

Annual Report (7/1/2014-6/30/2015)

Purdue University Occupational Safety and Health Training Grant (#8615)

Ellen M. Wells, Ph.D., Principal Investigator

SECTION I

Training Project Grant Summary

Purdue University's graduate program in Occupational and Environmental Health (OEH) has been training students to serve in industrial hygiene, safety, and occupational health for more than 35 years. The program currently offers a Ph.D. and an M.S. in OEH. The M.S. program is accredited by the Accreditation Board for Engineering and Technology (ABET); and is the only accredited graduate OEH program in Indiana. Over the past year, we have developed and received approval for a 4+1 program leading to both a B.S. and a M.S. degree in Occupational Health; we anticipate celebrating graduation of our first 4+1 class in the summer of 2016. The program draws many of its applicants from Indiana and nearby states and in turn graduates of the program often serve in industrial hygiene, safety and occupational health positions in this region. The program also serves the state and surrounding region through research projects on occupational health problems in local and regional workplaces. Program faculty includes specialists in industrial hygiene, epidemiology, and toxicology and is supported by additional faculty within our School as well as across the University. Faculty members are engaged in numerous important research projects concerning ergonomics, real-time video exposure monitoring, indoor air quality, nanoparticle exposure and health impacts, characterization and development of exposure biomarkers, as well as metal neurotoxicology and epidemiology. 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 education and training in IH core disciplines (e.g. exposure assessment, toxicology, epidemiology, engineering control technology, ergonomics), and develop their skills as critical thinkers, researchers and communicators, through classroom and laboratory instruction, student projects and thesis research.

Public Health Relevance

This program prepares students to be leaders in the fields of industrial hygiene and occupational health and safety. Students study the adverse impacts of toxic exposures on the health of workers and the means to control these exposures. Research projects provide the opportunity to explore specific issues in Indiana as well as globally.

Training Program Grant Website:

We released a new, updated design for our website in February 2015!

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

Key Personnel

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Core Faculty /Project Director (*report period*)

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Dr. Candace Tsai

Core Faculty

Specialization: Nanotechnology, Industrial Hygiene

Current affiliation: Colorado State University

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SECTION II

Program Highlights

Purdue University's Occupational and Environmental Health program was well represented at the 2015 American Industrial Hygiene Association's Conference and Exposition (AIHce) in Salt Lake City, Utah. Dr. Frank Rosenthal helped organize and was a speaker at the roundtable symposium, "Lead Poisoning Prevention: On the Threshold of New Initiatives and Discoveries." Dr. James McGlothlin was awarded the AIHA Volunteer Group Service Award and the AIHA Service Award for his dedicated service to the American Industrial Hygiene Association.

Several award-winning posters were also presented at the 2015 AIHce meeting. A team of undergraduate students working with Dr. James McGlothlin won first place from the non-ionizing radiation committee for their poster "The Effects of Different Levels of Ambient Oxygen on the Production of Surgical Fires." Graduate student Aparna Shinde, advised by Dr. Candace Tsai, won second place for Best of Session for her poster "Comparison of Cytotoxicity of Carbon Nanomaterials in Human Lung Normal and Cancer Cell Lines". Two graduates of Purdue's OEH program also won awards for their posters: Frank Pagone for "Use of Geospatial Analysis in Environmental and Occupational Health: IEPA Brownfield Site Cluster Identification" and Mark Wilson for "Cardiovascular Effects of Work-Related Stress in Working Women."

Dr. Wei Zheng received the prestigious Career Achievement Award from the Metals Specialty Section of the Society for Toxicology. The award was presented during the 2015 Society for Toxicology meeting in San Diego, CA.

Dr. James McGlothlin, with graduate student and former NIOSH trainee Josh Horton, completed a laboratory study of a scavenging system to evaluate and control airborne pathogens for health care workers in the Post Anesthesia Care Unit and the Intensive Care Unit. Dr. McGlothlin has also published studies on the use of infrared thermography to visualize waste anesthetic gases, and on prevention through design in the iron and steel industry. Dr. McGlothlin received an Apple Technical Award for the "best new technical app for industry" for the app "NIOSH RWL" which enables calculations with the NIOSH Revised Lifting Equation. Post-doctoral associate and former NIOSH trainee Sandra Cole, together with Dr. McGlothlin has present work on the evaluation and control of waste anesthetic gases in the post anesthetic care unit and on the use of ergonomically designed trash bags at recent AIHce meetings.

Dr. Ulrike Dydak, in collaboration with Dr. Ellen Wells, Dr. Frank Rosenthal, and doctoral student Eric Ward, have started to acquire the second time point of their longitudinal study on neurotoxic effects of occupational exposure to manganese in local US welders. The study, funded as "Outstanding New Environmental Scientist" Award (R01) by NIEHS, uses neuroimaging, neurological and neuropsychological assessment together with exposure sampling and modeling to develop a sensitive noninvasive biomarker of effect of Mn toxicity in the occupational setting. As part of the study brain manganese levels, as quantified through magnetic resonance imaging, and toe nail manganese levels are being investigated as biomarkers of exposure and correlated to

altered brain metabolism, cognitive and motor function.

As part of this NIEHS-funded study on neurotoxic effects of welding fumes by Dr. Ulrike Dydak, her doctoral student and NIOSH trainee Eric J. Ward completed a study investigating how chronic exposure to the metals manganese, copper, iron, and zinc from welding fumes impacts motor and cognitive function. This study was funded by a NIOSH pilot grant to Mr. Ward. Mr. Ward obtained a travel award from the Society of Toxicology to present his results at the annual SOT meeting in 2015. Mr. Ward's work includes evaluation of toenails as a possible biomarker of exposure and modeling how chronic manganese exposure and its effects on neurological function might be modified given exposure to other essential metals. Further, he recently became the Indiana local section president of the American Industrial Hygiene Association, was awarded a patent and has another one pending.

Dr. Ellen Wells, in collaboration with Dr. Ulrike Dydak, Dr. Frank Rosenthal, and graduate student Danelle Rolle, has recently completed a study which investigates the association of blood manganese and additional metals among welders with performance on neurologic function tests. She has also obtained additional funding to explore the impact of using a high-Mn content steel as a base welding material on occupational manganese exposure. Both of these projects are funded with NIOSH pilot grant funds.

Drs. Ellen Wells, Linda Nie, and Wei Zheng continued their collaborative research on searching for a novel biomarker for manganese exposure among smelting workers in Zunyi – known as the “manganese capital of China.” These three faculty members, along with graduate student Danelle Rolle and post-doctoral associates Farshad Mostafaei and Yingzi Liu traveled to Zunyi, China during the summer 2015 to train local study staff and set up their newly invented neutron activation analysis (NAA) equipment. The NAA equipment uses noninvasive means to quantify bone levels of manganese among workers who have been exposed to Mn. The project, funded with two NIOSH R21s obtained by Dr. Nie, aims to establish a reliable biomarker for early diagnosis of manganism among welders, smelters and miners due to occupational exposure as well as determine whether there are associations between chronic manganese exposure with motor and cognitive skills. In addition, it will establish a baseline level of manganese in human bone.