overall curriculum, course direction, material development and review, and possibly also the recruitment and training of instructors and assistants.

Areas of expertise, research interests and trainee involvement of faculty contributing to HST.

CORE FACULTY	AREAS OF EXPERTISE/RESEARCH	TRAINEE INVOLVEMENT
M. Doyle, RN, MPH, COHN-S/CM	Continuing education, worker training, hearing conservation	HST program director, program planning, professional education and worker training
J. Agnew, RN, MPH, PhD, COHN-S, FAAN	Vulnerable worker populations, aging workers, musculoskeletal disorders, occupational stress, military health	ERC director, course director for workplace toxins
P. Breysse, PhD	Pollutant source characterization, exposure measurement and interpretation, development and use of biomarkers of exposure/dose/effect	Director of occupational and environmental hygiene academic program
M. Cadorette, RN, MPH, PhD	Worker screening and surveillance, risk communication	MPH advisor, course instructor
P. S.J. Lees, PhD	Occupational and environmental exposure assessment methodology and its application to epidemiologic studies	ERC deputy director
J. Links, PhD	Radiation physics and dosimetry, medical imaging instrumentation, computer processing of biomedical images and biomarkers	Director, Johns Hopkins Center for Public Health Preparedness, Joint Appointment in Radiology, School of Medicine
K. Schwab, PhD	Integrate Hopkins researchers from multiple disciplines to address water-related public health issues	Professor, EHS, Joint appointment Department of Molecular Microbiology and Immunology

Accomplishments over the Project Period

During its first year of existence, the program trained a total of 175 trainees from diverse backgrounds in the nursing, hygiene and safety professions. Courses included the following:

- *Certified Hazardous Materials Manager (CHMM) Review Course* and CHMM Exam at the AIHAce conference in Philadelphia on June 1-4, 2007.
- *Personal Protective Equipment* for all Cecil County Health Department staff in Elkton, Md. on June 29, 2007.
- *Personal Protective Equipment* for Cecil County Health Department radiation teams in Elkton, Md. on June 29, 2007.

We have developed several close working relationships and partnerships that enhance our opportunities to present training. For example, we worked closely with Debora Jones, a regional expert in the area of health and safety who has served on the board of directors of the Chesapeake Region Safety Council. We also developed a partnership with the Cecil County Health Department of Maryland to develop a successful personal protective equipment (PPE) course to its employees, and we are implementing future courses.

Plans are in place to expand our training in the coming grant period. We met with Advisory Board member Clayton Miller in July to discuss collaboration with his company on HST courses and to assess training needs not met by existing training providers in Region III. Program faculty also attended the Academy of Certified Hazardous Materials Managers (ACHMM) chapter meetings to do a needs assessment of local chapter members in Washington, D.C. and Baltimore. Additionally, we have continued to assist in the development of a new Baltimore chapter of ACHMM.

Future program plans are to continue to offer HST courses, including training for first responders, a confined spaces course, and a CHMM review course with examination. We will continue to utilize our extensive network of Region III professional organizations and representatives of public sector employees to recruit those who would benefit most from hazardous substance training.

Conclusions

In summary, the mission of the Johns Hopkins ERC is to provide an integrated, interdisciplinary approach to training researchers and practitioners in the field of occupational safety and health. The ultimate objective of this project is to protect the health and safety of all working individuals. Additionally, as the only ERC in Region III, this center is dedicated to meeting regional and national needs through occupational safety and health practitioner and researcher training.

APPENDIX A: PUBLICATIONS

Occupational and Environmental Hygiene (OEH) Publications

Note: Trainee authors shown in **bold**.

1. Breysse PN, Weaver V, **Cadorette M**, et al. Development of a medical examination program for former workers at a Department of Energy national laboratory. Am J Ind Med 2002;42:443-54.

2. Krenzischek DA, Schaefer J, Nolan M, et al. Phase I collaborative pilot study: Waste anesthetic gas levels in the PACU. J Perianesth Nurs 2002;17:227-39.

3. **LaRosa LE**, Buckley TJ, Wallace LA. Real-time indoor and outdoor measurements of black carbon in an occupied house: an examination of sources. J Air Waste Manag Assoc 2002;52:41-9.

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6. **Brenneman S**. Passive Monitoring with Gore Sorbers. 2003;.

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9. Schwab KJ, **McDevitt JJ**. Development of a PCR-enzyme immunoassay oligoprobe detection method for Toxoplasma gondii oocysts, incorporating PCR controls. Appl Environ Microbiol 2003;69:5819-25.

10. **Stefaniak AB**, Hoover MD, Dickerson RM, et al. Surface area of respirable beryllium metal, oxide, and copper alloy aerosols and implications for assessment of exposure risk of chronic beryllium disease. AIHA J (Fairfax, Va) 2003;64:297-305.

11. **Stefaniak AB**, Weaver VM, **Cadorette M**, et al. Summary of historical beryllium uses and airborne concentration levels at Los Alamos National Laboratory. Appl Occup Environ Hyg 2003;18:708-15.

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14. **Henshaw S**. Spatial Attributes of Blood Organochlorine Concentrations in Washington County, Maryland. 2004;.

15. **Henshaw SL**, Curriero FC, Shields TM, Glass GE, Strickland PT, Breysse PN. Geostatistics and GIS: tools for characterizing environmental contamination. J Med Syst 2004;28:335-48.

16. **McCarthy SA**. Preliminary Assessment of the Indoor Air at a Poultry CAFO. 2004;.

17. **McDevitt JJ.** Development of Collection and Quantitative Methods for Assessing Exposures to Aspergillus Fumigates. 2004;.

18. **McDevitt JJ**, Lees PS, Merz WG, Schwab KJ. Development of a method to detect and quantify Aspergillus fumigatus conidia by quantitative PCR for environmental air samples. Mycopathologia 2004;158:325-35.

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20. **Stefaniak AB**. Influence of Physiochemical Properties on Dissolution of Beryllium from Beryllium Particles and Powders. 2004;.

21. **Stefaniak AB**, Hoover MD, Day GA, et al. Characterization of physicochemical properties of beryllium aerosols associated with prevalence of chronic beryllium disease. J Environ Monit 2004;6:523-32.

22. **Vaughn LP**. Noise Exposure of Rail Workers at a North American Chemical Facility. 2004;.

23. Breysse PN, **Williams DL**, Herbstman JB, **et al**. Asbestos exposures to truck drivers during World Trade Center cleanup operations. J Occup Environ Hyg 2005;2:400-5.

24. **Chapin A**. Non-Therapeutic Use of Anti-Microbials in Concentrated Animal Feeding Operations and the Presence of Antibiotic-Resistant and Arsenic Resistant Bacteria Environment Samples and Retail Meats. 2005;.

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30. **Landon P**, Breysse P, Chen Y. Noise exposures of rail workers at a North American chemical facility. Am J Ind Med 2005;47:364-9.

31. **McDevitt JJ**, Lees PS, Merz WG, Schwab KJ. Use of green fluorescent protein-expressing Aspergillus fumigatus conidia to validate quantitative PCR analysis of air samples collected on filters. J Occup Environ Hyg 2005;2:633-40.

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33. Nachman KE, **Graham JP**, **Price LB**, Silbergeld EK. Arsenic: a roadblock to potential animal waste management solutions. Environ Health Perspect 2005;113:1123-4.

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37. Wu HM, Fornek M, Schwab KJ, et al. A norovirus outbreak at a long-term-care facility: the role of environmental surface contamination. Infect Control Hosp Epidemiol 2005;26:802-10.

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39. **Geer LA**, Curbow BA, Anna DH, Lees PS, Buckley TJ. Development of a questionnaire to assess worker knowledge, attitudes and perceptions underlying dermal exposure. Scand J Work Environ Health 2006;32:209-18.

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43. **Kim S**. Methods and Measurements to Assess Mobile Source Air Toxics within a Micro-Environmental Hotspot and in Human Milk. 2006;.

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2. **Morkjaroenpong V**, Rand CS, Butz AM, et al. Environmental tobacco smoke exposure and nocturnal symptoms among inner-city children with asthma. J Allergy Clin Immunol 2002;110:147-53.

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Occupational Injury Prevention (OIP) Publications

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Biomarkers of Occupational Exposure and Susceptibility (BOES) Publications

Note: Trainee authors shown in **bold**.

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APPENDIX B: TABLES/ILLUSTRATIONS/ETC.

Appendix to Pilot Project Research Training (PPRT)

PPRT Program Announcement

ANNOUNCEMENT AND REQUEST FOR PROPOSALS

The Johns Hopkins NIOSH Education and Research Center

Pilot Project Research Training Awards, 2006-2007

Description: The objective of this program is to enhance occupational research training through direct support of research activities. Supplemental funds have been awarded by NIOSH to support student and new investigator (junior faculty) research projects with awards up to $15,000 each. The budget period is July 1, 2006 through June 30, 2007. There can be no extension beyond June 30, 2007.

Eligibility: Applicants must be doctoral students, post-doctoral fellows (including OM residents), or full-time faculty affiliated with a NIOSH Education and Research Center (ERC), Training Project Grant (TPG), or other related university-based program in NIOSH Region III. Faculty applicants must be new investigators who have not established support for their research through traditional mechanisms of funding. For student applicants, a faculty member must write a brief letter of support and be willing to be listed as the Principal Investigator for the project budget. Applications are due by Friday, September 8, 2006. *Prior to the release of funding, investigators must demonstrate approval of the research project by their Institutional Review Board or Animal Use Committee, as appropriate.*

Use of Funds: Budgets will be allocated in the name of the faculty member and are to be used exclusively for the described research. This support may be used for research expenses for which there are no other means of support. Examples include: supplies, domestic travel related to data collection or presentation, services such as data entry or laboratory analysis, and printing or photocopying. These funds may ***not*** be used for tuition or stipend. Awardees will be required to present their findings at a symposium at the Johns Hopkins Bloomberg School of Public Health and provide a written report within 30 days of the end of the budget period.

Evaluation of Applications: A committee representing Region III ERC and TPG programs will review the applications. Evaluation of projects will be based on relevance to worker health and safety, merit of the research, need for support, and potential to enhance research training capacity. Inclusion of an aspect of interdisciplinary interaction and research topics that concern priorities identified in the National Occupational Research Agenda (NORA) will be considered strengths of applications. Note that, in conformance with Federal regulations, exclusion of portions of populations (*e.g.*, gender or race) as potential research subjects must be specifically justified.

Application Format:

- Title
- Investigator (include biographical sketch)
- Faculty advisor and collaborators
- Budget (itemize costs for proposed project, with detailed justification of each item)
- Description of research project (limit to 3 pages):
    - Abstract (complete and suitable for reproduction in report to NIOSH)
    - Introduction (1 paragraph)
    - Objectives and Hypothesis (1 paragraph)
    - **Research plan** (2 pages: study population; sample size; methods; analysis; timeline; etc.)
- References

- List of current funding sources for this project and the investigator
- Documentation of Institutional Review Board or Committee on Animal Care and Use approval (Although projects need not be approved at the time of application, preference will be given to pre-approved projects and projects not requiring approval.)
- Brief letter of support from faculty advisor (student applications)
- Description of student involvement/enhancement of research training capacity (faculty applications)

Deadline for Applications: Submit applications electronically to plees@jhsph.edu with a hard copy to Dr. Peter S.J. Lees, Johns Hopkins University Bloomberg School of Public Health, Department of Environmental Health Sciences, Room E6624, 615 N. Wolfe St., Baltimore, MD 21205 by September 8, 2006. Direct questions to Dr. Lees at 410-955-3009 or plees@jhsph.edu.

Tables of PPRT Support Faculty by ERC Program

TABLE E.A.1. Occupational Health Nursing primary faculty and areas of research expertise

Name	Area of Expertise/Research Interest
J. Agnew, RN, MPH, PhD Professor	aging workers, cumulative trauma disorders, occupational stress, military health and safety
S. Fitzgerald, RN, MSN, PhD Associate Professor	health promotion, cardiovascular rehabilitation, occupational stress, adolescent workers
M. Cadorette, RN, MPH Assistant Scientist	medical screening and surveillance, occupational health policy, health risk communication
M. Doyle, RN, MPH Research Associate	hearing conservation, spirometry, case management, OHS education

TABLE E.A.2. Occupational and Environmental Hygiene primary faculty and areas of research expertise

Name	Area of Expertise/Research Interests
P.N. Breysse, PhD, CIH Professor	exposure assessment, airborne fiber exposure assessment, air cleaning adsorbents, noise, non-ionizing radiation, and airborne allergens
P.S.J. Lees, PhD, CIH Professor	exposure assessment for retrospective epidemiology, surface contamination, man-made vitreous fibers, and lead
A. S. Geyh, PhD Assistant Professor	exposure assessment, ozone, particulate matter; air pollution

TABLE E.A.3. Occupational Medicine primary faculty and areas of research expertise

Name	Area of Expertise/Research Interests
B. Schwartz, MD, MS Professor	occupational and environmental epidemiology, molecular epidemiology, neurobehavioral toxicology, lead intoxication & biomarkers, occupational Lyme & vector-borne disease
V. Weaver, MD, MPH Associate Professor	medical surveillance, lead-induced renal disease & hypertension, biomarkers, molecular epidemiology - benzene

TABLE E.A.4. Injury Prevention primary faculty and areas of research expertise

Name	Area of Expertise/Research Interests
S. Baker, MPH Professor	injury prevention epidemiology, transportation safety, military health and safety
A. Lincoln, ScD Adjunct Assistant Professor	injury prevention epidemiology, ergonomics, injuries of athletes
K. Pollack, PhD Assistant Professor	injury prevention epidemiology, worker risk factors for occupational injuries

TABLE E.A.5. Biomarker primary faculty and areas of research expertise.

Name	Area of Expertise/Research Interests
P. Strickland, PhD Professor	use of biomarkers in OHS, molecular epidemiology, molecular dosimetry-PAH, UV damaged DNA in skin, PAH-associated cancer

Responsiveness of PPRT Projects to NORA Priorities

TABLE E.A.6: PPRT Awards by NIOSH Priority Area, 2001-2005

NORA Priority Area	No. of Pilot Projects
Allergic and Irritant Dermatitis	3
Asthma and Chronic Obstructive Pulmonary Disease	8
Fertility and Pregnancy Abnormalities	3
Hearing Loss	0
Infectious Diseases	6
Musculoskeletal Disorders	19
Traumatic Injuries	19
Low Back Disorders	16
Emerging Technologies	6
Indoor Environment	10
Mixed Exposures	14
Organization of Work	23
Special Populations at Risk	27
Control Technology and Personal Protective Equipment	7
Exposure Assessment Methods	21
Health Services Research	13
Intervention Effectiveness Research	14
Risk Assessment Methods	15
Social and Economic Consequences	8
Surveillance Research Methods	18
Cancer Research Methods	6

Table E.A.7: PPRT Awards by NORA Sector Group, 2001-2005

NORA Sector Group	No. of Pilot Projects
Agriculture, Forestry & Fishing	5
Mining	1
Construction	0
Manufacturing	3
Wholesale and Retail Trade	0
Transportation, Warehousing & Utilities	4
Services	3
Healthcare & Social Assistance	4

PPRT Awardees, 2001-2006

Awarded 2001:

Name: William G. Hoh, MD (C. Martin, advisor)
Status: PGY-3 Resident
Affiliation: West Virginia University, Dept. of Community Medicine, Institute of Occupational and Environmental Health
Project title: *The Incidence of Hand-Arm Vibration Syndrome in West Virginia Coal Miners in 2000 Using a Comprehensive State-Managed Workers' Compensation Database*

Name: Seong-joon Jo, PhD
Status: Post-doctoral Fellow
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Assessment of Restaurant Worker ETS Exposure and a Comparison of Nicotine Analysis Methods*

Name: Jonathan Lazar, PhD
Status: Assistant Professor
Affiliation: Towson University, Department of Computer and Information Sciences
Project title: *Investigating User Error in Personal Computer and Web-Based Tasks*

Name: James J. McDevitt, MHS (P. Lees, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept of Environmental Health Sciences
Project title: *Development of a Quantitative PCR Method to Measure Aspergillus fumigatus in Workplace Air*

Name: Kathleen M. McPhaul, RN, MPH (J. Lipscomb, advisor)
Status: Ph.D. Candidate
Affiliation: University of Maryland School of Nursing, Dept. of Behavioral and Community Health
Project title: *Workplace Violence in Home and Community Health*

Name: Amir Sapkota (T. Buckley, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept of Environmental Health Sciences
Project title: *Tollbooth Worker Exposure to 1,3-Butadiene and Validation of Biomarker of Internal Dose*

Name: Virginia Weaver, MD, MPH
Status: Assistant Professor
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Nested Case-Control Study of Organophosphate Exposure and Risk of Non-Hodgkin's Lymphoma*

Name: Megan E. Weil, MHS (B. Schwartz, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Mercury Exposure, Superoxide Dismutase Genotype, and Neurobehavioral Function*

Awarded 2002:

Name: Amy R. Chapin, MPH (K. Schwab, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Characterizing Poultry Workers' Exposures to Airborne Antibiotic Resistant Bacteria*

Name: Joanna Gaitens (J. Agnew, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Pesticide Exposure Among Flight Attendants*

Name: Laura Geer, MHS (E. Silbergeld, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Evaluation of Potential Worker Exposure to Airborne Endotoxins and Antibiotics in Chicken Houses*

Name: Jeanne Geiger-Brown, Ph.D., RN
Status: Research Associate
Affiliation: University of Maryland, School of Nursing, Dept. of Behavioral and Community Health
Project title: *Development of a Survey for Medical Technologist Occupational Research*

Name: Rolf U. Halden, Ph.D., P.E.
Status: Assistant Professor
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *LC-MS Analysis of a Urinary Biomarker of Occupational Exposure to PAHs*

Name: Michael C. Ho, MPH, MBA (S. Baker, advisor)
Status: Ph.D. Student
Affiliation: Johns Hopkins University, Dept. of Health Policy and Management
Project title: *Identifying Factors of Organizational Safety Climate and Their Relationship to Workplace Injuries*

Name: Grant D. Huang, MPH, Ph.D.
Status: Research Assistant Professor
Affiliation: Uniformed Services University of the Health Sciences, Depts. of Medical &

Clinical Psychology and Preventive Medicine & Biometrics
Project title: *Prospectively Identifying Patterns of Ergonomic and Work Organization Risk Factors for Musculoskeletal Disorders*

Name: Thurmon E. Lockhart, Ph.D.
Status: Assistant Professor
Affiliation: Virginia Polytechnic Institute and State University, Grado Dept. of Industrial and Systems Engineering
Project title: *Effects of Aging and Load Carrying on Slip-Induced Fall Accidents*

Name: James J. McDevitt, MHS (P. Lees, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Comparison of Filter Collection with Quantitative PCR Analysis and Microbial "Reference" Methods for Measuring Airborne Aspergillus fumigatus*

Name: Weeraporn Seungthaworn, MSN (J. Agnew, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Living and Working Experiences Among Thai Immigrant Working Women*

Name: Theresa Pluth Yeo, MSN, MPH (S. Fitzgerald, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Differences in Cigarette Smoking, Environmental Tobacco Smoke Exposure, Occupational History, and Occupational Exposure to Carcinogens Between Cases of Familial Pancreatic Cancer and Cases of Sporadic Pancreatic Cancer and Matched Controls*

Awarded 2003:

Name: Kari Babski-Reeves, PhD
Status: Assistant Professor
Affiliation: Virginia Polytechnic Institute and State University, Grado Dept. of Industrial and Systems Engineering
Project title: *Investigating Muscle Activation Patterns Using Thermography to Prevent WMSDs of the Upper Extremity*

Name: Patricia Gucer, PhD
Status: Instructor
Affiliation: University of Maryland, School of Medicine
Project title: *Carpal Tunnel Syndrome Among Delmarva Poultry Processing Workers: Comparison to National Rates and Consequences to Employment and Activities of Daily Living*

Name: Chuan Fang Jin, MD, MPH
Status: Clinical Instructor
Affiliation: West Virginia University, School of Medicine, Dept. of Community Medicine

Project title: *Comparison of Proliferative Response of Blood and Bronchoalveolar Lymphocytes to Beryllium*

Name: Judith McKenzie, MD, MPH
Status: Assistant Professor
Affiliation: Hospital of the University of Pennsylvania, Division of Occupational Medicine
Project title: *Outcomes of a Consultation Program for Emergency Physicians for the Evaluation and Treatment of Occupational Blood Borne Pathogen Exposures*

Name: Roni Neff, ScM (T. Burke, advisor)
Status: Ph.D. Student
Affiliation: Johns Hopkins University, Bloomberg School of Public Health, Dept. of Health Policy and Management
Project title: *An Evaluation of Incentives for Injury Prevention Among High-Injury Employers*

Name: Keshia M. Pollack, MPH (G. Sorock, advisor)
Status: Ph.D. Student
Affiliation: Johns Hopkins University, Bloomberg School of Public Health, Dept. of Health Policy and Management
Project title: *Adult Obesity in America: Are There Occupational Injury Implications?*

Name: Lance Price, MS (E. Silbergeld, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Risks of Chlamydia Exposures to Poultry Workers*

Name: Keson Theppeang, MHS (B. Schwartz, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Relations of Bone Mineral Density, Blood Lead Levels, Bone Lead Levels and the Apolipoprotein E and Vitamin D Receptor Genotypes*

Awarded 2004:

Name: Susan M. Antol, MS, RN
Status: Instructor
Affiliation: University of Maryland, School of Nursing
Project title: *Health Issues of Female Mexican Crab Pickers*

Name: Maria Bulzacchelli, BA (J. Vernick , advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University, Bloomberg School of Public Health, Dept. of Health Policy and Management
Project title: *An Evaluation of the Impact of OSHA's Control of Hazardous Energy (Lockout/Tagout) Standard (29 CFR 1910.147) on Occupational Injury Rates*

Name: Myrna Callison, MA (M. Nussbaum, advisor)
Status: PhD Candidate

Affiliation: Virginia Polytechnic Institute and State University, Grado Dept. of Industrial and Systems Engineering
Project title: *Identification of Physically Demanding Patient Handling Tasks in an Acute Care Hospital*

Name: Nicole Cardello, MHS (T. Buckley, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Evaluation of Methods of Assessing Exposure to Polycyclic Aromatic Hydrocarbons*

Name: Lori Edwards, RN, MPH (J. Agnew, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Health Risks and Health Priorities of Vietnamese American Nail Salon Workers*

Name: Jurek George Grabowski, MPH (G. Li , advisor)
Status: PhD Candidate
Affiliation: Johns Hopkins University School of Medicine, Dept. of Emergency Medicine
Project title: *Occupational Injuries in Airport Ground Crews*

Name: Thurmon Lockhart, PhD
Status: Assistant Professor
Affiliation: Virginia Polytechnic Institute and State University, Grado Dept. of Industrial and Systems Engineering
Project title: *Age-Related Effects of Work-Pace and Load Carrying on Risk of Slip Initiation*

Name: Shirley Van Zandt, MS, MPH (S. Fitzgerald, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Factors Associated with Absenteeism, Presenteeism and Burnout Among Low-Income Non-RN Nursing Personnel in Three Hospitals* (sub-project of *Health & Employment Outcomes of Workplace Violence for Nursing Personnel*)

Awarded 2005:

Name: David Colquhoun, MS (R. Halden, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Application of Proteomics for the Development of Biomarkers of Occupational Exposure*

Name: Victoria V. Dickson, CRNP, MSN (L. McCauley, advisor)
Status: PhD Candidate
Affiliation: University of Pennsylvania, School of Nursing
Project title: *Variables Affecting Heart Failure Self-Care Management in the Workforce*

Name: Cherise B. Harrington, BA (M. Feuerstein, advisor)
Status: PhD Candidate
Affiliation: Uniformed Services University of Health Sciences, Dept. of Medical and Clinical Psychology
Project title: *Ergonomic and Psychosocial Interventions and Outcomes in Patients with Acute Low Back Pain*

Name: Andrew Lincoln, ScD
Status: Adjunct Assistant Professor
Affiliation: Johns Hopkins University, Bloomberg School of Public Health, Dept. of Health Policy and Management
Project title: *Reliability and Validity of Shoulder Impairment Ratings*

Name: Priscah Murjuru, DrPH
Status: Assistant Professor
Affiliation: West Virginia University, School of Medicine
Project title: *Evaluation of Various Injury Trends Among Young Workers, 1996-2005*

Name: My Linn Sawyer, MD, MPH (E. Emmett, advisor)
Status: Occupational Medicine Resident
Affiliation: University of Pennsylvania, School of Medicine, Institute of Occupational and Environmental Health
Project title: *Mandatory Overtime Increases Occupational Injuries at an Automotive Assembly Plant*

Name: Plernpit Suwan-Ampai, MSc, MHS (J. Agnew, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University Bloomberg School of Public Health, Dept. of Environmental Health Sciences
Project title: *Individual Factors and Geographical Variation of Polycyclic Aromatic Hydrocarbon (PAH) Exposures and Acute Respiratory Symptoms in NHANES 1999-2002 Participants*

Name: Jennifer Taylor, MPH (S. Baker, advisor)
Status: Ph.D. Candidate
Affiliation: Johns Hopkins University, Bloomberg School of Public Health, Dept. of Health Policy and Management
Project title: *Poor Organizational Culture Leads to Injuries in the Nursing Workforce: Are The Same Cultural Risk Factors Putting Patients at Risk?*

Awarded 2006:

Name: Rebecca Clouse, RN, MS
Status: PhD Candidate, Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health
Mentor: Jacqueline Agnew, PhD / Virginia Weaver, MD, MPH
Project title: Measurement of NHANES urinary metals panel in Korean lead workers

Name: Christopher Coleman, PhD, MPH
Status: Assistant Professor, University of Pennsylvania School of Nursing

Mentor: NA
Project title: The impact of HAART on the functional health status of employed individuals with AIDS

Name: Carrie D. Dorsey, MD, MPH
Status: Assistant Professor, University of Maryland School of Medicine
Mentor: NA
Project title: Human breast milk biomonitoring: detection of hazardous drugs in the breast milk of oncology nurses

Name: Harry Hochheiser, PhD
Status: Assistant Professor, Towson University
Mentor: NA
Project title: Evaluating menu selection task performance of blind users of screen readers

Name: Keshia M. Pollack, PhD, MPH
Status: Assistant Professor, Department of Health Policy and Management, Johns Hopkins University, Bloomberg School of Public Health
Mentor: NA
Project title: Ergonomic hazards: an exploratory study of personal protective equipment and obesity

Name: Julie Richman, MHS
Status: PhD Candidate, Department of Environmental Health Sciences, Johns Hopkins University, Bloomberg School of Public Health
Mentor: Alison Geyh, PhD
Project title: Determining the kinetics of blood Mn after exposure to welding fume

Name: Deborah E. Young, MS
Status: PhD Candidate, Grado Dept. of Industrial and Systems Engineering, Virginia Polytechnic & State University
Mentor: Maury A. Nussbaum, PhD
Project title: Evaluation of engineering control technology for drywall sanding operations