

**Annual Report (7/1/2015-6/30/2016)**  
**Purdue University Occupational Safety and Health Training Grant (#8615)**  
**Ellen M. Wells, Ph.D., Principal Investigator**

**SECTION I**

**Training Project Grant Summary**

Occupational and Environmental Health (OEH) education has been a priority at Purdue University since the first courses in industrial hygiene were offered in 1970 and a degree program was first offered in 1981. The high quality of our OEH graduate program is documented by the fact that we have maintained ABET accreditation for our MS program continuously since 1997 and both our MS and PhD programs have been continuously supported by a NIOSH Training Program Grant since 1993. The core curriculum for the program includes coursework in biostatistics, exposure assessment, toxicology, ergonomics, physical agents, aerosol science, epidemiology, safety and control technology. The philosophy of the program is to accept students with a solid background in the basic sciences, provide them with education and training in IH core disciplines, and develop their skills as critical thinkers, skillful researchers and capable communicators.

Over the current reporting period, our program includes 4 core faculty, 9 additional supporting faculty and/or lecturers, 4 doctoral students, and 8 master's students. We are also pleased to report that at the time of writing this report, we have hired a fifth core faculty member, Dr. Jae-Hong Park. Four of these masters' students graduated and have already found or have started seeking employment in industrial hygiene. During this reporting period, Dr. Ellen M. Wells, an occupational and environmental epidemiologist, has taken the leadership role as a new Principal Investigator of the training program. The program also recruited two new core faculty members, Dr. Jason Harris, a tenured associated professor and an expert in both industrial hygiene and health physics, and Dr. Jae-Hong Park, a tenure-track assistant professor in OEH and an expert in workplace exposure to aerosol nanoparticles. Dr. Harris joined the faculty in November 2015; Dr. Park joined us in August 2016. The program has been further enhanced by hiring Dr. Mark Wilson, Dr. John Zimbrick and Mr. Tony Havics (CIH) as nontenure-track lecturers to teach the core courses and assist student mentoring activities for this training program. Notably also, our program received a strong support from our emeritus faculty such as Dr. Neil Zimmerman who taught core classes during this period.

A significant part of our graduate student body has been derived from our ABET-accredited undergraduate program in industrial hygiene. Most of our students are from the Midwestern United States, although we have an increasing number of students and applicants from across the United States and internationally. The fact that Purdue University has this training project grant program is noted as a factor which helps attract high-caliber students to our program. Resources from this program have supported recruitment efforts at the 2016 American Industrial Hygiene Association Conference and Exposition in Baltimore, Maryland. Specifically, we had an exposition booth and organized a successful alumni reception for networking and student recruitment. Additional funds were used to support travel and related expenses to attend regional events organized by the Indiana and Chicago Chapters of the American Industrial Hygiene Association. For our students, these events provide unparalleled opportunities for learning, networking and exchanging innovative research ideas. In addition, these events provide an opportunity to recruit top students from around the country to apply for further graduate education to our program.

Two OEH trainees have been supported with this training program grant over the previous reporting period: MS student **Alexander Hughes** and doctoral student **Eric Ward**. Mr. Hughes came to Purdue after completing a bachelor's degree at Arizona State University. Since coming to Purdue he has taken a leadership role as president of our industrial hygiene student association and completed an industrial hygiene internship with Babcock & Wilcox. Mr. Ward continues to work on his dissertation project concerning assessment of multiple metal exposure among welders using air sampling and toenail biomarkers. Over the past year, he has made multiple presentations and received recognition for his work, described in more detail below. Mr. Ward was also president of the Indiana Chapter of the American Industrial Hygiene Association.

Research activities by Purdue OEH core faculty and students continues to expand in both size and quality. One of the key strengths of our program is that the diversity of our faculty encourages collaborative research projects, this benefits students as through working in these collaborations they gain experience and knowledge about working with diverse teams. Notable research projects during the past reporting period include a longitudinal study of manganese exposure and neurologic health among Indiana welders, involving **Drs. Ulrike Dydak, Frank Rosenthal and Ellen Wells; NIOSH-trainees Eric Ward and Alexander Hughes**; and many additional graduate students. This long-term project has also help supported several pilot research projects, including one led by **Dr. Wells** during this period. Towards the end of the reporting period, a new pilot project to quantify and describe particle count and metal content of welding fumes including nano-sized particles was initiated by **Drs. Wells and Rosenthal, Dr. Brandon Boor**, a new faculty member from Civil Engineering, our **NIOSH trainees Mr. Ward and Hughes**, and several other students. Meanwhile, the collaborative team **of Dr. Linda Nie, Ellen Wells and Wei Zheng**, along with several graduate students, continued work on a project to assess, for the first time, bone manganese concentration among ferroalloy workers from Zunyi, China.

### **Public Health Relevance**

This program prepares students to be leaders in the fields of industrial hygiene and occupational health and safety, and helps ensure that there are sufficient numbers of trained professionals in this area. Students study the adverse impacts of toxic exposures on the health of workers and the means to control these exposures. Through increasing the size of the occupational health and safety workforce, this project provides the talent needed to addresses several goals articulated in the Center for Disease Control and Prevention's Healthy People 2020: to prevent disease, injury and death related to the workplace. Additionally, research projects conducted by students and faculty in this program also address the Healthy People 2020 goals as well as multiple goals within the National Occupational Research Agenda. Specifically, our research addressing public health needs within Construction, Manufacturing, and Mining Sectors as well as Cross-Sector Goals within Cancer, Reproductive, Cardiovascular, and Other Chronic Disease Prevention and Respiratory Health. A main focus of our research is health effects of metal exposures, particularly among welders. This represents a regional priority, as the Midwestern region still supports a large number of manufacturing facilities, and has a higher proportion of welders than other parts of the United States.

### **Training Program Grant Website:**

<http://www.purdue.edu/hhs/hsci/students/graduate/programs/occupational.html>

### **Key Personnel**

#### **Jason T. Harris, PhD**

**Phone: 765-496-1271 Email: [jtharris@purdue.edu](mailto:jtharris@purdue.edu)**

Jason Harris joined the Purdue faculty in November 2015. He is an Associate Professor of Health Physics, co-director of the Purdue University School of Health Sciences graduate program in Environmental and Occupational Health, and the lead contact for our program's ABET reaccreditation process. Dr. Harris received his Ph.D. from Purdue University in health physics in 2007, a M.S. from the University of Illinois at Urbana-Champaign in nuclear engineering in 2002, and a B.S. in biology and marine science from the University of Tampa in 1995. Prior to joining the Purdue faculty, he was an Assistant, then Associate, Professor at Idaho State University (ISU) in the Department of Nuclear Engineering and Health Physics. Dr. Harris's research interests are related to environmental and reactor health physics, radioactive aerosol dosimetry, accelerator applications, radiation detection and measurement, nonproliferation, and nuclear security. He teaches HSCI 551 (Physical Agents in Environmental Health) and co-teaches HSCI 346 (Industrial Hygiene Engineering Control), two of the core classes in this program.

**Frank S. Rosenthal, PhD, CIH****Phone: 765-494-0812      Email: [frank@purdue.edu](mailto:frank@purdue.edu)**

Dr. Frank Rosenthal is a certified industrial hygienist and environmental health scientist who is the founder and former project director of the NIOSH training project grant at Purdue. Dr. Rosenthal's research includes exposure assessment methodology, aerosol technology, pulmonary aerosol deposition, health effects of nonionizing radiation, as well as occupational and environmental epidemiology. He teaches HSCI 345 Introduction to Occupational and Environmental Health Sciences and HSCI 545 Advanced Topics in Exposure Assessment and serves on graduate student committees.

**Ellen M. Wells, PhD, MPH, MEM****Phone: 765-496-3535      Email: [wells54@purdue.edu](mailto:wells54@purdue.edu)**

Dr. Wells is the Principal Investigator for this project. Dr. Wells has a master's degree in public health as well as environmental management (MEM) from Yale University; she completed her PhD in Occupational and Environmental Health at the Johns Hopkins Bloomberg School of Public Health. She is an Assistant Professor of Environmental and Occupational Health and co-director of the Purdue University School of Health Sciences graduate program in Environmental and Occupational Health. Dr. Wells is an experienced occupational and environmental epidemiologist whose research interests include health effects of metal exposure: her two major ongoing projects are focused on occupational manganese exposure in welders and ferroalloy workers. Dr. Wells continues to teach HSCI 547, Environmental Epidemiology, a core class in this program, and has mentored the majority of students in this program over the reporting period.

**Wei Zheng, PhD****Phone: 765-496-6447      Email: [wzheng@purdue.edu](mailto:wzheng@purdue.edu)**

Dr. Wei Zheng is an occupational toxicologist specializing in the neurotoxicity of metals. He is a Professor of Toxicology and Head of the School of Health Sciences. His long term goal has been to explore the occupational and environmental causes of Parkinson's disease (PD) for better diagnosis, prevention and intervention. His group has more than 25-year experience in mechanistic investigation of manganese (Mn) – induced parkinsonian disorders among welders and smelters. With the support from NIH/NIEHS since 1994, he has conducted human studies in welders and smelters who are occupationally exposed to Mn, by assessing air concentrations of metals (Mn, Al, Cu, and Fe), by evaluating neurological outcomes and by other epidemiological means. Most recently, he has established the collaborations with Dr. Linda Nie to use her noninvasive neutron activation X-ray fluorescence technique to investigate the body burden of Mn, Pb and aluminum (Al) among workers. For prevention and therapy, his group has developed unique techniques to study Mn, Fe and Cu distribution and transport across the brain barrier systems. For his many years of experiences in workplace research and student training, his laboratory has been a good place for NIOSH training students. Dr. Zheng teaches HSCI 560, Toxicology, and is a co-mentor for many graduate students in this program.

In addition to our core faculty members above, we are grateful to have the assistance and contributions of many additional experts who have actively supported our program during this project period by teaching classes, mentoring students, and collaborating on research projects:

- Brandon Boor, PhD; Assistant Professor; specialization: env.engineering/indoor air quality
- Jason Cannon, PhD; Associate Professor; specialization: toxicology
- Ulrike Dydak, PhD; Associate Professor, specialization: exposure assessment, medical imaging
- Jennifer Freeman, PhD; Associate Professor; specialization: toxicology
- Tony Havics, CIH; Lecturer; specialization: industrial hygiene
- Linda Nie, PhD; Associate Professor, specialization: exposure assessment, health physics
- James D. Schweitzer, PhD; Associate Professor and Purdue REM Director
- Mark Wilson, Lecturer, specialization: industrial hygiene/occupational health
- John Zimbrick, PhD; Professor Emeritus; specialization: industrial hygiene/health physics
- Neil Zimmerman, PhD, CIH; Professor emeritus; specialization: industrial hygiene

## SECTION II

### Program Highlights

Major trends and accomplishments in our program over the past year are summarized above; below we detail several significant highlights and accomplishments from the past year (7/1/2015-6/30/2016).

- **Dr. Jason Harris** joined our core faculty as a tenured associate professor in November 2015. **Dr. Jae-Hong Park** accepted a tenure-track assistant professor position in the spring of 2016 and joined our faculty in August 2016.
- Four students (**Erick Cleveland, Kelly Dwyer, Brittany Logsdon, and Andrea Wilkerson**) completed our new 4+1 MS program and graduated in May or August 2016.
- This NIOSH Training Project Grant supported two trainees: master's student **Alexander Hughes**, and doctoral student **Eric Ward**.
- An alumni survey was completed in spring 2016. Highlights from the survey include an overall good or high satisfaction with the quality of their training; the addition of business and/or risk communication courses was suggested to supplement the existing curriculum.
- Core faculty and students from our program published more than 12 articles in peer-reviewed journals, including *Environmental Health Perspectives, International Journal of Disaster Risk, and Toxicological Sciences*.
- Doctoral student and **NIOSH trainee Eric Ward** received the Eli Lilly Industrial Hygiene Student Award in April 2016.
- Doctoral student **Danelle Rolle** was awarded a first place award for her poster "Bone Manganese (BnMn) as a biomarker of cumulative Mn exposure: a pilot study" at the Indiana Public Health Week Conference in April 2016; **Drs. Wells, Wei Zheng, and Linda Nie** were coauthors on the poster.
- Supporting faculty, **Dr. Ulrike Dydak**, was named a Purdue University Faculty Scholar in recognition of her exceptional contributions to research.
- Doctoral student **Danelle Rolle** was awarded a first place poster award at the Indiana Public Health Week Conference.
- Former **NIOSH trainee Dallas Cowan** received the Outstanding Young Alumni Award from the School of Health Sciences. He also gave several guest lectures on industrial hygiene to our undergraduate and graduate students.
- **Dr. Wells**, in collaboration with other faculty from Purdue, was funded to organize a symposium, "How technology is improving public health" held in April 2016.
- A team including **Dr. Wells, NIOSH trainee Eric Ward, Mahmoud Nour, Christelene Horton, Dr. Rosenthal and Dr. Ulrike Dydak** presented the poster "Impact of welding material on manganese exposure among welders," at the University of Michigan's Center for Occupational Health and Safety Engineering Research Symposium in March 2016.
- **Danelle Rolle**, with **Drs. Wells, Zheng, and Nie** as coauthors, presented the poster "Blood lead, blood manganese, and grip strength in older U.S. Adults: NHANES 2011-2012" at the American Public Health Association meeting in November 2015.
- **Drs. Wells, Dydak and Rosenthal** obtained funding from the University of Michigan ERC Pilot Research Program and completed the study "Impact of welding material and exposure controls on manganese exposure and olfactory function: a natural experiment."
- **Drs. Dydak, Rosenthal and Wells**, along with multiple students including **NIOSH trainee Eric Ward**, began the second round of data collection for a longitudinal study to determine early-stage health effects among welders in Indiana.
- **Dr. Nie** received the Early Career Research Award from the Purdue University College of Health and Human Sciences in fall 2015.
- **Dr. Brandon Boor**, in collaboration with **Dr. Wells**, received pilot funding for a project to develop and implement clean cookstove technology in Nandi, Kenya.
- **NIOSH Trainee Eric Ward** presented his work on neuropsychological function and mixed metal exposure in welders at the Society of Toxicology 55<sup>th</sup> Annual Meeting in March 2016.