

**JOHNS HOPKINS EDUCATION and
RESEARCH CENTER for
OCCUPATIONAL SAFETY and HEALTH**

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

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Submitted by:

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II. INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION and EXECUTIVE SUMMARY**MAJOR ACCOMPLISHMENTS**

During this report period, the Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC) successfully accomplished its mission of providing professional training, research training and continuing education and outreach in the field of occupational safety and health (OSH). Professional training in the core ERC programs, Occupational and Environmental Hygiene (OEH), Occupational and Environmental Health Nursing (OEHN) and Occupational and Environmental Medicine (OEM) sustained and even surpassed its tradition of excellence. Research training continued to be the focus of the two allied programs, Biomarkers of Exposure and Susceptibility (BOES) and Occupational Injury Epidemiology and Prevention – which, combined with the OEH and OEHN programs, graduated nine doctorally prepared occupational safety and health researchers. Faculty and students of the ERC produced more than 76 publications during this year and made numerous other professional contributions, such as presentations, consultations and leadership in the field.

The ERC successfully completed the competing renewal process and was awarded continued approval for a five year period. Two programs, Biomarkers of Exposure and Susceptibility have been resubmitted for consideration in the current year. Additionally, the OEM program successfully completed the ACGME accreditation review and has been reaccredited for the maximum of five years. Likewise, the OEH program was reaccredited through ASAC-ABET.

This period saw the first year of our new program in Hazardous Substance Training that has been launched as part of the Continuing Education program. This new program allows us to increase our scope of training, as well as to reach a wider segment of the occupational safety and health community. The program focused first on reaching employees in the public sector.

Student recruitment remains a priority, with specific attention to recruiting minority students. Dr. Sheila Fitzgerald is leading efforts on behalf of the entire center to coordinate this with the new school Diversity Officer. Additionally, we constantly explore additional sources of student funding. The support provided by NIOSH funding is vital to sustaining and growing our programs, and allows us to leverage funding from other sources such as school scholarships.

The Pilot Projects Research Training Program (PPRT) supported seven studies, four of which are being conducted at other institutions. The investigators include six doctoral students and two junior faculty. Thus, in addition to supporting the thesis projects of doctoral trainees, the program is enhancing the OSH research training capacity at several institutions in Region III. The program is also building ties between this ERC and potential education and research partners.

The Continuing Education and Outreach Program has successfully reached a large proportion of practicing OSH professionals. As an illustration, during this reporting period, we provided 44 Continuing Education courses that drew a total of 898 participants.

In summary, this ERC continues to provide the highest quality OSH professional training. Additional details of specific program accomplishments appear below in Section IV of this report.

SIGNIFICANT CHANGES SINCE JUNE 30, 2006

Two changes in academic program leadership occurred during this report period. Dr. Clifford Mitchell resigned his faculty position at the school to join the state health department. With his departure, Dr. Virginia Weaver assumed the directorship of the Occupational and Environmental Medicine Residency program. Dr. Weaver is an associate professor and has been on the faculty of the OEMR for several years. In our Occupational Injury Prevention program, Dr. Keshia Pollack joined the faculty. Dr. Pollack is a graduate of the program and was selected for this position after completing a fellowship at the Robert Wood Johnson Foundation. Professor Baker continues to direct of the OIP program but is mentoring Dr. Pollack to become the director in 2008. Dr. Rey DeCastro left the faculty of the Occupational and Environmental Hygiene program for a position in the private sector. Finally, there was a significant staff promotion in the Continuing Education program when Mr. Keith Choi was promoted to program coordinator; this was especially important to the program's operation when the CE director was unavailable during our competing renewal site visit.

There have been minor changes made in course faculty responsibilities. For example, Drs. Agnew and Lees now direct the course *Occupational Health*. Dr. Maureen Cadorette now directs *Fundamentals of Occupational Health* and is revising this course for presentation in the on-line format. Dr. Pollack has taken over as course director for *Epidemiologic Methods in Injury Control*.

ERC WEB SITES

ERC home page:

<http://www.jhsph.edu/erc/index.html>

Occupational and Environmental Hygiene (OEH) program:

<http://www.jhsph.edu/erc/oeh.html>

Occupational and Environmental Health Nursing (OEHN) program:

<http://www.jhsph.edu/erc/oehn.html>

Occupational and Environmental Medicine Residency (OEMR) program:

<http://www.jhsph.edu/OMR/index.html>

Occupational Injury Prevention (OIP) program:

<http://www.jhsph.edu/erc/injury.html>

Continuing Education/Outreach (CE) program:

<http://www.jhsph.edu/erc/ce/index.html>

ERC director list (also the ERC homepage):

<http://www.jhsph.edu/erc/index.html>

Faculty directory for the whole school:

<http://faculty.jhsph.edu/facultylist.cfm>

Center for Injury Research and Policy:

<http://www.jhsph.edu/injurycenter/index.html>

III. PROGRAM PROGRESS REPORTS

CENTER WIDE PROGRAMS

CENTER ADMINISTRATION

ERC DIRECTOR: **Jacqueline Agnew, RN, PhD, MPH, Professor, Department of Environmental Health Sciences (Joint Appointment, School of Nursing)**

CENTER DESCRIPTION AND OBJECTIVES

Dr. Jacqueline Agnew, the director of the Education and Research Center for Occupational Safety and Health (ERC), holds primary responsibility for all center operations. The center deputy is Dr. Peter Lees, and each of the five academic programs is directed by a senior faculty member. As the ERC has become increasingly complex in its structure over recent years, the duties of the director, deputy director and others with key administrative roles have expanded. Center administration priorities have been to ensure: strong leadership and oversight; effective coordination and communication among the center components and with external contacts; and flexibility to respond to emerging occupational health problems and to incorporate changes that occur at the departmental and school levels.

The ERC Executive Committee is charged with sharing information across programs, setting and pursuing new directions, and evaluating the progress of the center. Specifically, the Executive Committee includes: the center director and deputy director; the five academic program directors; the continuing education/outreach director; and the business administrator of the Department of Environmental Health Sciences (or designee). During this year, we have also established a management team that is available to deal with the day-to-day issues associated with management of the ERC. Specifically, these issues are generated by external organizations such as NIOSH or other stakeholders, school or university entities, or the ERC programs themselves. This team consists of the director (Dr. Agnew), the deputy director (Dr. Lees), and the director of Continuing Education/Outreach (Ms. Mary Doyle). All three are prepared to serve as primary contacts, thus ensuring timely communication with all ERC components and with external constituents. Another key element in the administration of the ERC is the Department Business Office, which, with the center director, manages the several component budgets, student appointments, personnel payroll, interaction with the Office of Grants Administration, coordination with external institutions (such as non-JHU pilot project grantees) and NIOSH reporting requests.

The ERC External Advisory Board membership represents the core disciplines in which we provide academic training, the private sector, government, academia, professional organizations and labor. Its function has been to help evaluate the center's effectiveness and to provide advice regarding priorities and new directions. During this grant period, our meeting and interaction with the Advisory Board focused on the application for ERC renewal and input regarding creative new initiatives.

Among other administrative activities, the ERC has been coordinating opportunities for training, outreach and continuing education with partner centers within the school. Examples are the Center for Public Health Preparedness and the MidAtlantic Public Health Training Center. Other centers of importance to our mission of interdisciplinary interaction are the Center for Injury Research and Policy and the Center for Urban Environmental Health.

Other responsibilities of the administrative core include coordination of centralized ERC activities – e.g., seminars, guest speakers, joint projects, meetings and events held with other centers. These are described in other sections of this report.

FUTURE PLANS

The ERC will continue to progress under strong leadership and committed faculty, and we will meet our objective to provide outstanding training in occupational safety and health. The recent five-year approval for continued NIOSH support will make this possible in the case of four of our academic programs. However, the loss of support for our program Biomarkers of Exposure and Susceptibility is a great concern. The program faculty and students were making significant contributions to the body of scientific knowledge that is relevant to the field of occupational health. The failure to recognize the need for expert researchers in this area will deprive our ability to address issues such as gene-exposure interaction. We have resubmitted a competing renewal application for this program.

Additionally, we have submitted a competing application for funds to support an initiative "NORA Scholars Program." This program, if funded, will allow us to prepare future academics in all disciplines represented in our programs. The need for university faculty in our field is dire; our plan is to help fill the major gap that now exists.

With regard to faculty, we expect that Dr. Keshia Pollack will be ready to assume the directorship of the Occupational Injury Prevention program at the end of the coming year. There is a mentoring plan in place for her, and all is proceeding on course. While Dr. Virginia Weaver is yet in her first year of the Occupational and Environmental Medicine Residency, she is revitalizing and growing the program. We expect it to flourish in the coming year and beyond.

We will continue to seek counsel from our Advisory Board, particularly with regard to the development of new initiatives and maintaining innovations such as the Biomarkers program.

Student recruitment will remain a priority, with specific attention to recruiting minority students. Additionally, we constantly explore additional sources of student funding. The support provided by NIOSH funding is vital to sustaining and growing our programs, and allows us to leverage funding from other sources such as school scholarships.

In summary, with renewed funding, we see the coming grant period as an opportunity to examine potential new directions and areas for program growth or improvement. The results of our current competing applications will influence those future decisions.

OUTREACH

OUTREACH PROGRAM DIRECTOR: Mary Doyle, RN, MPH, COHN-S/CM, Research Associate, Department of Environmental Health Sciences

During this grant period, ERC faculty routinely interacted with universities and schools, professional societies, labor organizations and corporations. Within our own institution, we worked with faculty and students of the Schools of Arts & Sciences, Engineering, Medicine and Nursing to increase curricular opportunities in occupational safety and health. Lectures and seminars and consultations have been conducted in Region III with professional as well as non-professional groups to raise awareness of workplace safety and health issues. Examples of our Outreach activities are presented below.

EDUCATIONAL DEVELOPMENT

Several educational initiatives were led by our Continuing Education (CE) program:

- Continuing Education faculty served on the planning committee for the Regional Occupational Health Conference for three local chapters of the American Association of Occupational Health Nurses. CE staff provided all administrative support for this conference, which was attended by 83 nurses.
- CE faculty and staff served on the planning committee for the 5th Mid-Atlantic Regional Conference (MARCOM) in occupational medicine. ERC nursing faculty also served on this committee.
- The CE director collaborated with the American Industrial Hygiene Association (AIHA) to develop a teleWeb, taught by ERC faculty, entitled "Emergency Response: Responding and Preparing a Corporate Plan," which was attended by 163 participants.
- The ERC HST program co-sponsored a continuing education course at the annual national AIHA Conference and Exposition.
- CE faculty continue to develop and co-sponsor continuing education programs for local professional occupational safety and health organizations such as AAOHN, AIHA, ASSE, ACHMM and the Maryland Board of Sanitarians.

Faculty of the Occupational and Environmental Medicine (OEM) Residency have been actively developing joint conferences with colleagues in the region with overlapping interests. To date, the following have been completed or are being developed:

- JHU OEM residents participated in a Public Health Preparedness series with the JHU General Preventive Medicine Residency.
- JHU OEM residents joined Uniformed Services University of the Health Sciences (USUHS) occupational medicine residents for a lecture by Dr. Natalie Hartenbaum on "The DOT Medical Examination."

- USUHS residents have been invited to join the JHU OEMR for a lecture by Dr. Ann Kuhnen on "Corporation Health: Applications of Population Health Management."
- A joint conference with the University of Maryland occupational health program is being a planned.
- Dialogue has begun with JHU emergency medicine residency faculty regarding joint conferences.
- The OEMR has instituted a yearly e-mail communication to regional residencies in internal medicine, family medicine and emergency medicine about OEM and the JHU program, including links to the OEMR Web site, along with an offer to present a lecture on OEM to the residents in those programs.
- Dr. Weaver has been in e-mail contact with Drs. Scott Jones and Gary Fortune, occupational and environmental medicine colleagues in St. Louis, Missouri, who are hoping to reinstitute their program. She has provided information on the JHU training program and introduced them to a JHU program graduate who recently took a corporate position in the St. Louis area.

Other examples of ERC educational outreach activities include the following:

- The National Transportation Safety Board proposed to contribute to the training of JHU Occupational Injury Prevention (OIP) program doctoral students in transportation safety by offering opportunities for collaborative research and potential employment.
- Dr. Pollack (OIP) placed the syllabus for the course *Epidemiologic Methods in Injury Control* on the Web site of the Society for the Advancement for Violence and Injury Research.
- Occupational and Environmental Health Nursing (OEHN) faculty provided outreach to several regional professional associations, including the three regional chapters of the American Association of Occupational Health Nurses (AAOHN), the Maryland Nurses Association (NMA), the American Industrial Hygiene Association (AIHA), the Chesapeake section of the American Society of Safety Engineers (ASSE), the Chesapeake and Potomac Sections of American Industrial Hygiene Association (AIHA), the National Capital Chapter of the Academy of Certified Hazardous Materials Managers (ACHMM), the Maryland Board of Environmental Sanitarians, and the Chesapeake Region Safety Council.
- OEHN Director Dr. Fitzgerald was appointed to the advisory board for the University of Pennsylvania's Nurse Practitioner Program.
- The Occupational and Environmental Hygiene (OEH) program course *Principles of Industrial Hygiene* continues to be presented on the school's open courseware Web page. This is available at no charge to all who are interested.

PRESENTATIONS/LECTURES/AWARENESS SEMINARS

ERC faculty and students gave numerous presentations at scientific meetings, academic institutions and in other venues. For example, Occupational and Environmental Medicine Residency (OEMR) faculty gave presentations at scientific meetings and academic institutions on occupational and environmental nephrotoxicants and neurotoxicants, both nationally and at international conferences in Italy and France. Occupational Injury Prevention program faculty and students presented at the annual meetings of the American Public Health Association (APHA), the Society for the Advancement of Violence and Injury Research, and the Aerospace Medical Association this year. Faculty also presented at invited symposiums hosted by the National Institutes of Health and the Interagency Committee on Disability Research. OEHN faculty have presented at the Maryland Department of Health and Mental Hygiene and at local professional meetings. Ms. Doyle and Dr. Agnew were invited to participate in a roundtable presentation on emergency preparedness as part of the conference "Workplace Issues for Nurses: Adapting to Change in the 21st Century," sponsored by the Western Maryland Area Health Education Center (AHEC).

International venues for faculty presentations have included Italy, Mexico and Germany. Additionally, a student in the OEH program received a best poster award at the American Industrial Hygiene Conference and Exposition.

CONSULTATIONS

Faculty of the ERC provided consultation to various government, labor, non-profit and professional organizations, including the National Institute for Occupational Safety and Health (NIOSH), the Laborers International Union of North America, the National Center for Healthy Housing, the three regional chapters of the American Association of Occupational Health Nurses, the Maryland Nurses Association, the American Industrial Hygiene Association, the Chesapeake section of the American Society of Safety Engineers, the Chesapeake and Potomac Sections of American Industrial Hygiene Association, the National Capital Chapter of the Academy of Certified Hazardous Materials Managers, the Maryland Board of Environmental Sanitarians, and the Chesapeake Region Safety Council.

Some specific examples of outreach consulting activities are the following:

- Dr. Schwartz (OEM) will direct a new Institute for Environmental Health that is a joint venture between the Geisinger Health System Center for Health Research and Rural Advocacy and the Johns Hopkins Bloomberg School of Public Health. Issues relevant for both occupational and environmental health will be addressed through this Institute.
- Professor Baker (OIP) initiated discussions with the National Transportation Safety Board regarding opportunities to enhance the work of the board.
- Dr. Pollack (OIP) provided consultation to the Robert Wood Johnson Foundation on how to strengthen the ability of Employee Assistance Programs to address and prevent intimate partner violence.

OTHER ACTIVITIES

Dr. Virginia Weaver (OEM) continues to serve on the Medical Advisory Board of the International Association of Fire Fighters (IAFF). Dr. Weaver testified on behalf of the IAFF in Denver in support of presumptive cancer legislation for firefighters in that state. The legislation was subsequently passed. Dr. Schwartz assisted in preparation of the testimony.

Dr. Fitzgerald (OEHN) continued her work with the Institute of Medicine (IOM) Committee on the Study of the Social Security Disability Determination Process.

Dr. Cadorette (OEHN) was the facilitator for conference calls among project coordinators from the 13 Department of Energy Former Worker Programs and DOE program managers.

Dr. Agnew (OEHN, ERC director) continues to serve on the NIOSH National Occupational Research Agenda (NORA) Liaison Committee. She was also a member of the Institute of Medicine Roundtable on Environmental Health Sciences, Research, and Medicine and was a reviewer on the Committee to Review and Assess Industrial Hygiene Standards and Practices at Tooele Chemical Agent Disposal Facility, a committee formed by the National Research Council, National Academy of Sciences, Board on Army Science and Technology.

Occupational and Environmental Hygiene (OEH) faculty participated in a National Toxicology Program (NTP) review and an OEH faculty member served as the chair for the Safety and Occupational Health NIH Study Section.

FUTURE PLANS

We plan to continue our service to the practicing community and other stakeholders at the individual faculty, program and ERC levels. We will maintain our strong ties to professional organizations and we will pursue opportunities to partner on new and existing activities. However, as we enter a new grant period, the Outreach program has been separated from the Continuing Education program and will now fall under a different budget. We hope to provide at least one regional conference that will focus on the occupational safety and health needs of the dominant sector in the respective area. For example, a conference on the Eastern Shore of Maryland might address agricultural concerns. This and other new initiatives will depend on the availability of financial support.

INTERDISCIPLINARY COORDINATION

The goals and objectives of each program and all activities of the ERC emphasize interdisciplinary interaction. Students from all academic programs work and learn together in didactic and practicum courses and joint seminars, on special field trips, and in research and team investigations of occupational health problems. We begin each academic year with an ERC orientation and introductory session to greet new students; at this seminar and luncheon, each director presents an overview of the history and purpose of the ERC and introduces their faculty and students.

Faculty and students also interact in research settings where it is possible to work with a variety of professionals, including those outside of the core areas of occupational safety and health. Most faculty research projects involve cross-disciplinary collaboration and often involve students. Research mentors often represent multiple disciplines. Examples of multidisciplinary doctoral research projects included studies of heavy metal biomarkers and renal function (Occupational and Environmental Medicine and Occupational and Environmental Health Nursing) as well as PAH biomarkers and their sources and associations with respiratory and cardiovascular outcomes (Occupational and Environmental Health Nursing and Biomarkers of Occupational Exposure and Susceptibility).

Opportunities for interaction in seminars include: the monthly ERC seminar that all students attend; weekly seminars, for one term, presented by the Center for Injury Research and Policy and also attended by all ERC students and faculty; and the joint Division of Occupational and Environmental Health–Department of Epidemiology seminar and journal club that Dr. Virginia Weaver (Occupational and Environmental Medicine) coordinates. Additionally, several other centers within the school stimulate participation in their missions and thus are settings for working together. Examples are the Center for Public Health Preparedness and the MidAtlantic Public Health Training Center. ERC faculty members are also collaborating with members of the Center for Injury Policy and Research to develop projects that address the concerns of a major Maryland insurance organization.

A project that has provided an excellent opportunity for multidisciplinary practice and research opportunities is the Department of Energy-funded program for medical surveillance of former workers of Los Alamos National Laboratory in New Mexico. This project was recently expanded to Sandia National Laboratories and will continue to bring nurses, physicians, occupational hygienists and other professionals together in projects with practice – and sometimes research – purposes.

There are also several examples of faculty and student interdisciplinary interactions with occupational health professionals outside of the Johns Hopkins University – in government, labor and private sector organizations. These opportunities continue to grow. Finally, because students from the various ERC academic programs take their core coursework together, the classroom is a venue for interdisciplinary interaction. The flagship interdisciplinary course in the final term, *Occupational Health*, requires students to work in interdisciplinary teams and is co-taught by faculty from Occupational and Environmental Health Nursing and Occupational and Environmental Hygiene.

PILOT PROJECT RESEARCH TRAINING (PPRT) PROGRAM

PPRT PROGRAM DIRECTOR: Peter S.J. Lees, PhD, CIH, Professor, Department of Environmental Health Sciences

PROGRAM DESCRIPTION AND GOALS

The Pilot Project Research Training (PPRT) program enhances the research training capacity of the Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC) and other institutions with occupational safety and health training programs in Region III through direct support of pilot research activities. Funds are used to support short-term research projects to 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. The program fosters increased interdisciplinary interaction and promotes collaboration with Training Program Grantees (TPGs) and other institutions with occupational safety and health research training programs in Region III.

The following are examples of research activities that are appropriate for Pilot Project Research Training Program 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

Project proposals are reviewed and prioritized by a panel designated by the ERC director (Jacqueline Agnew), chaired by the PPRT program director (Peter S.J. Lees) and consisting of one faculty member from each ERC program (Occupational and Environmental Health Nursing, Occupational and Environmental Medicine, Occupational and Environmental Hygiene, Occupational Injury Prevention) as well as a representative of regional Training Program Grant (TPG) faculty. Standardized evaluation criteria include, but are not limited to: importance of the problem; relevance to NORA objectives; and soundness of design. The review also addresses whether: the expertise of investigators is adequate; the resources and facilities are adequate; the research is ethically acceptable; and the budget is appropriate. The merits of the proposal are then scored, and those that rank highest are funded.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

We continue to offer the PPRT Request for Proposals to all NIOSH-supported institutions and other institutions engaged in occupational safety and health research in the region; 17 applications were received this year, from the West Virginia University School of Medicine (1), the University of Pennsylvania School of Nursing (2), the University of Maryland School of Medicine (1), Morgan State University (1), Virginia Polytechnic and State University (3), Towson University (2), and the Johns Hopkins Bloomberg School of Public Health (7).

Of the 17 applications received in 2006, the following seven were selected for funding:

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*

PROGRAM PRODUCTS

We have been notified that the following publications attributable to previous PPRT awards have been published during the current project periods. The PPRT recipients are underlined. A systematic update of PPRT products is ongoing.

1. Latshaw MW, Glass T, Parsons P, Hidalgo J, Schwartz B. Predictors of blood mercury levels in older urban residents. *J Occup Environ Med* 2006;48:715-22.
2. Sapkota A, Halden RU, Dominici F, Groopman JD, Buckley TJ. Urinary biomarkers of 1,3-butadiene in environmental settings using liquid chromatography isotope dilution tandem mass spectrometry. *Chem Biol Interact* 2006;160:70-9.
3. Sapkota AR, Ojo KK, Roberts MC, Schwab KJ. Antibiotic resistance genes in multidrug-resistant *Enterococcus* spp. and *Streptococcus* spp. recovered from the indoor air of a large-scale swine-feeding operation. *Lett Appl Microbiol* 2006;43:534-40.

FUTURE PLANS

There are no substantial new plans for this program. We will continue to seek outstanding and relevant proposals. Program success will be monitored by reviews of project reports and outcomes such as publications, grants and reported impact of findings on occupational safety and health practice.

NATIONAL OCCUPATIONAL RESEARCH AGENDA (NORA) RESEARCH TRAINING PROGRAM

NORA PROGRAM DIRECTOR: Jacqueline Agnew, MPH, PhD, Professor, Department of Environmental Health Sciences

PROGRAM DESCRIPTION**Purpose and Goals**

The Johns Hopkins University Education and Research Center for Occupational Safety and Health (ERC) is a center of excellence for the development of future leaders in occupational health research and for professionals who must translate research into practice within their respective disciplines. The National Occupational Research Agenda (NORA) supplemental funds have been critical to this mission. To this end, the Johns Hopkins University ERC program targeted three broad areas for support with NORA funds: 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 has been our primary objective.

Responsible Conduct of Science Training

Students funded by the NORA supplemental program have been in doctoral degree programs and thus have completed required courses that address the responsible conduct of science – either *Research Ethics* (one unit) or *Research Ethics and Integrity: US and International Issues* (three units). These courses cover the principles of research ethics and regulatory requirements. Both courses satisfy the NIH requirements for instruction in the responsible conduct of science. Students also receive content in research ethics in other courses, such as *Public Health Perspectives* (two units, over two terms), which is mandatory for all doctoral students. Completion of these courses is monitored and recorded, and each course is evaluated at the end of the term.

Faculty Participation

Faculty in each of the research training programs of the ERC have been involved in this supplemental program during this grant period as advisors, teachers and facilitators of interdisciplinary interaction. These faculty are listed in the program sections of this report. In most cases, their support has been provided by their respective program funding or by other sources. Exceptions are the faculty members who received additional direct support from this supplement to strengthen their research training programs, as described below.

Curricula

The students funded through this supplemental program have been affiliated with any of the four academic programs that offer doctoral degrees. Students were enrolled in PhD, DrPH, or ScD programs. The Occupational and Environmental Medicine (OEM) program does not prepare researchers; thus, tuition and stipends of residents have not been supported. Within each academic program, students follow the same curriculum established for that respective program regardless of their source of funding (i.e., core or NORA). Refer to the specific curriculum of each academic program for further information about these requirements.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

Progress towards the goals of this supplemental program is presented below, according to the three program goals.

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

Four faculty members who received partial funding from this program represent the programs in Occupational and Environmental Hygiene (OEH), Occupational and Environmental Health Nursing (OEHN), Occupational and Environmental Medicine (OEM) and Biomarkers of Occupational Exposure and Susceptibility (BOES). Each conducts research in areas that are relevant to the NORA sector approach currently pursued by NIOSH. 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
M. Doyle (CE)	Educational program development and needs assessment.

Dr. Sheila Fitzgerald's research addresses vulnerable populations (such as disabled and young workers), workplace cardiovascular risk factors and workplace violence. She has been a co-investigator on a series of studies that have prospectively followed teen workers into their early jobs and plans to continue that work with a currently proposed project. NORA supplemental support has helped her develop new directions for this research and has allowed her to submit a grant proposal for its continued support. Funding will enable her to advise more doctoral students. Dr. Fitzgerald has also built research relationships with faculty in the Johns Hopkins University School of Nursing, where she is a co-investigator on a study of workplace violence.

Dr. Virginia Weaver's research bridges an established ERC program, Occupational and Environmental Medicine (OEM), with the newer area of biomarkers research training. This specialized area is innovative and is relevant to the NORA priority areas of exposure assessment methods and surveillance research methods. In addition to her recently increased duties as the director of the OEM program, Dr. Weaver is now the co-advisor of an OEHN student with an interest in biomarkers research. She has also taken on the responsibility of coordinating a joint research journal club with the Department of Epidemiology, another indication of her increasing role in research and research training.

Dr. Maureen Cadorette holds a major role in an interdisciplinary project that conducts medical surveillance of former Department of Energy workers at Los Alamos National Laboratory in New Mexico. NORA support enabled her to secure funding to expand the program to Sandia National

Laboratories, thus providing increased opportunities for ERC students with relevant interests. As a relatively new faculty member, leadership of this project is a major step in further developing Dr. Cadorette's research program.

Dr. Allison Geyh's research addresses airborne particulate matter, air pollution and exposure assessment. The work she has done to assess World Trade Center exposures of workers and the community has demonstrated the relevance of her research to the area of public health preparedness and response to disasters. Her teaching and advising duties are now expanding to that area.

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

Under the direction of Ms. Mary Doyle, the Continuing Education and Outreach programs bring 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, including:

- Chesapeake and Potomac sections of the American Industrial Hygiene Association (AIHA)
- Four regional chapters of the American Association of Occupational Health Nurses (AAOHN)
- Chesapeake (Maryland) and Delmarva (Delaware) sections of the American Society of Safety Engineers (ASSE)
- 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. Similar activities are planned for the coming year.

Goal 3: Doctoral student support and training

Our primary application of NORA funding has been the support of doctoral students in each of the academic programs. A total of five doctoral students, most in the research phase of their programs and with a focus on NORA topics, received full or partial support in the form of stipends and/or tuition. Students from each academic research training program (with the exception of OEM, which prepares practitioners) were funded. This funding was critically important because it enabled us to prepare more future researchers in the field of OSH than otherwise would have graduated from our institution. The students and their areas of interest are listed below in Table 2.

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

PROGRAM PRODUCTS

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.

Trainees supported by NORA-related funds

NAME	PROGRAM	AREA OF INTEREST
W. Austin	OIEP	Workplace violence
R. Clouse	OEHN	Relationship between biomarkers of exposure to metals and health effects
D. Colquhoun	BOES	Application of proteomics as biomarkers of occupational exposure
J. Richman	OEH	Noise exposures in manufacturing industries
V. Park	OEH	Second-hand smoke exposure assessment methods

FUTURE PLANS

NORA supplemental funding has been an extremely valuable resource to this ERC over the recent years, particularly with regard to our primary mission – the preparation of professionals who will contribute to the field. It allowed us to increase our research training capacity, and it gave some of our most outstanding candidates the opportunity to attend the program. Unfortunately, the nature of the use of these funds has been revised. In our competing continuation application, we proposed a program that would have provided similar support to doctoral students with an interest in pursuing academic careers. That proposed program did not receive approval, thus decreasing our ability to support the same numbers of students. A competing renewal application has been submitted and, if funded, will allow us to begin rebuilding a program that we felt was an exceptional feature of the NIOSH ERC training program as a whole.

CORE ACADEMIC PROGRAMS

OCCUPATIONAL AND ENVIRONMENTAL HYGIENE (OEH) PROGRAM

OEH PROGRAM DIRECTOR: Patrick N. Breyse, PhD, CIH, Professor, Department of Environmental Health Sciences

PROGRAM DESCRIPTION**Goals and 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 Johns Hopkins Education and Research Center for Occupational Safety and Health (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 offers training at the master's (Master of Health Sciences; MHS) and doctoral (PhD, DrPH and ScD) levels. We also train post-doctoral fellows, although NIOSH funds have not supported PDF training. By providing faculty and student support, NIOSH funding continues to provide crucial resources to the OEH program. The OEH master's program will maintain accreditation through the Accreditation Board for Engineering Technology (ABET).

Responsible Conduct of Science

All students who are enrolled in research degree programs (i.e., the PhD, ScD, or DrPH) are required to have formal course instruction in the responsible conduct of research by taking one of the following courses: *Research Ethics* (1 unit) or *Research Ethics and Integrity: US and International Issues* (3 units). These courses ensure that students know and abide by the principles of research ethics and regulatory requirements. One of these courses is completed by every student in a research degree program. Both courses satisfy the NIH requirements for instruction in the responsible conduct of science. Masters and doctoral students also receive content in research ethics in the *Academic Ethics Module*, an on-line course that is required of all students in the school. Completion of these courses is monitored and recorded, and each course is evaluated at the end of the term.

Faculty Participation

The OEH program operates with three full-time core tenure-track faculty and a variety of supporting and affiliated faculty. Full-time tenure-track faculty include Patrick N. Breyse (OEH program director), Peter S.J. Lees and Alison Geyh. Dr. Ray De Castro recently left the program to pursue a job in the private sector. Supporting faculty include numerous full-time Bloomberg School of Public Health faculty who teach required courses, and affiliated professional faculty who also assist the program by teaching required courses. Core, supporting and affiliated faculty are listed in the table below.

OEH program core, supporting and affiliated faculty

Name	Appointment	Expertise/Research Interest
Core Program Faculty		
Breyse, PN (CIH)	Professor, Program Director	exposure assessment, fibers, allergens, childhood asthma
Lees, PSJ (CIH)	Professor, Deputy Director of ERC, Director Pilot Project Program	exposure assessment, surface contamination, fibers, chromium, lead
Geyh, A	Assistant Professor	particulate matter, air pollution, metals, and exposure assessment
Supporting Program Faculty		
Agnew, J	Professor, ERC Director	occupational health nursing,
Curriero, F	Assistant Professor, EHS*	biostatistics, spatial modeling
Schwab, K	Associate Professor, EHS	molecular microbiology, bioaerosols, water quality
Halden, R	Assistant Professor, EHS	water quality, bioremediation
Burke, T	Professor, Health Policy and Management	risk assessment
Goldman, L	Professor, EHS	environmental health, risk assessment, risk policy
Links, J	Professor, EHS	preparedness, radiation health
Locke, P	Associate Professor, EHS	law, risk policy
Samet, J	Professor, Epidemiology	epidemiology, air pollution
Schwartz, B	Professor, EHS	occupational medicine, environmental epidemiology
Silbergeld, E	Professor, EHS	neurotoxicology, occupational health, risk assessment, risk policy
Tankersley, C	Associate Professor, EHS	physiology, air pollution
Trush, M	Professor, EHS	toxicology, chemoprevention
White, R	Associate Scientist, Epidemiology	risk assessment, risk policy
Yager, J	Professor, EHS	Toxicology
Zeger, S	Professor, Biostatistics	Biostatistics
Affiliated Faculty		
Knowles, E (CIH, CSP)	Department Associate	safety sciences, management
Lopez, M	Department Associate	ergonomics
Sliney, D	Department Associate	physical agents, lasers
Koegel, A (CIH)	Department Associate	general industrial hygiene
Kesavan, J	Department Associate	aerosol sciences, bioaerosols

* EHS – Environmental Health Sciences

Curriculum

Required courses for the 1.5-year OEH master's program and OEH doctoral program are listed in Appendix A.

Doctoral students in the OEH program are expected to have a master's degree from a program providing similar training to the Johns Hopkins OEH master's program. If there are significant gaps in a student's master's coursework, they are to be made up via coursework at the doctoral level.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

During the past year, we have maintained progress towards training goals and objectives. Some specific program activities and accomplishments include the following:

- The OEH program graduated six MHS and four doctoral students in this year.
- We have received an important new source of funding: Both Drs. Geyh and Breysse are principal investigators in the EPA-funded Particulate Matter Research Center.
- In collaboration with the Department of Epidemiology, faculty are participants in a newly funded initiative titled Disease Investigation through Specialized Clinically-Oriented Ventures in Environmental Research (DISCOVER).
- A student received a best poster award at the American Industrial Hygiene Conference and Exposition.
- We continued our focus on the agricultural sector through expanded research on health effects associated with concentrated animal feeding operations (CAFOs).
- In our faculty research and doctoral training program, we continued to focus on exposure to mobile source pollutants and exposures in the transportation sector.
- We continue to provide support to epidemiologic studies of industrial populations through the development of exposure estimates and models.
- Dr. Lees serves on the Board of Directors of the American Board of Industrial Hygiene.
- Dr. Breysse served on the NIOSH Safety and Occupational Health Study section.
- Dr. Lees continues his work on the NIEHS Center for the Evaluation of Risks to Human Reproduction's Committee on bis-Phenol A.
- The program has 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 program prepared and submitted a detailed self-study, underwent a site visit, and received continuation of ASAC-ABET accreditation.

PROGRAM PRODUCTS

- Program faculty and students have produced 12 publications (see Appendix B) during the project year, which have included students as author or co-author.
- The OEH program has placed the content for the *Principles of Industrial Hygiene* course on the school's "OpenCourseWare" Web site.
- The OEH program continues to offer a CIH review course.
- The *Principles of Occupational and Environmental Hygiene Course* continues to be offered for credit on-line. Two new courses are being adapted to this format.
- One program graduate accepted a faculty position and others now work for the private sector, government agencies and a non-governmental organization.
- Drs. Geyh and Breyse's published studies on exposures and effects at the World Trade Center have helped to focus medical screening efforts for cleanup workers.
- Dr. Lees served as a reviewer on the Committee to Review and Assess Industrial Hygiene Standards and Practices at Tooele Chemical Agent Disposal Facility. He contributed to the final report submitted to the National Research Council, National Academy of Sciences, Board on Army Science and Technology.
- OEH Program faculty frequently serve as peer-reviewers for numerous journals. Peer-reviewed science is crucial to improving worker safety and health.
- An OEH student collaborated with an Occupational Medicine faculty member to write an OSHA white paper on respiratory protection for infectious diseases.
- Research on potential health effects from exposure to antibiotic-resistant microorganisms in concentrated animal feeding operations (CAFOs) has provided opportunities for numerous student projects and theses and has helped to raise awareness about the potential for this important emerging health concern.

FUTURE PLANS

Future plans include continuing to train and graduate well qualified professionals and researchers. We also plan to develop a Web-based option for the MHS in OEH. To this end, we are in the process of increasing the number of OEH courses offered on-line, including *Noise and Physical Agents* and *Industrial Ventilation*. Finally, we will continue ongoing course and program review as required by our ASAC-ABET accreditation.

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) PROGRAM

OEHN PROGRAM DIRECTOR: Sheila T. Fitzgerald, MSN, PhD, RN-C, Associate Professor, Department of Environmental Health Sciences (Joint Appointment, School of Nursing)

PROGRAM DESCRIPTION**Goals and Objectives**

The primary goal of the Occupational and Environmental Health Nursing (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 Master of Public Health (MPH), Master of Science in Nursing and Master of Public Health (MSN/MPH), Doctor of Philosophy (PhD) and Doctor of Public Health (DrPH). The Doctor of Science (ScD) is also an option 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.

The OEHN program is located in the Division of Occupational and Environmental Health (DOEH), in the Department of Environmental Health Sciences, which also includes the divisions of 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 OEHN program's location, administratively and physically, facilitates interaction with faculty and students of the Occupational and Environmental Medicine, Biomarkers of Exposure and Susceptibility and Occupational and Environmental Health Engineering programs. The Occupational Injury Prevention program, which resides in the Department of Health Policy and Management – one block away, is also very accessible. Examples of other Education and Research Center (ERC) program faculty interaction with OEHN students include numerous required courses as well as co-advising and membership on doctoral research committees. Shared seminars include a monthly journal club, the OEHN weekly seminar series, two DOEH seminars and the monthly ERC seminar.

Responsible Conduct of Science Training

All students enrolled in research degree programs (i.e., the PhD, DrPH, or ScD) complete formal course instruction in the responsible conduct of research by taking one of the following courses: *Research Ethics* or *Research Ethics and Integrity: US and International Issues*, which are designed to ensure that students know and abide by the principles of research ethics and regulatory requirements. Both courses satisfy the NIH requirements for instruction in the responsible conduct of science. Students also receive research ethics content in other courses, such as *Public Health Perspectives*, which is mandatory for all doctoral students. Completion of these courses is monitored and recorded, and each course is evaluated at the end of the term.

Faculty Participation

The core faculty consists of four nurses who contribute to the OEHN program through teaching, mentoring and advising, participation in school and university governance, outreach, national and international professional activities and conduct of research. Nurses with associate appointments also lend expertise from a nursing perspective. Other faculty of the division, department and school are considered support faculty. All OEHN core, support and associate faculty and are listed in the table below.

Areas of expertise, research interests and trainee involvement of OEHN faculty.

CORE FACULTY	AREAS OF EXPERTISE/RESEARCH	TRAINEE INVOLVEMENT
S. Fitzgerald, RN-C, MSN, PhD	Cardiovascular risk factors, adolescent workers, and workers with chronic conditions, job stress	Advisor, course director, OEHN program director
J. Agnew, RN, MPH, PhD, COHN-S, FAAN	Vulnerable worker populations, aging workers, musculoskeletal disorders, occupational stress, military health	Advisor, director for two courses, ERC director
M. Cadorette, RN, MPH, PhD	Worker screening and surveillance, risk communication	MPH advisor, course instructor
M. Doyle, RN, MPH, COHN-S/CM	Continuing education, worker training, hearing conservation	Teaches audiometry and pulmonary function to OEHN students, CE program director
SUPPORT FACULTY	AREAS OF EXPERTISE/RESEARCH	TRAINEE INVOLVEMENT
L. Goldman, MD	Environmental and health care policy and regulation.	Doctoral research committee member and advisor
B. Schwartz, MD, MS	Occupational epidemiology, neurotoxic effects of lead and solvents, exposure assessment	Doctoral and MPH advisor, research committee member, course director Principles of Occupational Health
P. Strickland, PhD	Molecular epidemiology, occupational cancer, molecular dosimetry of combustion product exposure, UV induced DNA damage in skin	Doctoral advisor, research committee member, Acting director of DOEH, Director of Departmental PhD program, course instructor
V. Weaver, MD, MPH	Occupational epidemiology, biomarkers, surveillance, renal disease	Director of OMR, Co-advisor, course director, journal club advisor
S. Chen, PhD	Statistical methods in occupational and environmental health, genetic epidemiology of cancer	Research committee member, biostatistical advising for doctoral dissertations

A. Navas Acien, MD, PhD	Epidemiology of occupational and environmental exposures	Research committee member, advisor to doctoral students in epidemiological methods
D. Barnett, MD	Preparedness; emergency response; training; terrorism preparedness; all-hazards readiness	Directs and conducts multiple continuing education programs on preparedness; seminar presenter and lecturer
C. Parker, MD, MPH	Global environmental change, community based participatory research, risk communication	Directs the course Global Environmental Health, guest lecturer
J. Kub, RN, PHD, APRN (joint appointment, School of Nursing and School of Public Health)	Community health nursing, violence, ethics	Directs Community Health MSN/MPH Nursing Program, co-advisor, course director
ASSOCIATE FACULTY	AREAS OF EXPERTISE/RESEARCH	TRAINEE INVOLVEMENT
J. Cohran, RN, MSN, CIC, COHN-S	Infectious disease control, health care and emergency response workers	Infectious disease courses and seminars
A. Schill, RN, MPH, PhD	Musculoskeletal injuries, psychosocial work factors, occupational health policy	OEHN Seminar presentations
A. Alfriend, RN, MPH, COHN-S	OH management, OH services	Seminar presentations
F. Humphrey, CRNP, MSN, COHN-S	Clinical OH, OH program management, health promotion	MSM/MPH preceptor, seminar presentations, CE instructor
R. Moreland, RN, PhD, COHN-S	Clinical OH, ergonomics, surveillance, program administration	Seminar presentations
E. Handelman, RN, M.Ed., COHN-S	Regulatory process, occupational health policy	MSN/MPH preceptor, OEHN seminar presentations

Curricula

MPH, MSN/MPH, PhD and DrPH degree requirements and a sample curriculum for each program are included in Appendix A.

OEHN practitioners in the Baltimore-Washington metropolitan area have been instrumental as role models and mentors to our students. We frequently engage these colleagues as seminar speakers. Additionally, they provide practicum opportunities for our students to work with interdisciplinary teams in their respective work settings; for example, the Organization Resources Counselors (ORC), the Occupational Safety and Health Administration (OSHA), and Morgan State University.

The OEHN advisory committee also provides input regarding curricula and practicum experiences.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

The following achievements demonstrate the progress of the OEHN program in meeting its goals and objectives:

- The doctoral program graduated one student; five doctoral and four masters students are continuing.
- The 2006-2007 OEHN doctoral graduate now holds a faculty position at Thomas Jefferson University in Philadelphia.
- Dr. Maureen Cadorette became director of the course *Fundamentals of Occupational Health*.
- Dr. Agnew became co-director of the course *Occupational Health*, with Dr. Peter Lees of the OEH program. This is the ERC Capstone course; students work in multidisciplinary teams to visit and evaluate OEH programs within the Baltimore area.
- Drs. Fitzgerald and Agnew participate in the Johns Hopkins University School of Nursing teaching program, addressing occupational and environmental health and nursing.
- Dr. Cadorette successfully obtained and initiated a DOE Former Workers Program at Sandia National Laboratories, building on the existing project at Los Alamos Laboratories.
-
- Dr. Fitzgerald chairs the school's Committee on Affirmative Action.
- Dr. Fitzgerald serves as educational director of the local American Association of Occupational Health Nurses (AAOHN) chapter.
- Dr. Agnew serves on the NIOSH NORA Liaison Committee.
- One doctoral student works extensively with the Johns Hopkins Urban Health Institute.
- One doctoral student received the Maryland Nurses Association's (MNA's) "Nurse of the Year" award.
- Another doctoral student provides consultation on occupational hazards to healthcare personnel to the American Nurses Association.
- A visiting OEHN graduate of the University of Washington ERC spent time in residence in this program and earned a Certificate in Occupational Health.
- The program hosted visits from nurses from Taiwan and Korea.

PROGRAM PRODUCTS (publications appear in Appendix B)

- The OEHN-sponsored conference “Lessons from Katrina: Keeping Responders Safe and Healthy” was produced as a DVD and made available for Continuing Education credits.
- Dr. Agnew presented on topics related to preparedness to the Maryland Nurses Association (at its annual conference), the Western Maryland Area Health Education Center (AHEC), and the Maryland Department of Health and Mental Hygiene.
- One master’s student has contributed to an OSHA Web site on teen workers in the construction industry.
- The program completed a survey of former graduates (with a response rate of 81%) to characterize their experiences since graduation and to obtain feedback regarding program content.
- Dr. Cadorette is revising the course Fundamentals of Occupational Health for on-line presentation in the fall of 2008.
- Dr. Agnew consulted to the National Research Council as a member of the National Academy of Sciences, Board on Army Science and Technology’s Committee to Review and Assess Industrial Hygiene Standards and Practices at Tooele Chemical Agent Disposal Facility.
- Dr. Fitzgerald and students have begun to work with Morgan State University, a historically black university, to develop a community based participatory research program aimed at Integrated Pest Management.
- Dr. Agnew and a doctoral student are working with Vietnamese nail salon workers to research and develop methods to reduce work-related musculoskeletal disorders. The doctoral student, Ms. Lori Edwards, has taken part in health fairs and health education in the Vietnamese-American community.

FUTURE PLANS

Future program plans are to continue to produce outstanding practitioners in OEHN. We will also explore ways to further address international occupational health, and will continue to emphasize the broader scope of environmental health, since these exposures (air, food, water, etc.) have major implications for workers in all the NORA identified sectors. We will pursue continued development of individual research programs and identification of external sources of student support.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE RESIDENCY (OEMR) PROGRAM

OEMR PROGRAM DIRECTOR: Virginia Weaver, MD, MPH, Associate Professor, Department of Environmental Health Sciences (joint appointment, School of Medicine)

PROGRAM DESCRIPTION**Goals and Objectives**

The mission of the Occupational and Environmental Medicine Residency (OEMR) 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 the 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.

Responsible Conduct of Science Training

All residents are required to complete the on-line *Research Ethics* training module and the on-line *General Privacy Issues* course module on the Johns Hopkins Medical Institutions HIPAA training Web site. The school also provides a faculty-directed Research Ethics Consulting Service, which raises awareness of ethical issues in research and is an additional resource for residents doing research projects. Formal instruction in the responsible conduct of research can also be obtained from one of the following courses, *Research Ethics*, and *Research Ethics And Integrity: U.S. And International Issues* or *Public Health Perspectives On Research*, which are required for PhD students but can also be taken by residents interested in research careers. These courses satisfy the NIH requirements for instruction in the responsible conduct of science.

Faculty Participation

The OEMR benefits from the skills and expertise of a wide range of faculty and preceptors at Johns Hopkins and throughout the mid-Atlantic region.

Dr. Weaver, the OEMR director, an associate professor of Environmental Health Sciences, has been a core faculty member of the OEMR since 1993 and is board-certified in internal and occupational medicine. Responsible for all aspects of the OEMR, Dr. Weaver combines research, teaching and clinical work in her position at the Johns Hopkins Bloomberg School of Public Health. Her research utilizes molecular epidemiologic tools to evaluate populations with exposure to occupational and environmental chemicals. Her research goals include validation of exposure and early biological effect markers to improve risk assessment, medical surveillance and exposure management (including treatment). Her primary research focus is on nephrotoxicants, including lead and cadmium. She has conducted a range of clinical/professional practice activities, including a medical surveillance program for cadmium-exposed workers, as well as her work as a co-investigator in the Department of Energy Former Worker Medical Surveillance program for former Los Alamos National Laboratory workers.

Dr. Brian Schwartz is a professor of Environmental Health Sciences and has served as deputy director of the OEMR since 1998. He directed the OEMR from 1993 to 1998 and the Division of Occupational and Environmental Health (DOEH) from 1996 to 2006. Dr. Schwartz is board-certified in both internal and occupational medicine. His areas of expertise include occupational and environmental molecular epidemiology, with a focus on the adult central nervous system. Dr. Schwartz's clinical interests include medical surveillance and causation determination for exposed individuals and populations. He directs the Department of Energy Former Worker Medical Surveillance program for former Los Alamos National Laboratory workers.

Several other Hopkins faculty have key supporting roles in the OEMR. Dr. Edward Bernacki is executive director of Health, Safety & Environment for the University. His areas of expertise include workers' compensation management, occupational hazards in the health care industry, ergonomics and flight medicine. Dr. Lynn Goldman is a professor in Environmental Health Sciences and chair of the Interdepartmental Program in Applied Public Health. Her interests include children's environmental health, and public health practice, including her role as co-director of the National Study Center for Preparedness and Critical Event Response (PACER), a university-based Center of Excellence that will support the mission of the Department of Homeland Security by conducting research and educational initiatives to build the science of preparedness and response and international chemical and biotechnology safety.

The continued growth and evolution of the faculty within the division have enhanced the strength of the faculty and, as a result, of the OEMR. Several recruitments are important in this regard. Drs. Daniel Barnett and Cindy Parker are instructors in the division and are key faculty in the Center for Public Health Preparedness. Both have extensive expertise in all-hazards public health emergency readiness and response. They are trained in general preventive medicine and have had extensive experience working with employers on workplace preparedness-related issues. They provide a series of lectures on this topic to residents in the general preventive medicine and OEM programs. In addition, residents may spend elective time with them in the Center for Public Health Preparedness. One resident, who started the residency in 2007, spent three months rotating with Drs. Barnett and Parker prior to starting his MPH. He will build on this experience for his research project and future career in the Navy.

Dr. Ana Navas-Acien is an assistant professor and environmental epidemiologist whose research interests include the cardiovascular effects of arsenic, selenium, lead, cadmium and other trace metals. She is also involved in research and policy activities to reduce exposure to environmental tobacco smoke and can serve as a research mentor to residents in either area. She recently took over the directorship of the combined Division of Occupational and Environmental Health and Occupational and Environmental Epidemiology group journal club, held once per month. Thus residents benefit from her expertise in this capacity.

Dr. Maureen Cadorette is a nurse and recent doctoral program graduate who is a co-investigator on two Department of Energy-funded programs that offer medical examinations to former workers from nuclear weapons defense facilities to determine if they have occupational illnesses related to past exposures during their employment at these facilities. The sites involved are the Los Alamos National Laboratory and Sandia National Laboratory, both in New Mexico. Dr. Cadorette's research interests include adverse thyroid effects from radiation and chemicals and the health of former workers from exposures in the nuclear weapons complex. Residents work with her during their elective time in New Mexico and on record reviews and summary results letters from the screening examinations.

In addition, we utilize the strengths of the occupational and environmental medicine community in the mid-Atlantic area, many of whom have trained or been faculty at Johns Hopkins. Dr. Carrie Dorsey, an

assistant professor at the University of Maryland, is a key preceptor in the four-month clinical rotation. She provides focused observations and evaluations as part of ACGME required documentation of competency achievement. In addition, she assists with resident interviews, organization of joint conferences with the Occupational Health program at the University of Maryland and with resident professional practice mentoring. Her supervisor, Dr. Melissa McDiarmid, a professor at the University of Maryland, is also an important preceptor for residents and a key mentor for Dr. Dorsey. Other key preceptors include: Minda Nieblas and colleagues at the Occupational Safety and Health Administration (OSHA); Margit Bleecker at the Center for Occupational and Environmental Neurology; Dr. Robert Lavin in the JHU Occupational Injury Clinic; and Mr. Rich Duffy at the International Association of Fire Fighters (IAFF). Finally, we have outstanding faculty as preceptors at rotations that are currently electives, such as Dr. Craig Thorne at Erikson.

Curricula

The core curriculum in the first year (academic phase) of the program provides OEMR trainees with the intellectual foundations of occupational and preventive medicine with a focus on population health issues. This year is particularly strong as a result of the depth and breadth of the Johns Hopkins Bloomberg School of Public Health, the largest school of public health in the world. During the academic year, the primary obligation of the resident is to complete the requirements of the MPH degree. Additional requirements during this time include weekly attendance at departmental and divisional seminars and conferences. Residents matriculate in the MPH program, taking a wide range of MPH and OEMR required courses, as shown in Appendix A. The OEMR core consists of courses taught by OEMR faculty and other Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC) members. The core consists of: *Fundamentals of Occupational Health* (Drs. Schwartz and Cadorette); *Clinical Environmental and Occupational Toxicology* (Dr. Weaver); *Principles of Occupational and Environmental Hygiene* (Dr. Lees); *Public Health Toxicology* (Drs. Trush and Yager); *Environmental Health* (Dr. Links); the *Occupational Health* (worksite inspection) course (Drs. Agnew and Lees); and the *Occupational Medicine Seminar* series (Dr. Weaver). These are augmented by a wide variety of attractive electives, including: *Public Health Practice*; *Introduction to Ergonomics*; *Introduction to Radiation Health Sciences*; *Epidemiology of Injuries*; *Molecular Biology of Carcinogenesis*; *Toxicokinetics and Molecular Epidemiology and Biomarkers in Public Health*; *Noise and Other Physical Agents in the Environment*; *Health Effects of Indoor and Outdoor Air Pollution*; and *International Health*. The epidemiology and biostatistics offerings in the school are particularly rich, and residents are encouraged to complete as many of the five-course epidemiology and four-course biostatistics series as possible; a minimum of two courses in each area is required.

The second year consists of 10 months of required rotations (with choices within these requirements) and two months of electives. The three core rotations are:

1. Johns Hopkins University-University of Maryland Clinical Rotation. This four-month rotation provides opportunities in: 1) comprehensive health care industry occupational health programs; and 2) academic occupational and environmental clinics.
2. International Association of Fire Fighters (IAFF). This two-month rotation at an international union representing 274,000 full-time professional fire fighters and paramedics provides residents with an understanding of the health concerns and advocacy role of a major trade union.
3. Occupational Safety and Health Administration (OSHA). This two-month rotation at OSHA's national office in Washington, D.C., is designed to provide residents with an understanding of

the legal and regulatory environment of occupational safety and health. Residents work with OSHA staff in the Office of Occupational Medicine, which now includes three of our graduates.

For additional corporate and industrial experience, residents choose one of the following three two-month employer-based rotations: GlaxoSmithKline; the U.S. Department of Agriculture Animal and Plant Health Inspection Services (APHIS); or the National Security Agency. Residents select from a number of elective options (clinical, research, or administrative) for the remaining two months of the practicum year. Elective rotations allow residents to tailor the practicum year to fit their career objectives. Examples include: corporate rotations such as McCormick and Company, Inc., at its spice and food manufacturing facility in Hunt Valley, Md.; clinical rotations with Johns Hopkins faculty in physical medicine and rehabilitation and with faculty in the Allergy & Immunology Service at the National Naval Medical Center; and public health rotations with the Johns Hopkins Bloomberg School of Public Health Center for Public Health Preparedness. Residents may also use elective time to complete their research projects.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

The following achievements demonstrate the progress of the OEMR program in meeting its goals and objectives:

- During this reporting period, the OEMR graduated one resident, Dr. Olusoma Malomo, who is starting a clinical position at the Police and Fire Clinic in Washington, D.C., where she will report to an earlier graduate of our program.
- Five residents are continuing.
- We have continued to attract highly qualified applicants, as evidenced by the number of our trainees who have received Occupational Physician Scholarship Fund (OPSF) scholarships, including one scholar in the current group of residents.
- Dr. Olusoma Malomo was awarded the 2007 Randall Bass Award.
- Both Drs. Weaver and Schwartz were elected to the Faculty Senate at the Bloomberg School of Public Health.
- Dr. Weaver now directs the *Clinical Environmental and Occupational Toxicology (CEOT)* course. This was formerly *Clinical Occupational and Environmental Medicine*, a course she directed from 1997 to 2006. Based on the first year enrollment, the new course attracts a wider audience.
- She continues to instruct residents in specific occupational medicine content in the *Occupational Medicine* seminar series, which is specifically for clinicians (physicians and nurses) and will provide the in-depth details needed by this audience.

PROGRAM PRODUCTS (publications appear in Appendix B)

- During this reporting period, we have continued to offer half-day *Occupational and Environmental Medicine Updates* in collaboration with the Maryland College of Occupational and Environmental Medicine. Dr. Weaver presented an "Update in Metals Toxicology" at the Spring Conference in Baltimore in May 2007.
- Dr. Weaver presented an "Update in Metals Toxicology" as an invited speaker in the OSHA Clinical Update in Toxicology seminar at the American Occupational Health Conference in New Orleans in May 2007.
- Dr. Weaver presented "Occupational and Environmental Medicine for the Internist" at the Department of Medicine Grand Rounds, Union Memorial Hospital, Baltimore in May 2006.
- In January 2007, Dr. Weaver was a co-presenter of a talk entitled "A Reappraisal of Lead-Associated Nephropathy" (Renal Rounds, Division of Nephrology, JHU School of Medicine, Baltimore).

Dr. Weaver has also presented research posters and presentations at a variety of national and international meetings and academic settings:

- Weaver VM, Lee B-K, Griswold M, Jaar BG, Todd AC, and Schwartz BS. Longitudinal Associations Between Lead Dose And Renal Function In Korean Lead Workers. Joint International Society for Environmental Epidemiology/ISEA Conference. Paris, France, September, 2006.
- Weaver VM, Lee B-K, Griswold M, Jaar BG, Todd AC, and Schwartz BS. Associations Between Longitudinal Measures of Occupational Lead Dose and Renal Function. Society of Toxicology. Charlotte, NC. March, 2007.
- Weaver VM, Lee B-K, Griswold M, Jaar BG, Todd AC, and Schwartz BS. Associations Between Longitudinal Measures of Occupational Lead Dose and Renal Function. American Occupational Health Conference. New Orleans, LA. May, 2007.
- "Environmental Risk Factors in Patients with Chronic Kidney Disease: Discussion of a New Grant Proposal" Renal Disease Interest Group, JHMI Welch Center, Jan 2007.

FUTURE PLANS

The OEMR made substantial progress in documenting competencies, particularly in the clinical rotations during the practicum year. Dr. Dorsey's contribution will be particularly important in this regard. As in previous years, recruitment continues to be the single biggest challenge confronting the residency. The limited number of highly qualified applicants is a cause for concern for the entire specialty. The situation appears to have worsened this year based on the fact that OPSF applications, a measure of nationwide interest, were substantially lower. We are addressing this in several ways:

- Routinely emailing information on the OEMR to students accepted into MPH class, and routinely emailing information on the OEMR, along with an offer to provide an OEM overview lecture to regional IM, FP and EM residencies;
- Joint conferences with the JHU general preventive medicine residency;
- Exploring a joint conference with the JHU Emergency Medicine Residency;
- Addressing the increased interest in training from physicians who already possess an MPH without a focus in occupational medicine by continuing to offer a shortened (15-to-18-month) training program. We have one graduate of this track and another currently in it.

ALLIED OS&H ACADEMIC PROGRAMS

BIOMARKERS OF OCCUPATIONAL EXPOSURE AND SUSCEPTIBILITY (BOES) ALLIED RESEARCH TRAINING PROGRAM**PROGRAM DIRECTOR: Paul T. Strickland, PhD, Professor of Environmental Health Sciences****PROGRAM DESCRIPTION**

The rationale for the Biomarkers of Exposure and Susceptibility (BOES) research training program is 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. Application of these biomarkers spans the entire range of the exposure-disease continuum and leads to interdisciplinary research with other components of the ERC, as well as school-wide collaborations. This program in molecular biomarkers 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. The large size of this School and the strong emphasis on research makes this setting a unique environment for research and doctoral studies. The importance of collaboration and interdisciplinary research is well accepted in the Department and the School. As a result, the School's faculty members are readily willing to assist students by serving as informal advisors and committee members, and by providing laboratory resources.

The purpose of this 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. The main objective of the BOES training program is 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 focuses 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. Graduates from the program are prepared to enter research, teaching or regulatory careers in several venues, including academic universities, research institutes, governmental health agencies and international health organizations. The BOES program benefits from continued ERC training support by allowing the program to maintain a critical mass of students and faculty focused in this research area, and by including these students within the ERC. We have previously benefited from ERC funding by increasing the size and momentum of the program. BOES faculty have advised an average of six doctoral students per year over the past four years in this program area, whereas these faculty advised an average of only three-to-four doctoral students prior to the beginning of NIOSH funding in 2002. More importantly, the BOES program has provided a more defined curriculum for these students and interaction with students and faculty with related interests through affiliation with an ERC. The training provided by this program has broad application in occupational health research and practice. General areas of importance for research include, but are not limited to: 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. Thus, the expertise and knowledge

gained by program graduates is applicable in risk assessment, biomonitoring, disease etiology and the diagnosis and prevention of human diseases of occupational origin.

Doctoral candidates in the BOES training program matriculate through the Division of Occupational and Environmental Health (DOEH) or another division within the Department of Environmental Health Sciences, and work toward either the PhD or DrPH degree. The distinction between the University-wide PhD and the School-wide DrPH degrees is one of emphasis. Research toward the PhD often leads to an expanded understanding of one of the several domains of occupational health, including molecular epidemiology, exposure assessment, clinical (and laboratory) toxicology, health promotion and disease prevention. In contrast to PhD training, the program for DrPH training emphasizes the skills necessary: to assess the needs for occupational health services at regional, national and international levels; to develop policy and regulatory frameworks to address the integration of exposure assessment and measurement of health effects; and to define the consequences of specific occupational exposures. Candidates for either degree are expected to develop the ability to express research ideas verbally and in writing, and to develop skills in critical reading, discussion and evaluation of the literature. Due to the nature of their research, most of the doctoral candidates in the BOES program receive the PhD degree.

Completion of a doctoral degree in the School of Public Health requires four-to-five years. Students admitted to the BOES doctoral program are expected to complete the requirements for the PhD in the DOEH. Additional coursework is based on the research area focus of the student and is designed on an individual basis by the student's advisor with input from the divisional faculty and the student's doctoral committee. We have been successful in increasing the number of doctoral students in the BOES program from three-to-four (pre-funding) to six students this year, with seven students graduating during the period 2002-07. These students were funded through a combination of resources, including ERC funds, personal funds, foreign government funds, research funds and university funds. The support provided through this BOES program grant was targeted toward recruiting and retaining additional eligible students into this research area and developing a centralized organizational program structure.

All students who are enrolled in research degree programs at the Bloomberg School of Public Health are required to have formal course instruction in the responsible conduct of research by taking one of the following courses: 550.860.01 Research Ethics (1 unit) or 306.665.01 Research Ethics and Integrity: US and International Issues (3 units). These courses are designed to ensure that students know and abide by the principles of research ethics and regulatory requirements. One of these courses must be completed by every student in a research degree program. Both courses satisfy the NIH requirements for instruction in the responsible conduct of science. Students also receive content in research ethics in other courses, such as 550.865.01 Public Health Perspectives on Research (2 units), which is mandatory for all doctoral students.

Before involvement in any research project, students must complete on-line training in the use of animals in research and/or human research, and additional training on HIPAA if any medical records or healthcare data are to be used. On-line training modules have been developed by the Committee on Human Research of the Office of Research Subjects (ORS) at the Johns Hopkins BSPH. The ORS also organizes a lecture/workshop "brown bag" lunchtime series at the School concerning IRB ethical issues. In conjunction with the School's Phoebe Berman R. Bioethics Institute, the ORS also provides a faculty-directed Research Ethics Consulting Service that assists investigators in addressing ethical issues in research and is available to students and faculty members. The Bioethics Center occasionally sponsors short courses on bioethical issues of broad interest to the public health community, such as the recent one-day course entitled *Ethical & Legal Considerations in Genetic Research*.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

Several of our recent graduates have successfully transitioned to full-time employment in occupational, environmental and public health related fields. Megan Weil successfully defended her dissertation entitled *Blood Mercury Levels and Neurobehavioral Function* in 2005, and was recently appointed director of environmental health programs at the Association of Public Health Laboratories, located in Silver Spring, Maryland. Prior to accepting that appointment, she was selected as one of 107 Regional Finalists for the White House Fellows Program – the nation's most prestigious program for leadership and public service. Keson Theppeang successfully defended her dissertation entitled *Relations of Bone Mineral Density, Blood Lead Levels, Bone Lead Levels and the Apolipoprotein E and Vitamin D Receptor Genotypes* in July 2007. She has been appointed to a position in the Department of Occupational Safety and Health in her native Thailand.

Our current students continue to make satisfactory progress in their graduate training. Fifth-year doctoral candidate Nicole Cardello has completed her dissertation and is scheduled to defend in December of this year. Fifth-year doctoral candidate David Colquhoun has also completed his dissertation research on the effects of maternal smoking on the fetal proteome and is also scheduled to defend in December. He has submitted for publication a manuscript on his research entitled *Biomarkers of Maternal Cigarette Smoking in Human Fetal Umbilical Cord Blood Proteomes*. Fourth-year trainee Ellen Wells completed her doctoral written and oral comprehensive exams and is analyzing data on her research study on health effects of lead in newborns with Dr. Goldman. Third-year trainee Jing Feng passed her doctoral written and oral comprehensive exams in 2006-2007 and is conducting her research with Dr. Schwartz. Second-year trainee Ann Lui joined the program in September 2006 and is preparing for her written comprehensive exams. Our new first-year trainee Laura Helmke-Long joined the program in September 2007.

Several of our students obtained independent funding for their doctoral research. PhD candidate Ellen Wells received an EPA STAR fellowship to study the effects of heavy metal exposures during pregnancy on maternal and infant health. PhD candidate Nicole Cardello received a grant from the Center for a Livable Future to study dietary confounders of combustion product exposure biomarkers.

In response to our previous review, we have made significant enhancements to our faculty expertise in proteomics, genomics and bioinformatics, and to the course curriculum to bolster student training in these areas. To further enhance BOES faculty expertise in proteomics, genomics and bioinformatics, we have recruited three new members of the Department of Environmental Health Sciences to be contributing faculty in our BOES allied research training program:

- Rolf Halden, MS, PhD, associate professor, whose research interests include proteomic analysis of subjects exposed to environmental agents and mass spectrometric detection of human proteins and microorganisms.
- Shyam Biswal, PhD, associate professor, whose research involves understanding gene-environment interactions that modulate susceptibility to lung diseases using genomic and proteomic technologies.
- Sining Chen, PhD, assistant professor, whose research focuses on statistical methods for environmental health research, bioinformatics in proteomics and neuroimaging, and computational molecular biology.

PROGRAM PRODUCTS (publications appear in Appendix B)

A major product of the BOES program is contribution of new knowledge to the field in order to address problems in occupational and environmental health. (Student publications in the past year are listed in Appendix B.) Another major product of the program is the graduation of highly trained individuals skilled in a diverse mix of disciplines with the ability to coordinate their scientific expertise and professional skills to address problems in occupational and environmental health. In terms of contributions to regional and national needs, graduates of the program are prepared to enter research and teaching careers in a variety of settings, including academic universities, research institutes, governmental health agencies and international health organizations. The proximity of the School to Washington, D.C. has fostered strong ties with federal government agencies and the supporting private sector. Government employees often take courses in the many departments of the School through off-campus offerings, and sometimes enroll as full-time graduate students. Conversely, many graduates of the School have assumed positions at government regulatory and research agencies, including the National Institutes of Health, OSHA, the FDA and the NIEHS.

The majority of the research conducted by program faculty and students is related to one or more of the priority research areas identified by NIOSH in the National Occupational Research Agenda (NORA). Under the *Research Tools and Approaches* category, program faculty use biomarkers to improve: a) cancer research methods, b) exposure assessment methods, c) intervention effectiveness research, and d) surveillance research methods. Under the *Work Environment and Workforce* category, their research is directed toward identifying special populations at risk. In addition to the commitment of the designated BOES faculty, the overall depth of faculty expertise at the Johns Hopkins Bloomberg School of Public Health and in the University as a whole, particularly in areas of interest to our students, is a major programmatic strength. These subject areas include toxicology, physiology, radiation health sciences, epidemiology, biostatistics, health policy, biochemistry and reproductive biology.

Over the past year, the availability of ERC funding for this program has strengthened our academic and research training efforts in several dimensions. First, it has facilitated the recruitment of new students – particularly those from the United States – and has aided in the retention of existing students through the availability of stipends and tuition support. Second, program funding has allowed the director, Dr. Strickland, to direct a larger portion of his effort toward identifying and selecting the best students for training, and toward advising and mentoring these students during their training. In addition, he has had time to expand the curriculum and supplement program faculty to broaden the expertise directly available to students. Third, the expansion and formal recognition of the BOES training program has contributed, in part, to the School's initiative to develop a joint interdepartmental MSc/PhD program in Molecular Epidemiology. Dr. Strickland played an instrumental role in the initiation of this program by serving on both the school-wide committee charged with founding the program and on several (earlier) committees that explored the potential and feasibility of such a program. Students in the departments of Epidemiology, Environmental Health Sciences, Biochemistry & Molecular Biology, and Microbiology & Molecular Immunology will be eligible for the program – obtaining a PhD from one department and a MSc degree from one of the other departments listed. This program has now been formally approved by the School of Public Health and is currently open to existing PhD students. After an initial phase-in period, the associated departments will develop a recruitment plan to attract new student applicants. We anticipate that this new opportunity will increase the number of trainees in our BOES program and in related programs within the ERC training grant, and that it will expand their degree options. In addition, new courses are being planned that will support this initiative, as well as our program.

Through his affiliation with the ERC, Dr. Strickland has had the opportunity to participate in several activities sponsored by the JHU ERC's Continuing Education program. For example, in March 2006, he attended the one-day genetics symposium entitled "Genes in the Workplace: The Right Fit?" held at the Georgetown University Law Center in Washington, D.C., which examined how genetic research may affect the workplace and employment; Dr. Strickland served as a panelist discussing a presentation on the scientific aspects of genetic research in the workplace. He has also consulted with a number of ERC graduate students outside the BOES program regarding the use of molecular biomarkers of exposure and effect in their research.

In summary, we have continued to improve our course offerings and training in the area of molecular and population genetics as proposed in the previous competitive renewal. This complements expanded 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.

FUTURE PLANS

We will continue to use the majority of program funds for student support to maintain the critical mass of the BOES program. This past year, we supported two doctoral students in the program with BOES funding, and we will continue to do so during the research phase of their doctoral programs. In the upcoming academic year, we will also begin to support new trainees with additional ERC funding. We will continue to actively recruit the most competitive students available to the program, which currently numbers six.

OCCUPATIONAL INJURY PREVENTION (OIP) PROGRAM

OIP PROGRAM CO-DIRECTORS: Susan P. Baker, MPH, ScD (honorary), Professor, Department of Health Policy and Management; and Keshia M. Pollack, Assistant Professor, Department of Health Policy and Management

PROGRAM DESCRIPTION**Goals and Objectives**

The Occupational Injury Prevention (OIP) program focuses on the advanced preparation of professionals in the field of occupational injury epidemiology and prevention. Students are trained in epidemiologic research methods through coursework and development of independent research. They gain experience in teaching and acquire a strong background in the causes and prevention of occupational injury, as well as basic injury control methods. Working closely with their advisors, other faculty and student colleagues, they acquire the knowledge and skills to excel in this specialized area of public health. Thus, our graduates bring a new public health perspective to injury prevention in the workplace and assume the leadership roles of faculty, researchers and instructors to train the next generation of occupational injury prevention professionals. During 2006-2007, there were four trainees, two of whom have now completed their dissertations and are teaching at other universities, continuing our tradition of adding to the body of new occupational injury researchers.

The program objective is to train independent researchers who can take an integrated epidemiological approach to occupational injury control. The educational objectives of our program combine the broader foundations of public health measurement sciences (e.g., survey methods, exposure assessment, research/experimental design, intervention evaluation) and health policy with specific training in occupational injury epidemiology and prevention (e.g., injury surveillance, injury control, occupational safety, ergonomics).

Instruction in the Responsible Conduct of Science

In 1996, The School of Public Health began requiring all research students (PhD, ScD, MSc, MHS) to take a course in *Research Ethics and Integrity*, taught by our noted ethicist Dr. Nancy Kass. The course introduces concepts inherent to the ethical conduct of research with human participants, issues of scientific integrity, and ethical theories and principles. It addresses: topics in human research, such as the just selection of research participants, balancing risk/benefit and protecting the welfare of participants, and informed consent – issues that arise in clinical and survey research as well as in conducting research with special populations, and issues of academic and scientific integrity and role responsibilities of investigators.

Faculty Participation

There are three core faculty members who contribute to the program through teaching, mentoring and advising. They are:

- Professor Susan Baker, MPH, ScD (honorary), is professor of Health Policy and Management, with joint appointments in Environmental Health Sciences and Emergency Medicine, and has been the co-director of the program since its inception. She works closely with the other co-director, Dr. Keshia Pollack, on budgetary matters, recruitment, on-going assessment of students and matching prospective students with potential faculty advisors or resources. She assists in planning and oversight of the training program and in making sure that objectives are met and guidelines adhered to. Professor Baker is also the co-instructor for the courses *Issues in Injury and Violence Prevention* and *Politics, Policies and Transportation Safety*. Her major research interests are the safety of workers in the aviation industry and transportation safety.
- Keshia Pollack, MPH, PhD, has been the program co-director since January 2007. In 2006, Dr. Pollack was selected through an intensive national search to join the School of Public Health, Department of Health Policy and Management as an assistant professor. She also holds the Leon S. Robertson Faculty Development Chair in Injury Prevention. Dr. Pollack is the primary instructor for the course *Epidemiologic Methods in Injury Control* and is the faculty sponsor for the occupational injury seminar series. Dr. Pollack is involved in overseeing the progress of the two current trainees and has been responding to inquiries about the program from potential applicants. Dr. Pollack also has a joint appointment in the Department of Environmental Health Sciences. Her major research emphasis is the study of obesity and injury and disparities in traumatic workplace injuries.
- James L. Weeks, ScD, an adjunct assistant professor in the Department of Health Policy and Management, has co-taught the *Occupational Injury Prevention* course for the past decade. He serves as a consultant to trainees on their research and is an expert in the area of safety and health issues in mining.

Four adjunct faculty members also contribute to the core education and research objectives of the program. They are:

- Andrew E. Lincoln, ScD, adjunct assistant professor in the Department of Health Policy and Management, has been the co-instructor for the course *Occupational Injury Prevention/Safety Practice* since 2002. He serves as a consultant to trainees on their doctoral research and sits on students' doctoral committees.
- Gary S. Sorock, MS, PhD, an adjunct association professor in the Department of Health Policy and Management, is the former director of the training program. Dr. Sorock left the ranks of the full-time faculty last year, but remains a consultant to trainees on their doctoral activities.
- Robert Dodd, ScD, an associate faculty member in the Department of Health Policy and Management, is chief of the Division of Safety Studies at the National Transportation Safety Board. He teaches the *Politics, Policies and Transportation Safety* course and works closely with trainees, especially those interested in the safety of transportation workers.
- Kristin Archer, PT, DPT, PhD, is an assistant professor and co-director of the Spine Outcomes Research Center in the Department of Orthopaedic Surgery at Johns Hopkins University

School of Medicine. Dr. Archer is a former trainee and is in her first year on faculty. Her interest in is rehabilitation and tertiary prevention for lower back injuries.

Twelve additional faculty members make important contributions to the program through advising, teaching and consulting. The interdisciplinary flavor of the occupational injury program is exemplified by frequent interactions with the Environmental Health Sciences (EHS) faculty. Not only do they sit on dissertation committees of doctoral students in Health Policy and Management, but also they participate together on research projects. For instance, Dr. Pollack and JHU ERC Director Dr. Jacqueline Agnew recently published a paper together on the use of employer-based databases for studying injuries.

Minority Recruitment and Retention

During 2006-2007, one minority student (Hispanic) was funded through the NIOSH training program. We have a number of activities planned to continue our efforts to recruit and retain trainees from underrepresented minority groups. In addition to institutional recruitment, we will send information about the training program to the numerous Historically Black Colleges and Universities (HBCU). Promising applicants are contacted by telephone early in the application/admissions process to encourage their attention to this program. We have also been working more closely with neighboring Morgan State University (MSU), the only HBCU with a school of public health. Dr. Andrea Kidd Taylor is the only faculty at MSU in the area of occupational and environmental health. Dr. Taylor is a graduate of the Department of Health Policy and Management and is now on the faculty at MSU after a long career in industry and government. Dr. Pollack and Dr. Taylor are currently exploring ways to collaborate on research projects and both have agreed to lecture in each others' courses.

Curricula

Required courses as well as relevant electives for the doctoral program of study appear in Appendix A. Sixteen courses are required in the doctoral program, many of which are also required by the student's home department. For example, biostatistics courses are required of all doctoral programs. Areas of study within the Occupational Injury Program include: occupational injury; general injury prevention; occupational health; public policy and risk sciences; behavioral sciences; teaching and research skills; epidemiology; and biostatistics. The course on *Research and Proposal Writing* requires students to develop a proposal that could be used to apply for dissertation support from federal or foundation sources. Students also critique one another's proposals under faculty guidance, which contributes to their growth as independent researchers and their ability to serve as reviewers for journals and grant proposals after they complete the doctoral program. A seminar series in occupational injury prevention is jointly sponsored by the ERC and the Center for Injury Research and Policy, and students have interacted in other seminars (e.g., the joint Division of Occupational & Environmental Health and Department of Epidemiology seminar). During the 2006-2007 year, Dr. Sorock and Dr. Pollack were the co-faculty sponsors.

A few changes are worth highlighting and can be viewed in the Sample Curriculum included in Appendix A. First, the Department of Epidemiology revamped its curriculum and now students may choose to take a series in advanced epidemiologic methods or the introductory epidemiology courses. Second, a few courses were modified, and changes to titles and terms taught have been included. Lastly, courses that are no longer being taught have been removed, and where possible have been replaced with alternative courses.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

The following achievements demonstrate the ability of the OIP program in meeting its goals and objectives:

- Kristin Archer (Swygert) successfully defended her dissertation, "Determinants of Referral to Physical Therapy: Influences of Patient Work Status and Surgeon Efficacy Beliefs," in the summer of 2007. She is senior author of two recent journal articles, and two others are submitted or are in preparation.
- Jennifer Taylor successfully defended her dissertation on *Comparison and Application of Patient Safety Event Case-Finding Methods using Administrative Data and an Error-reporting System*. She is also conducting a related research project, *Poor Organizational Culture Leads to Injuries in the Nursing Workforce: Are the same cultural risk factors putting patients at risk?* She is preparing articles from her dissertation for submission to peer-reviewed journals.
- Dr. Kristin Archer secured a tenure track faculty position in the Department of Orthopaedic Surgery at the Johns Hopkins University School of Medicine.
- Dr. Jennifer Taylor secured a tenure track faculty position in the Department of Environmental and Occupational Health at the Drexel University School of Public Health.
- Dr. Maria Bulzacchelli, a graduate in 2006, secured a tenure track faculty position at the assistant professor level in the Department of Public Health at the School of Public Health and Health Sciences at the University of Massachusetts.
- Whitney Austin began as a trainee in 2006-2007 year. She also received the William Haddon Jr. Fellowship in Injury Prevention. At the conclusion of her first year, she successfully passed her written qualifying exam and is exploring topics for her dissertation research.
- Trainee Renan Castillo expects to complete and defend his dissertation on "Modeling the Course of Disability and Return to Work Following Trauma" in 2007.
- Professor Baker received the Champion award from the Society for Advancement of Violence and Injury Research. With Dr. Guohua Li, she developed a scoring system for predicting fatalities in airline crashes.
- Dr. Pollack submitted two grants to explore new areas of occupational health research. One grant, in review at the Robert Wood Johnson Foundation, will explore the use of Employee Assistance Programs in addressing Intimate Partner Violence. The other grant will be submitted to the Department of Homeland Security and will explore injury, health, and fitness activities among firefighters. If awarded, both of these projects will include the involvement of students.
- Dr. Pollack and Mr. Castillo secured funding from the Injured Workers Insurance Fund (IWIF), the largest workers compensation insurer in Maryland. IWIF is providing funds to develop a scoring system to predict return to work for employees who sustained a back injury.

PROGRAM PRODUCTS (publications appear in Appendix B)

- Professor Baker was an author on six papers in 2007 and has two more in press. She presented results of her research on safety of commuter flights at the Aviation, Space, and Environmental Medicine annual meeting and contributed to a resolution and policy paper on safe cabin altitudes for airline flights, an issue of special importance to flight attendants.
- Dr. Pollack published four papers in 2007 and has two more currently under review. She was an invited speaker at the NIOSH WorkLife conference, and she also gave an oral presentation at the 2007 APHA conference and a poster presentation at the Society for the Advancement of Violence and Injury Research (SAVIR) meeting.
- Trainee Renan Castillo was an author on four papers in 2007.

FUTURE PLANS

Future program plans are to continue to recruit and graduate leaders in the field of occupational injury epidemiology and prevention. We are fostering our relationships with our partners, including the Applied Physics Laboratory of JHU, the U.S. Army Center for Health Promotion, 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. We are exploring opportunities to work with the Ford-UAW Health and Safety Committee. And, as mentioned above, we recently developed a relationship with the Injured Workers Insurance Fund (IWIF), the largest workers' compensation insurer in the state of Maryland. IWIF will sponsor a project that will be led by Renan Castillo, exploring the use of a predictive model for return to work after back injury.

The National Transportation Safety Board has proposed a relationship that will contribute to the training of our doctoral students in transportation safety by offering opportunities for collaborative research as well as potential employment.

Professor Baker and Dr. Dodd will continue their work on transportation worker safety, which is consistent with the NORA II sector approach. This focus is in large part due to the high death rates among professional drivers, pilots and EMS crews. Moreover, in most sectors, road deaths are the leading cause of on-the-job injury death.

Dr. Pollack is planning to continue and expand her work on the intersection of worker health and workplace injury risk.

Through in-person meetings, we will consider new avenues for our training and research, taking advantage of the expertise represented within our Advisory Committee, which has been expanded and now includes representatives of industry (Gordon Reeve, Ford Motor Company), small business (Rebecca Moreland, Chesapeake Occupational Health Services), research (Robert Dodd, National Transportation Safety Board), the labor and research community (James Weeks, former Health and Safety Director of United Mine Workers of America and faculty at George Washington University), insurance (Gordon Smith, University of Maryland School of Medicine), the military (Bruce Copley, Col. [ret.], U.S. Air Force, and Joseph Myers, U.S. Coast Guard and a Certified Safety Professional) and professional organizations (Russell Rayman, Aerospace Medical Association). A meeting of the Advisory Committee is planned for 2008.

CONTINUING EDUCATION PROGRAMS IN OCCUPATIONAL SAFETY AND HEALTH

CONTINUING EDUCATION (CE) TRAINING PROGRAM

**CE PROGRAM DIRECTOR: Mary Doyle, RN, MPH, COHN-S/CM, Research Associate,
Department of Environmental Health Sciences**

PROGRAM DESCRIPTION

The Continuing Education (CE) training program is an interdisciplinary effort coordinated across multiple departments at the Johns Hopkins Bloomberg School of Public Health and is a key component of the Johns Hopkins Education and Research Center for Occupational Safety and Health (ERC). Under the leadership of Mary Doyle, the program supports the mission of the ERC by offering short courses and seminars to practicing professionals such as physicians, nurses, industrial hygienists, safety engineers and sanitarians. In addition, the 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.

The goals of the Continuing Education training program are to:

- Serve as a regional educational resource for addressing occupational and environmental safety and health issues and the prevention of hazards that occur in the workplace;
- Provide access to skills and information related to occupational safety and health and environmental health; and
- Develop, present, coordinate and participate in occupational and environmental safety and health programs designed to be disseminated to government agencies, health departments, professionals, industry, labor, private and public service organizations, and individuals.

Within this framework, our specific objectives are to:

- Increase the competencies of practicing occupational safety and health professionals to function effectively in the increasingly complex areas related to occupational safety and health and environmental health;
- Assist public health workers, sanitarians, medical practitioners, engineers, nurses and other professionals with newly designated occupational safety and health responsibilities to acquire the needed knowledge and skills in occupational and environmental safety and health; and
- Meet community needs by developing and supporting outreach activities that will help other institutions to address problems related to occupational and environmental safety and health, which are addressed in the Outreach section of this grant proposal.

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 is scheduled for October 13, 2007. Sheila Fitzgerald of the OEHN program, Mary Doyle, and Keith Choi served on the planning committee for this conference.

The CE program recruits course instructors from the faculty of the Johns Hopkins Bloomberg School of Public Health, whose diverse backgrounds and expertise enhance the quality of the education, practice and research components of our programs. Continuing education course instruction is provided by ERC and other JHU faculty and associate faculty members, as well as faculty from outside the university. Our faculty is a major reason for the excellence of the Continuing Education program, as they are recognized experts in the core areas of occupational and environmental hygiene and safety sciences, occupational and environmental health nursing, occupational and environmental medicine, occupational injury prevention and biomarkers of occupational exposure and susceptibility. To insure quality control, a JHU faculty member is involved in planning each course. All faculty in the ERC core areas participate in the Continuing Education programs related to their fields of interest. Participation of faculty includes planning of curriculum content, development and critique of course materials, recruitment and mentoring of course instructors and course evaluation.

During this reporting period, faculty members taught in 44 courses, which are displayed in Table 12a (submitted earlier this year). In addition to ERC and other Hopkins faculty, course instructors were recruited from federal, state and local governments and agencies (including health departments), the U.S. military, for-profit companies, non-profit organizations, private health practice, professional associations, and other academic institutions.

Course curricula are individually designed based on the learning objectives and the target audience of each Continuing Education course. Courses range from one to three days in length, depending on the complexity of the content. Off-site, weekend and evening courses are offered in response to the needs of the target audience. Shorter seminars and conferences are also held to meet the continuing education needs of occupational safety and health (OSH) practitioners who are unable to attend longer offerings due to staffing or work commitments.

Courses are designed utilizing a continuous quality improvement approach to ensure training effectiveness. This process includes assessing a clear need for the course from various sources, developing targeted program objectives and curriculum, designing an efficacious delivery system, choosing the appropriate program format, identifying subject area experts, and developing a useful evaluation system. Feedback is used to improve course content, delivery systems and presenter quality. This approach incorporates training models such as hands-on exercises, lectures, discussions, role playing, breakout groups and knowledge assessments.

The CE training program responds to requests from local public health agencies, regional private employers and non-profit organizations for specific assistance with consultation or training for occupational and environmental health professionals. This is accomplished by the close association of the faculty with Ms. Doyle to develop and implement these courses. Examples of these types of programs are included below.

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

During the grant period, the CE training program demonstrated progress toward our program goals and objectives. A total of 898 occupational safety and health professionals were trained in 44 courses, seminars and workshops covering a multitude of broad and innovative topics.

The CE program has been strengthened by developing and expanding numerous external partnerships within Region III occupational safety and health professional organizations; these include 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 SVAAOHN), and state and local organizations such as the Maryland Department of the Environment, the Maryland Board of Environmental Sanitarians and county public health departments. These partnerships have enhanced the CE training program by providing speakers, trainers, members of the advisory board, course participants, and assessment of needs for course topics. Based on needs assessments within these professional organizations, we have collaborated with these groups to develop new training courses to meet their particular continuing education needs. During the grant period, Ms. Doyle and Mr. Choi also served on two planning committees for regional conferences involving occupational safety and health professionals.

Partnerships with other academic institutions, particularly Training Project Grants (TPGs) such as 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 health professionals (such as registered sanitarians and hazardous materials managers).

As part of the ERC outreach program, faculty members collaborate with training programs directed within labor organizations; for example, the George Meany Center for Labor Studies/National Labor College, the International Chemical Workers Union (IWCUC), the American Postal Workers Union and the International Association of Fire Fighters (IAFF). We recognize that several labor organizations have continuing education programs in place, and we do not want to replicate those resources. We do, however, consult these organizations and seek ways in which we can collaborate. The CE program provides opportunities to augment worker training programs in place at these organizations, to provide a broad range of training activities for this population. Based on their recommendations, we are capable of providing courses perceived to fill existing gaps in their curriculum and/or meeting the needs of specific subgroups. JHU ERC faculty participate in the CE programs currently offered by other organizations; for example, the national professional organization conferences of AIHA, AAOHN, ASSE and ACOEM.

We maintain numerous connections to the public sector through ties with local, county and state public health departments. Private sector groups with whom we have worked include the Maryland Department of the Environment and Maryland Occupational Safety and Health (MOSH). Several faculty have worked with public safety and other municipal workers (e.g., fire, EMT, police, sanitation), allowing us to gain access to leaders and training officials within the organizations and identify training needs we can provide. An example of this networking is our relationship with county and state health officers and environmental health leaders in Region III.

Various organizations contact the ERC with requests for faculty to speak at their meetings or conferences. In particular, Ms. Doyle was invited to participate in a roundtable presentation on emergency preparedness as part of the conference "Workplace Issues for Nurses: Adapting to Change in the 21st Century" on November 3, 2006 in Hagerstown, Maryland, sponsored by the Western Maryland Area Health Education Center (AHEC). Various professional organizations in occupational safety and health request faculty to speak at their dinner meetings and professional conferences. Ms. Doyle and Mr. Choi assisted these organizations in topic development, speaker selection and conference planning.

The CE program presented 44 courses, conferences and presentations during the current grant period. The program also responded to requests for consultation on training needs for specific projects. For example, Ms. Doyle responded to a request by AIHA to develop a teleWeb entitled "Emergency Response: Responding and Preparing a Corporate Plan" taught by ERC faculty and received by 163 participants. In addition, the ERC HST program co-sponsored their first continuing education course at the annual national AIHA Conference and Exposition in June 2007.

Prompted by requests from registered sanitarians and sanitarians-in-training for continuing education courses, Ms. Doyle has met with the Environmental Health Directors and the Maryland Board of Environmental Sanitarians to discuss course topics and get courses approved for CE credit.

For the past three years, the JHU ERC CE program, the Institute for Johns Hopkins Nursing and Abbott Laboratories have co-sponsored a Web-based bi-monthly continuing education program open to Abbott Laboratories nurses and ERC students. To make these sessions more accessible to more practitioners and students, each one-hour session is recorded and remains available for 30 days after the session. Post-session evaluations are coordinated by the CE program and are completed via the Web using SurveyMonkey.com.

Ms. Doyle collaborated with a national expert in the field of spirometry to co-sponsor the NIOSH-approved spirometry course. This strategy allowed the CE program to offer a top-quality course that was previously taught by Cliff Mitchell and Mary Doyle. We have marketed this program to research personnel as well to occupational health practitioners, thus increasing interest and enrollment in the course.

Specific recruitment efforts are tailored according to course topic and intended audience. Methods include the use of listserves, newsletters, trade publications, Web site listings, e-mail and postcards. Additionally, mailing lists are purchased for various organizations and professional groups based on the target audience and topics.

The CE program will continue to consult with the Johns Hopkins Bloomberg School of Public Health Student Diversity Office. Their mission is to increase the number of underrepresented minority students in the School. Dr. Fitzgerald, the Occupational and Environmental Health Nursing director, is chair of the school's Affirmative Action Committee, which strives to achieve these goals. In the CE program, we plan to recruit through minority professional associations such as the National Association of Hispanic Nurses and the National Black Nurses Association in order to increase minority representation in our courses.

PROGRAM PRODUCTS

One of our goals is to produce enduring resources such as CD-ROMS, other audio-visual reference materials, and library resource materials as products of course design. During this grant period, we utilized several of these methods and plan to expand these efforts with NIOSH support in the new grant period. CDs or Web streamed conferences and seminars have significantly increased the numbers of occupational safety and health professionals we are able to reach with our training. Examples of these resources include a DVD from the conference titled "Genes in the Workplace: The Right Fit?" and a DVD produced from the nursing seminar "Lessons from Katrina: Keeping Responders Safe and Healthy." We grant continuing education credits for completion of these versions. Web streaming from the CE program Web site is supported by the Johns Hopkins Bloomberg School of Public Health Distance Education Division.

FUTURE PLANS

Ms. Doyle is exploring various opportunities for the Johns Hopkins ERC to continue our collaboration with the American Industrial Hygiene Association on national continuing education course offerings. For example, the ERC is working with AIHA and the Johns Hopkins Center for Public Health Preparedness to offer on-line training modules for continuing education credit. Additional teleWeb conferences are being planned.

The CE program plans to expand our work as a network partner with the National Center for Healthy Housing. Our goal is to recruit more public health nurses and to expand the types of courses offered in this program. We plan to add an additional course on Integrated Pest Management.

We will continue to work closely with the professional organizations in the OSH field. The Chesapeake section of ASSE, in particular, has requested our assistance in designing CE course offerings for their membership based on the needs assessment survey results. Ms. Doyle will continue to serve on the planning committees for regional and national conferences, as she has gained considerable expertise in this area.

HAZARDOUS SUBSTANCE TRAINING (HST) PROGRAM

HST PROGRAM DIRECTOR: Mary Doyle, RN, MPH, COHN-S/CM, Research Associate, Department of Environmental Health Sciences

PROGRAM DESCRIPTION**Goals and Objectives**

The Continuing Education program in Hazardous Substance Training (HST) 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 program. 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.

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.

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.

Faculty Participation

The faculty of the JHSPH combines individuals with diverse backgrounds as well as expertise in teaching and research. Course instruction in this program is provided by JHU ERC and other JHU faculty members, associate faculty and faculty from outside the university who are recognized experts in hazardous substance training and related areas such as toxicology, radiation health science and safety sciences, thus giving the program breadth of subject matter. To ensure quality control for every CE course, a JHU faculty member serves as course director and must be involved in planning each course. All faculty member in the ERC core areas participates in the continuing education programs and also take part in HST courses related to their fields of interest. For example, Dr. Jonathan Links has developed a course on radiation terror preparedness, Dr. Pat Breyse and Dr. Peter Lees are organizing a course on biological detection equipment for first responders, and Dr. Kellogg Schwab will share his expertise in wastewater treatment.

The core faculty who contribute to the program are listed below. In addition to Ms. Doyle, Drs. Cadorette and Schwab will receive partial support from this grant. 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 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. Breyse, 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

PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

The following achievements demonstrate the progress of the HST program in meeting its goals and objectives:

- Trained a total of 175 trainees in three HST courses over the past five months from a diverse background of nursing, hygiene and safety professions (see Program Products, below).
- 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.

- Developed a partnership with the Cecil County Health Department of Maryland in creating and delivering a successful PPE course to its employees and implementing future courses.
- Met with Advisory Board member Clayton Miller in July to discuss collaboration on HST courses and to assess training needs not met by existing training providers in Region III.
- Added a labor representative to our Advisory Board (per our summary statement suggestion). The labor representative is from the George Meany Center, which also has an HST grant. This collaboration allows us to better coordinate training with the Meany Center to provide new and innovative training and to avoid duplication of efforts.
- De-emphasized worker emphasis in the HST program, and placed a greater focus on our strength, which is professional education.
- Attended Academy of Certified Hazardous Materials Managers (ACHMM) chapter meetings to do a needs assessment of local chapter members in Washington, D.C. and Baltimore. Continued to assist in the development of a new Baltimore chapter of ACHMM.

PROGRAM PRODUCTS

- Certified Hazardous Materials Manager (CHMM) Review Course (55 students) and CHMM Exam (28 test-takers) at the AIHAce conference in Philadelphia on June 1-4, 2007.
- Personal Protective Equipment for all Cecil County Health Department staff (65 participants) in Elkton, Md. on June 29, 2007.
- Personal Protective Equipment for Cecil County Health Department radiation teams (24 participants) in Elkton, Md. on June 29, 2007.

FUTURE PLANS

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.

IV. SPECIFIC IMPROVEMENTS IN OS&H RESULTING FROM ERC PROGRAMS

REPORT on SPECIFIC IMPROVEMENTS in OS&H RESULTING from ERC PROGRAMS

The following are examples of the impact of this ERC on worker safety and health and the field of occupational safety and health during the reporting year:

- The new ERC program in Hazardous Substances Training reached 175 workers, most of whom represent the public sector.
- The Continuing Education program presented 44 courses, reaching more than 898 professionals.
- Outreach activities, particularly interactions with OSH professional societies in the core areas of occupational and environmental medicine, occupational and environmental health nursing, occupational and environmental hygiene, and safety have greatly increased during this period (see report for specific organizations).
- Four of seven funded Pilot Project Research Training program grants were awarded to regional institutions outside of Johns Hopkins. This is one means by which we have helped increase the OSH research training capacity of other universities.
- Faculty of three ERC programs continued to operate a large medical surveillance program for former Department of Energy workers at Los Alamos National Laboratories in New Mexico. In addition to providing professional practice and research opportunities, this program has identified workers in need of medical follow-up for work-related exposures.
- ERC programs have increased their research focus on two important sectors – agriculture and transportation. This work has relevance to the new NORA sector-based framework.
- Dr. Fitzgerald, the director of Occupational and Environmental Health Nursing program, is increasingly involved in school diversity recruitment efforts as the chair of the university Affirmative Action Committee and as a former member of the university Diversity Council.
- The Occupational and Environmental Hygiene (OEH) program course *Principles of Industrial Hygiene* continues to be presented on the school's open courseware Web page.
- During this reporting period, we have continued to offer half-day *Occupational and Environmental Medicine Updates* in collaboration with the Maryland College of Occupational and Environmental Medicine.
- Dr. Pollack (Occupational Injury Prevention) placed the syllabus for the course *Epidemiologic Methods in Injury Control* on the Web site of the Society for the Advancement for Violence and Injury Research.
- There were many student contributions to the field. As one example, an Occupational and Environmental Health Nursing master's student helped design and evaluate an OSHA Web site on teen workers in the construction industry.
- Research on potential health effects from exposure to antibiotic resistant microorganisms on concentrated animal feeding operations (CAFOs) has helped to raise awareness about the potential for this important emerging health concern.

V. APPENDICES

APPENDIX A: PROGRAM CURRICULA

OCCUPATIONAL AND ENVIRONMENTAL HYGIENE (OEH) – MHS & PhD**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational and Environmental Health Program*Italicized:* Required courses for the Division of Environmental Health Engineering MHS & PHD Program

Course Number	Course Title	Units
First Year		
1st Term		
140.621	<i>Statistical Methods in Public Health I</i>	4
182.840	<i>Special Studies/Seminar</i>	1
187.610	Public Health Toxicology	4
188.680	Fundamentals of Occupational Health	3
340.601	<i>Principles of Epidemiology</i>	5
2nd Term		
140.622	<i>Statistical Methods in Public Health II</i>	4
182.621	Introduction to Ergonomics	4
182.625	Principles of Occupational & Environmental Hygiene	4
182.840	<i>Special Studies/Seminar</i>	1
183.631	Fundamentals of Human Physiology	4
3rd Term		
140.623	<i>Statistical Methods in Public Health III</i>	4
180.629	<i>Environmental and Occupational Health Law & Policy</i>	4
182.614	Industrial Hygiene Laboratory	5
182.623	Occupational Safety & Health Management	3
182.840	<i>Special Studies/Seminar</i>	1
4th Term		
182.615	<i>Airborne Particles</i>	3
182.622	<i>Ventilation Controls</i>	4
182.840	<i>Special Studies/Seminar</i>	1
188.681	Occupational Health	5

Electives		3
Second Year		
1st Term		
182.631	<i>Principles of Occupational Safety</i>	2
182.840	<i>Electives or Special Studies/Essay</i>	6
182.840	<i>Special Studies/Seminar</i>	1
186.601	<i>Introduction to Radiation Health Sciences</i>	5
317.600	<i>Introduction to the Risk Sciences & Public Policy</i>	3
2nd Term		
182.637	<i>Noise and Other Physical Agents in the Environment</i>	4
182.840	<i>Electives or Special Studies/Essay</i>	8
182.840	<i>Special Studies/Seminar</i>	1
317.610	<i>Risk Policy, Management and Communication</i>	3
<p>Doctoral (PhD) students in the OEH program are expected to have a master's degree from a program providing similar training to the OEH master's program described above. If there are significant gaps in master's coursework they are to be made up at the doctoral level.</p> <p>Additional doctoral course work requirements are as follows:</p>		
3rd Term		
180.609	<i>Principles of Environmental Health I</i>	4
180.610	<i>Principles of Environmental Health II</i>	4
182.638	<i>Water and Health</i>	4
317.605	<i>Methods in Quantitative Risk Assessment</i>	4
182.617	<i>Intro to Chem of Amb Air Poll Air Pollution Chem</i>	2
4th Term		
182.616	<i>Advanced Topics in Airborne Particles</i>	2
183.641	<i>The Health Effects of Indoor and Outdoor Air Pollution</i>	3
317.615	<i>Topics in Risk Assessment</i>	2
187.634	<i>Molecular Dosimetry & Biomarkers</i>	4
OR		
180.640	<i>Molecular Epi & Biomarkers in Public Health</i>	4

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) – MPH**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational and Environmental Health Nursing Program*Italicized:* Required courses for MPH Program

Course Number	Course Title	Units
Summer		
140.609	<i>Statistical Computing in Public Health</i>	2
140.610	<i>Introduction to Public Health Statistics</i>	2
221.637	<i>Health Information Systems</i>	3
223.668	<i>Social Behavioral Foundations</i>	4
550.605	<i>History of Public Health</i>	2
550.608	<i>Problem Solving in Public Health</i>	4
550.863	<i>Special Topics: MPH Goals Analysis</i>	0
1st Term		
140.621	<i>Statistical Methods in Public Health I</i>	4
187.610	Public Health Toxicology	4
188.680	Fundamentals of Occupational Health	3
188.840	Special Studies/Occupational & Environmental Health	1
317.600	<i>Intro to Risk Science & Public Policy</i>	3
340.601	<i>Principles of Epidemiology</i>	5
2nd Term		
140.622	<i>Statistical Methods in Public Health II</i>	4
182.625	Principles of Occupational & Environmental Hygiene	4
340.602	Intermediate Epidemiology	6
317.610	Risk Policy, Management and Communication	3
3rd Term		
140.623	<i>Statistical Methods in Public Health III</i>	4
182.623	Occupational Safety & Health Management	3
188.684	Occupational and Environmental Medicine	4
188.687	Occupational Health in Developing Countries	4

188.840	Special Studies/Occupational Health	1
550.866	Special Topics: MPH Integrating Experience	2
340.612	Epidemiologic Basis for TB Control	2
4th Term		
180.611	Global Environment and Public Health	4
180.840	Special Studies/Environmental Health	2
188.681	Occupational Health	5
188.840	Special Studies/Occupational Health	1
340.618	Occupational Epidemiology	Audit
550.002	Internet Skills	Audit
188.694	Advanced Topics in Occupational Health Nursing	3

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) – MSN/MPH**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational and Environmental Health Nursing Program*Italicized:* Required courses for MSN/MPH Program

Course Title	Course Number	Units
SUMMER		
550.605	<i>History of Public Health</i>	2
550.608	<i>Problem Solving in Public Health</i>	4
550.863	<i>MPH Educational and Professional Goals Analysis</i>	1
140.610	<i>Introduction to Public Health Statistics</i>	2
140.609	<i>Statistical Computing</i>	3
221.637	<i>Health Information Systems</i>	3
302.690	<i>Social and Behavioral Aspects of Public Health</i>	4
FALL (1)		
187.610	Public Health Toxicology	4
188.680	Fundamentals of Occupational Health	3
340.601	<i>Principles of Epidemiology</i>	5
180.610	<i>Principles of Environmental Health</i>	5
500.601	<i>PHN: Theory and Practice</i>	3
140.611	<i>Statistical Reasoning in Public Health</i>	6
100.515	<i>Nursing Informatics</i>	1
SPRING (1)		
182.625	Principles of Occupational & Environmental Hygiene	4
182.623	Occupational Safety & Health Management	3
188.684	Occupational and Environmental Medicine	4
500.605	<i>PHN: Leadership and Management</i>	3
100.500	<i>Concepts and Theories in Nursing</i>	3
100.503	<i>Research Design Methodology</i>	3
300.600	<i>Introduction to Health Policy</i>	4
260.605	Genomics	4

	Elective	
SUMMER (2)		
500.602	<i>PHN: Theory and Practice Practicum</i>	3
100.561	Program Evaluation	2
188.681	Occupational Health	5
188.840	Special Studies/Occupational and Environmental Health	1
188.694	Advanced Topics in Occupational Health Nursing	3
100.533	<i>Ethics of Health Care</i>	2
FALL (2)		
188.840	Special Studies/Occupational & Environmental Health	1
500.603	<i>PHN: Leadership, Management and Evaluation Practicum</i>	3
100.509	<i>Scholarly Project</i>	1
	Elective	

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) – DrPH**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational and Environmental Health Nursing Program*Italicized:* Required courses for DrPH Program

Course Number	Course Title	Units
YEAR 1		
1st Term		
140.621	<i>Statistical Methods in Public Health I</i>	4
187.610	Public Health Toxicology	4
188.840	Special Studies/Occupational Health	1
317.600	<i>Introduction to Risk Sciences and Public Policy</i>	3
550.873	Seminar in Public Health Leadership	1
2nd Term		
140.622	Statistical Methods in Public Health II	4
188.840	Special Studies/Occupational Health	1
340.602	<i>Intermediate Epidemiology</i>	6
340.608	Observational Epidemiology	4
550.873	Seminar in Public Health Leadership	1
3rd Term		
140.623	<i>Statistical Methods in Public Health III</i>	4
180.640	Molecular Epidemiology and Biomarkers in Public Health	4
188.840	Special Studies/Occupational Health	1
306.655	<i>Ethical Issues in Public Health</i>	3
550.873	Seminar in Public Health Leadership	1
4th Term		
140.623	Statistical Methods in Public Health IV	4
180.611	<i>Global Environment and Public Health</i>	4
188.840	Special Studies/Occupational Health	1
340.618	Occupational Epidemiology	4
550.873	Seminar in Public Health Leadership	1

YEAR 2		
1st Term		
551.603	<i>Fundamentals of Budgeting & Financial Management</i>	3
551.602	Approaches to Managing Hlth Svcs Organizations	2
188.840	Special Studies/Occupational Health	1
2nd Term		
182.621	Introduction to Ergonomics	4
182.637	Noise and Other Physical Agents in the Environment	4
305.861	Graduate Seminar in Injury Res and Policy	1
3rd Term		
188.684	<i>Occupational and Environmental Medicine</i>	4
305.612	Epidemiology of Injuries	
4th Term		
183.641	<i>Health Effects of Indoor and Outdoor Air Pollution</i>	3
305.613	Design and Evaluation of Comm Hlth & Safety Interventions	3
340.613	Design and Conduct of Clinical Trials	3
YEAR 3		
1st Term		
188.840	Special Studies/Occupational Health	3
2nd Term		
188.840	Special Studies/Occupational Health	1
300.750	Teaching at the University Level	3
313.790	Understanding Cost-Effectiveness Analysis in Health Care	2
3rd Term		
188.840	Special Studies/Occupational Health	3
4th Term		
188.840	Special Studies/Occupational Health	3

YEAR 4		
1st Term		
140.613	Data Analysis Workshop I	2
140.614	Data Analysis Workshop II	2
2nd Term		
188.840	Special Studies/Occupational Health	3
3rd Term		
188.840	Special Studies/Occupational Health	3

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) – PhD**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational and Environmental Health Nursing Program*Italicized:* Required courses for PhD Program

Course Number	Course Title	Units
YEAR 1		
1st Term		
140.621	<i>Statistical Methods in Public Health I</i>	4
140.607	Multilevel Models	1
221.637	Health Information Systems	2
187.610	Public Health Toxicology	4
188.680	Fundamentals of Occupational Health	3
188.840	Special Studies/Occupational Health	1
340.601	<i>Principles of Epidemiology</i>	5
2nd Term		
182.625	Principles of Occupational & Environmental Hygiene	4
140.622	<i>Statistical Methods in Public Health II</i>	4
188.840	Special Studies/Occupational Health	1
300.600	<i>Introduction to Health Policy</i>	4
305.610	Issues in Injury and Violence Prevention	2
308.602	Role of Government in Health Policy	3
182.621	Introduction to Ergonomics	3
3rd Term		
188.684	Occupational and Environmental Medicine	4
188.840	Special Studies/Occupational Health	1
182.623	Occupational Safety & Health Management	3
4th Term		
188.681	Occupational Health	5
188.840	Special Studies/Occupational Health	1
302.690	<i>Social and Behavioral Aspects of Public Health</i>	3

188.694	Advanced Topics in Occupational Health Nursing	3
YEAR 2		
1st Term		
188.840	Special Studies/Research in Occupational Health	3
2nd Term		
180.601	Environmental Health	5
550.860	<i>Research Ethics</i>	1
3rd Term		
140.623	Statistical Methods in Public Health III	4
4th Term		
140.624	Statistical Methods in Public Health IV	4
340.618	Occupational Epidemiology	4
YEAR 3		
1st Term		
188.840	Special Studies/Research in Occupational Health	3
2nd Term		
340.602	Intermediate Epidemiology	6
3rd Term		
180.640	Molecular Epidemiology and Biomarkers in Public Health	4
4th Term		
188.840	Special Studies/Research in Occupational Health	3
YEAR 4		
1st Term		
188.820	Thesis Research in Occupational Health	3
2nd Term		
188.820	Thesis Research in Occupational Health	3
3rd Term		
188.820	Thesis Research in Occupational Health	3

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE RESIDENCY (OEMR) – MPH**SAMPLE CURRICULUM**

Term and Course	Units	Requirement for:
Summer Session		
340.601 Principles of Epidemiology	5	MPH
180.601 Environmental Health	5	MPH, OEMR
550.608 Problem Solving in Public Health	4	MPH
550.863 MPH Educational & Professional Goals Analysis*	0	MPH
188.840 Special Studies/Research Occ./Env. Health	1	OEMR
1st Term		
140.621 Statistical Methods in Public Health I	4	MPH
187.610 Public Health Toxicology	4	MPH, OEMR
302.690 Social and Behavioral Aspects of Public Health	4	MPH
188.680 Fundamentals of Occupational Health	3	OEMR
182.631 Principles of Occupational Safety	2	Elective
188.840 Special Studies/Research Occ./Env. Health	1	OEMR
2nd Term		
182.625 Principles of Industrial Hygiene	4	OEMR
140.622 Statistical Methods in Public Health II	4	OEMR
182.621 Introduction to Ergonomics	4	Elective
340.608 Observational Epidemiology**	4	OEMR
182.633 Occupational Safety & Health Law	3	Elective
188.840 Special Studies/Research Occ./Env. Health	1	OEMR
3rd Term		
140.623 Statistical Methods in Public Health III	4	Elective
180.629 Environmental and Occupational Health Law And Policy	4	Elective
188.686 Clinical Environmental and Occupational Toxicology	3	OEMR
340.xxx Topics in Applied Epidemiology	4	Elective
188.840 Special Studies/Research Occ./Env. Health	1	OEMR
4th Term		
188.681 Occupational Health	5	OEMR
305.623 Fundamentals of Clinical Preventive Medicine	3	OEMR
188.611 The Global Environment and Public Health	4	Elective
300.651 Introduction to the U.S. Healthcare System	4	MPH
188.840 Special Studies/Research Occ./Env. Health	1	OEMR

*This is not a course, but rather a required document that must be submitted by each resident by the end of the first term.

**Residents interested in research or academic careers will follow the Epidemiologic Research Track which includes Epidemiologic Methods 1, 2 and 3 in the first, second and third terms, respectively. All are five-credit courses.

BIOMARKERS OF OCCUPATIONAL EXPOSURE AND SUSCEPTIBILITY (BOES) – PhD**SAMPLE CURRICULUM****Bolded:** Required courses for the BOES PhD Program*Italicized:* Required courses for the Division of Occupational and Environmental Health PhD Program

Course Number	Course Title	Units
1st Term		
188.680	<i>Fundamentals of Occupational Health</i>	3
187.646	<i>Principles of Toxicology</i>	4
340.751	<i>Epidemiologic Methods I</i>	5
140.621	<i>Statistical Methods in Public Health</i>	4
180.609	<i>Principles of Environmental Health I</i>	4
2nd Term		
182.625	Principles of Occupational and Environmental Hygiene	4
340.752	<i>Epidemiologic Methods II</i>	5
140.622	<i>Statistical Methods in Public Health II</i>	4
180.610	<i>Principles of Environmental Health II</i>	4
550.860	<i>Scientific Ethics</i>	1
3rd Term		
188.686	<i>Clinical Environmental & Occupational Toxicology</i>	3
180.640	<i>Molecular Epidemiology & Biomarkers</i>	4
140.623	<i>Statistical Methods in Public Health III</i>	4
187.634	Molecular Dosimetry and Biomarkers	4
340.753	<i>Epidemiologic Methods 3</i>	5
4th Term		
188.681	<i>Occupational Health</i>	5
180.603	Molecular Techniques for Environ Sciences	3
340.618	<i>Occupational Epidemiology</i>	4
Summer Term		
340.760	Genetic Epidemiology in Populations	2
340.665 OR	Molecular Biology for Genetic Epidemiology	1

340.664	Intro to Genetic Epidemiology	3
In addition, all students are required to complete the Academic Ethics Module (on-line course located at: http://commprojects.jhsph.edu/academics/AcademicEthics.cfm). This module should be completed within two terms of matriculation and before graduating.		
The following courses are suggested electives but not required :		
306.665	<i>Research Ethics and Integrity</i>	3
340.630	Fundamentals of Genetic Epidemiology	3
340.631	Methods in Genetic Epidemiology I	3
340.632	Methods in Genetic Epidemiology II	3
340.669	Statistical Approaches to Genetics of Cancer	3
187.630	Role of Metabolism of Xenobiotics in Toxicology	4
183.631	Fundamentals of Human Physiology	4
183.641	<i>Health Effects of Indoor and Outdoor Air Pollution</i>	3
340.610	Etiologic Factors in Cancer Epidemiology	3
340.603	Cohort Studies: Design, Analysis, and Application	4
340.604	Design and Applications of Case-Control Studies	5
340.637	Environmental Epidemiology	2
301.630	Environmental and Occupational Health Policy	4
260.601	Biologic Basis of Public Health	4
182.621	Introduction to Ergonomics	4
182.623	Occupational Safety and Health Management	3
182.631	Principles of Occupational Safety	2
180.611	<i>The Global Environment and Public Health</i>	4
180.631	Environmental and Occupational Health Policy Seminar	3
The four course Risk Sciences series (<i>course numbers listed below</i>) is also available for those with an interest in applying biomarkers to the risk sciences:		
317.600	Introduction to Risk Sciences & Public Policy	3
317.605	Methods in Quantitative Risk Assessment	4
317.610	Risk Policy, Management & Communication	3
317.615	Topics in Risk Assessment	2

OCCUPATIONAL INJURY PREVENTION (OIP) – PhD**SAMPLE CURRICULUM****Bolded:** Required courses for Occupational Injury Prevention Program

Course Number	Course Title	Units
First Year		
1st Term		
140.621	Statistical Methods in Public Health I	4
340.601	Principles of Epidemiology or Epidemiologic Methods I	5
305.610	Issues in Injury and Violence Prevention	2
300.711	Health Policy I: Social and Economic Determinants in Public Health	3
300.721	Health Policy I: PhD Lab	1
305.861	Graduate Seminar in Injury Res and Policy	1
301.861	Graduate seminar in Prevention and Public Policy	1
	Academic Ethics Module	Non-credit
2nd Term		
140.622	Statistical Methods in Public Health II	4
300.711	Health Policy II: Public Health Policy Formulation	3
300.722	Health Policy II: PhD Lab	1
305.612	Epidemiologic Methods in Injury Control	3
301.861	Graduate seminar in Prevention and Public Policy	1
305.861	Graduate Seminar in Injury Res and Policy	1
340.602	Epidemiologic Methods II	5
300.700	Teaching Assistant Orientation Seminar	1
3rd Term		
140.623	Statistical Methods in Public Health III	4
300.713	Health Policy III: Research and Evaluation Methods for Health Policy	4
306.650	Public Health and the Law	3

305.607	Public Health Practice	4
301.861	Graduate Seminar in Injury Res and Policy	1
	Graduate seminar in Prevention and Public Policy	1
340.647	Applied Epidemiology	3
Electives – up to 6 units.		
4th Term		
140.624	Statistical Methods in Public Health IV	4
300.714	Health Policy IV: Health Policy Analysis and Synthesis	3
300.724	Health Policy IV: PhD Lab	1
305.615	Occupational Injury Prevention and Safety Practices	2
300.844	First Year Doctoral Capstone	
301.861	Graduate seminar in Prevention and Public Policy	1
301.861	Graduate Seminar in Injury Res and Policy	1
Electives – up to 9 units, including two of the following:		
305.613	Design and Eval of Community Health and Safety Interventions	3
309.630	Emergency Medical Services and Trauma Systems	3
301.627	Understanding and Preventing Violence	3
Second Year		
1st Term		
188.680	Fundamentals of Occupational Health	3
300.750	Teaching at the University Level	3
300.870	Research and Proposal Writing Seminar	2
550.865	Public Health Perspectives on Research	1
182.631	Principles of Occupational Safety	2
Electives including special studies and thesis research up to 15 units.		
2nd Term		
300.871	Research and Proposal Writing Seminar	2
182.621	Introduction to Ergonomics	4
305.630	Policy, Politic and Transportation Safety	2

550.865	Public Health Perspectives on Research	1
Electives including special studies and thesis research up to 14 units.		
3rd Term		
306.665	Research Ethics and Integrity: US & International Issues	3
182.629	Environmental and Occupational Health Law and Policy	4
Electives including special studies and thesis research up to 14 units.		
4th Term		
188.681	Occupational Health	5
340.618	Occupational Epidemiology	4
Electives including special studies and thesis research up to 13 units.		

APPENDIX B: PUBLICATIONS BY PROGRAM AREA

OCCUPATIONAL AND ENVIRONMENTAL HYGIENE (OEH) PUBLICATIONS

1. Correa A, Min YI, Stewart PA, et al. Inter-rater agreement of assessed prenatal maternal occupational exposures to lead. *Birth Defects Res A Clin Mol Teratol* 2006;76:811-24.
2. 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.
3. Giardet R. Office Ergonomic Project at a Federal Agency. 2006;.
4. Jones E. Evaluation of a Respirable Dust Engineering Control for Roofing Tile Saws. 2006;.
5. Kang HK, Dalager NA, Needham LL, et al. Health status of Army Chemical Corps Vietnam veterans who sprayed defoliant in Vietnam. *Am J Ind Med* 2006;49:875-84.
6. Kim S. Methods and Measurements to Assess Mobile Source Air Toxics within a Micro-Environmental Hotspot and in Human Milk. 2006;.
7. LaRosa LE. Field and Laboratory Evaluation of an Unrefined Method for Assessing Small Airway Function. 2006;.
8. Sapkota AR, Ojo KK, Roberts MC, Schwab KJ. Antibiotic resistance genes in multidrug-resistant *Enterococcus* spp. and *Streptococcus* spp. recovered from the indoor air of a large-scale swine-feeding operation. *Lett Appl Microbiol* 2006;43:534-40.
9. Stefaniak AB, Day GA, Hoover MD, Breyse PN, Scripsick RC. Differences in dissolution behavior in a phagolysosomal simulant fluid for single-constituent and multi-constituent materials associated with beryllium sensitization and chronic beryllium disease. *Toxicol In Vitro* 2006;20:82-95.
10. Stefaniak AB, Day GA, Hoover MD, Breyse PN, Scripsick RC. Differences in dissolution behavior in a phagolysosomal simulant fluid for single-constituent and multi-constituent materials associated with beryllium sensitization and chronic beryllium disease. *Toxicol In Vitro* 2006;20:82-95.
11. Bulzacchelli MT, Vernick JS, Webster DW, Lees PS. Effects of the Occupational Safety and Health Administration's control of hazardous energy (lockout/tagout) standard on rates of machinery-related fatal occupational injury. *Inj Prev* 2007;13:334-8.
12. Dalton P, Lees PSJ, Gould M, et al. Biomonitoring to Determine Effective Occupational Exposure to Styrene Vapor and Effects on Olfactory Function. *J Occ Environ Med* 2007;Accepted.
13. McDevitt James J., Lees PSJ, Merz WG, Schwab KJ. Inhibition of Quantitative PCR Analysis of Fungal *Conidia* Associated with Indoor Air Particulate Matter. *Aerobiologica* 2007;23:35-45.

OCCUPATIONAL AND ENVIRONMENTAL HEALTH NURSING (OEHN) PUBLICATIONS

1. Agnew J. Scientific Foundations of Occupational and Environmental Health Nursing Practice. In: Salazar M, eds. Core Curriculum for Occupational and Environmental Health Nursing. 3rd Ed. ed. Saunders Elsevier, 2006:119-151.
2. de Castro AB, Curbow B, Agnew J, Haythornthwaite JA, Fitzgerald ST. Measuring emotional labor among young workers: refinement of the Emotions at Work Scale. AAOHN J 2006;54:201-9.
3. McFadden DE, Kub J, Lamar E, Fitzgerald ST. Occupational health hazards to first responders from clandestine methamphetamine labs. Journal of Addictions Nursing 2006;.
4. Pollack KM, Agnew J, Slade MD, et al. Use of employer administrative databases to identify systematic causes of injury in aluminum manufacturing. Am J Ind Med 2007;50:676-86.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE RESIDENCY (OEMR) PUBLICATIONS

- 1 Alphas HH, Schwartz BS, Stewart WF, Yousem DM. Findings on brain MRI from research studies of occupational exposure to known neurotoxicants. *AJR Am J Roentgenol* 2006;187:1043-7.
- 2 Dorsey CD, Lee BK, Bolla KI, et al. Comparison of patella lead with blood lead and tibia lead and their associations with neurobehavioral test scores. *J Occup Environ Med* 2006;48:489-96.
- 3 Ekong EB, Jaar BG, Weaver VM. Lead-related nephrotoxicity: a review of the epidemiologic evidence. *Kidney Int* 2006;70:2074-84.
- 4 Glass TA, Rasmussen MD, Schwartz BS. Neighborhoods and obesity in older adults: the Baltimore Memory Study. *Am J Prev Med* 2006;31:455-63.
- 5 Glenn BS, Bandeen-Roche K, Lee BK, Weaver VM, Todd AC, Schwartz BS. Changes in systolic blood pressure associated with lead in blood and bone. *Epidemiology* 2006;17:538-44.
- 6 Guallar E, Silbergeld EK, Navas-Acien A, et al. Confounding of the relation between homocysteine and peripheral arterial disease by lead, cadmium, and renal function. *Am J Epidemiol* 2006;163:700-8.
- 7 Latshaw MW, Glass T, Parsons P, Hidalgo J, Schwartz B. Predictors of blood mercury levels in older urban residents. *J Occup Environ Med* 2006;48:715-22.
- 8 Martin D, Glass TA, Bandeen-Roche K, Todd AC, Shi W, Schwartz BS. Association of blood lead and tibia lead with blood pressure and hypertension in a community sample of older adults. *Am J Epidemiol* 2006;163:467-78.
- 9 Rajaraman P, Stewart PA, Samet JM, et al. Lead, genetic susceptibility, and risk of adult brain tumors. *Cancer Epidemiol Biomarkers Prev* 2006;15:2514-20.
- 10 Shih RA, Glass TA, Bandeen-Roche K, et al. Environmental lead exposure and cognitive function in community-dwelling older adults. *Neurology* 2006;67:1556-62.
- 11 Stewart WF, Schwartz BS, Davatzikos C, et al. Past adult lead exposure is linked to neurodegeneration measured by brain MRI. *Neurology* 2006;66:1476-84.
- 12 Weaver VM. Section 6.4, "Renal Effects of Lead" in: U.S. Environmental Protection Agency report "Air Quality Criteria for Lead". Research Triangle Park, N.C.: U.S. Environmental Protection Agency, 2006.
- 13 Weaver VM, Lee BK, Todd AC, et al. Effect modification by delta-aminolevulinic acid dehydratase, vitamin D receptor, and nitric oxide synthase gene polymorphisms on associations between patella lead and renal function in lead workers. *Environ Res* 2006;102:61-9.

14. Hu H, Shih R, Rothenberg S, Schwartz BS. The epidemiology of lead toxicity in adults: measuring dose and consideration of other methodologic issues. *Environ Health Perspect* 2007;115:455-62.
15. Kosnett MJ, Wedeen RP, Rothenberg SJ, et al. Recommendations for medical management of adult lead exposure. *Environ Health Perspect* 2007;115:463-71.
16. Lee BK, Glass TA, McAtee MJ, et al. Associations of salivary cortisol with cognitive function in the Baltimore memory study. *Arch Gen Psychiatry* 2007;64:810-8.
17. Schwartz BS, Stewart WF. Lead and cognitive function in adults: a review of the evidence for cause, treatment, and prevention. *Int Rev Psych* 2007;.
18. Schwartz BS, Hu H. Adult lead exposure: time for change. *Environ Health Perspect* 2007;115:451-4.
19. Shih RA, Hu H, Weisskopf MG, Schwartz BS. Cumulative lead dose and cognitive function in adults: a review of studies that measured both blood lead and bone lead. *Environ Health Perspect* 2007;115:483-92.
20. Stewart WF, Schwartz BS. Effects of lead on the adult brain: a 15-year exploration. *Am J Ind Med* 2007;50:729-39.

**BIOMARKERS OF OCCUPATIONAL EXPOSURE AND SUSCEPTIBILITY (BOES)
PUBLICATIONS**

1. Colquhoun DR, Schwab KJ, Cole RN, Halden RU. Detection of norovirus capsid protein in authentic standards and in stool extracts by matrix-assisted laser desorption ionization and nanospray mass spectrometry. *Appl Environ Microbiol* 2006;72:2749-55.
2. Fagundes RB, Abnet CC, Strickland PT, et al. Higher urine 1-hydroxy pyrene glucuronide (1-OHPG) is associated with tobacco smoke exposure and drinking mate in healthy subjects from Rio Grande do Sul, Brazil. *BMC Cancer* 2006;6:139.
3. Genkinger JM, Platz EA, Hoffman SC, et al. C47T polymorphism in manganese superoxide dismutase (MnSOD), antioxidant intake and survival. *Mech Ageing Dev* 2006;127:371-7.
4. Gunier RB, Reynolds P, Hurley SE, et al. Estimating exposure to polycyclic aromatic hydrocarbons: a comparison of survey, biological monitoring, and geographic information system-based methods. *Cancer Epidemiol Biomarkers Prev* 2006;15:1376-81.
5. Latshaw MW, Glass T, Parsons P, Hidalgo J, Schwartz B. Predictors of blood mercury levels in older urban residents. *J Occup Environ Med* 2006;48:715-22.
6. Paustenbach DJ, Gaffney SH. The role of odor and irritation, as well as risk perception, in the setting of occupational exposure limits. *Int Arch Occup Environ Health* 2006;79:339-42.
7. Sapkota A, Halden RU, Dominici F, Groopman JD, Buckley TJ. Urinary biomarkers of 1,3-butadiene in environmental settings using liquid chromatography isotope dilution tandem mass spectrometry. *Chem Biol Interact* 2006;160:70-9.
8. Abnet CC, Fagundes RB, Strickland PT, et al. The influence of genetic polymorphisms in Ahr, CYP1A1, CYP1A2, CYP1B1, GST M1, GST T1 and UGT1A1 on urine 1-hydroxypyrene glucuronide concentrations in healthy subjects from Rio Grande do Sul, Brazil. *Carcinogenesis* 2007;28:112-7.
9. Gaffney SH, Paustenbach DJ. A proposed approach for setting occupational exposure limits for sensory irritants based on chemosensory models. *Ann Occup Hyg* 2007;51:345-56.
10. Paustenbach DJ, Gaffney SH, Scott PK, Brown JL, Panko JM. High background levels of urinary benzene metabolites found in a volunteer study. *J Occup Environ Hyg* 2007;4:71-7.
11. Visvanathan K, Crum RM, Strickland PT, et al. Alcohol dehydrogenase genetic polymorphisms, low-to-moderate alcohol consumption, and risk of breast cancer. *Alcohol Clin Exp Res* 2007;31:467-76.

OCCUPATIONAL INJURY PREVENTION (OIP) PUBLICATIONS

1. Katrina Consequence Assessment and Projection Report. Johns Hopkins Bloomberg School of Public Health: , 2006.
2. Archer KR, Castillo RC, Mackenzie EJ, Bosse MJ. Gait symmetry and walking speed analysis following lower-extremity trauma. *Phys Ther* 2006;86:1630-40.
3. Archer KR, Castillo RC, Mackenzie EJ, Bosse MJ, LEAP Study Group. Physical disability after severe lower-extremity injury. *Arch Phys Med Rehabil* 2006;87:1153-5.
4. Archer KR, Castillo RC, Mackenzie EJ, Bosse MJ, LEAP Study Group. Physical disability after severe lower-extremity injury. *Arch Phys Med Rehabil* 2006;87:1153-5.
5. Baker SP, Grabowski JG, Dodd RS, Shanahan DF, Lamb MW, Li GH. EMS helicopter crashes: what influences fatal outcome? *Ann Emerg Med* 2006;47:351-6.
6. Bulzacchelli M. Evaluation of the Impact of OSHA's Lockout/Tagout Standard On Occupational Injury Rates. 2006;.
7. Castillo RC, MacKenzie EJ, Wegener ST, Bosse MJ, LEAP Study Group. Prevalence of chronic pain seven years following limb threatening lower extremity trauma. *Pain* 2006;124:321-9.
8. Chen LH, Baker SP, Li G. Graduated driver licensing programs and fatal crashes of 16-year-old drivers: a national evaluation. *Pediatrics* 2006;118:56-62.
9. Chervak M. The Association of Health Risk Behaviors And Occupational Injury Among U.S. Army Basic Trainees. 2006;.
10. Farber AJ, Castillo R, Clough M, Bahk M, McFarland EG. Clinical assessment of three common tests for traumatic anterior shoulder instability. *J Bone Joint Surg Am* 2006;88:1467-74.
11. Huang YH, Ho M, Smith GS, Chen PY. Safety climate and self-reported injury: assessing the mediating role of employee safety control. *Accid Anal Prev* 2006;38:425-33.
12. Li G, Grabowski JG, Baker SP, Rebok GW. Pilot error in air carrier accidents: does age matter? *Aviat Space Environ Med* 2006;77:737-41.
13. Lincoln JM, Chen LH, Mair JS, Biermann PJ, Baker SP. Inmate-made weapons in prison facilities: assessing the injury risk. *Inj Prev* 2006;12:195-8.
14. MacKenzie EJ, Bosse MJ, Kellam JF, et al. Early predictors of long-term work disability after major limb trauma. *J Trauma* 2006;61:688-94.
14. Makary MA, Pronovost PJ, Weiss ES, et al. Sharpless surgery: a prospective study of the feasibility of performing operations using non-sharp techniques in an urban, university-based surgical practice. *World J Surg* 2006;30:1224-9.

15. Smith GS, Huang YH, Ho M, Chen PY. The relationship between safety climate and injury rates across industries: the need to adjust for injury hazards. *Accid Anal Prev* 2006;38:556-62.
16. Sorock GS, Chen LH, Gonzalzo SR, Baker SP. Alcohol-drinking history and fatal injury in older adults. *Alcohol* 2006;40:193-9.
17. Webster DW, Bulzacchelli MT, Zeoli AM, Vernick JS. Effects of undercover police stings of gun dealers on the supply of new guns to criminals. *Inj Prev* 2006;12:225-30.
18. Webster DW, Vernick JS, Bulzacchelli MT. Effects of a gun dealer's change in sales practices on the supply of guns to criminals. *J Urban Health* 2006;83:778-87.
19. Archer KR. Determinants of Referral to Physical Therapy: Influences of Patient Work Status and Surgeon Efficacy Beliefs. 2007;.
20. Cornell A, Baker SP, Li G. Age-60 Rule: the end is in sight. *Aviat Space Environ Med* 2007;78:624-6.
21. Li G, Baker SP. Crash risk in general aviation. *JAMA* 2007;297:1596-8.
22. Li G, Baker SP, Qiang Y, Rebok GW, McCarthy ML. Alcohol violations and aviation accidents: findings from the U.S. mandatory alcohol testing program. *Aviat Space Environ Med* 2007;78:510-3.
23. Neff R. In the Wrong Place?: Geographic Variation in U.S. Occupational Injury/Illness Rates. 2007;.
24. Pollack KM, Agnew J, Slade MD, et al. Use of employer administrative databases to identify systematic causes of injury in aluminum manufacturing. *Am J Ind Med* 2007;50:676-86.
25. Pollack KM, Cheskin LJ. Obesity and workplace traumatic injury: does the science support the link? *Inj Prev* 2007;13:297-302.
26. Pollack KM, Sorock GS, Slade MD, et al. Association between body mass index and acute traumatic workplace injury in hourly manufacturing employees. *Am J Epidemiol* 2007;166:204-11.
27. Rebok GW, Qiang Y, Baker SP, Li G. Age-related vision problems in commuter and air taxi pilots: a study of 3019 pilots, 1987-1997. *Aviat Space Environ Med* 2007;78:706-11.
28. Taylor J. Utility of Patient Safety Case Finding Methods and Associations among Organizational Safety Climate, Nurse Injuries, and Errors. 2007.