

**University of Cincinnati Education and Research Center - 5T42OH008432**  
**Annual Report**  
**Reporting Period: July 1, 2016 – June 30, 2017**  
**Principal Investigator: Tiina Reponen, PhD**

**SECTION I:**

**Summary:**

The purpose of the University of Cincinnati Education and Research Center is to provide an excellent interdisciplinary educational environment for graduate students in four core (Industrial Hygiene, Occupational Health Nursing, Occupational Medicine Residency and Occupational Safety and Health Engineering) and one component (Biomonitoring) training program. Additionally our goal is to support the development of research skills through Pilot Research Program (PRP) and Targeted Research Training (TRT) programs; encourage innovative and interdisciplinary research to identify causal relationships between exposure and illness or injury, design control strategies and evaluate the effectiveness of interventions; deliver continuing education (CE), consultation and outreach. We address environmental and occupational safety and health needs through regional partnerships; and advocate the translation of research findings into practice regionally, nationally and internationally. This is accomplished through a collaboration of faculty from the Colleges of Medicine, Nursing and Engineering. The ERC leadership seeks input from an External Advisory Board, which represents key stakeholders.

Academic program trainees have been accepted into MS, MPH, and PhD graduate programs in their respective Colleges and Departments. Non-academic program trainees in the PRP represent graduate students, junior faculty or senior faculty transitioning into occupational safety and health. Trainees in CE and Outreach span the range of educational backgrounds and employment, as the program reaches practitioners in multiple disciplines as well as employees with health and safety responsibilities in diverse work settings. The TRT involves faculty and students in all academic programs to provide a safer and more healthful workplace in regionally important employment sectors: firefighters, emergency responders, and healthcare workers. The PRP Symposium and the Annual Topical Symposium are open to the community providing an opportunity for more than 100 professionals to interact with the investigators. The annual Research Capacity Building Workshop is offered for 15-20 junior investigators at PRP institutions.

Classroom and laboratory facilities are available in each College. Numerous clinical rotations are available to the physicians. Practicum locations are arranged with various employers. Substantial fieldwork is done by all disciplines, utilizing local workplaces for walk-throughs, evaluation of potential workplace exposures, multi-disciplinary workshop projects, and research-to-practice projects.

**Relevance:**

Occupational injury and illness add substantially to health care costs. The educational programs offered by the ERC prepare professionals to serve in their respective roles on the health and safety team – identifying hazardous exposures, reducing risk and treating injury and illness, and minimizing disability. Through outreach, students translate research to practice and learn of the need for CE as part of life-long learning.

**Key Personnel:**

Center Director:

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## **SECTION II: Center Highlights**

### **Pilot Research Program (PRP)**

**Program Director: Amit Bhattacharya, PhD, CPE**

Below are examples of PRP project impacts from research efforts conducted during the past.

#### **Black Carbon Validation of a Novel Sensor for Traffic-Related Indoor Air Pollution**

An Industrial Hygiene PhD student is working on evaluating a state-of-the-art tool for monitoring traffic-related particles (TRAP). The new monitor is expected to make the personal assessment of indoor air quality easier as the individuals wear a smaller, lighter, and quieter sampling device. It allows an industrial hygienist to collect gravimetric and real-time aerosol data and conduct more accurate and less costly laboratory analyses. By ensuring that these new exposure monitors are capable of detecting TRAP successfully, researchers and industrial hygienists are armed with a user-friendly tool to monitor indoor air quality. The real-time data can lead to potential solutions to reduce or remove indoor air pollution. The goal of improving overall worker health and safety can be achieved by improving the indoor air quality and reducing the risk of asthma and other respiratory illnesses.

#### **Firefighter Physiological Health Assessment and Hazard Monitoring Device**

A PhD student in electrical and computer engineering is developing a wearable physiological health assessment and hazard-monitoring device. This device will have an impact because Firefighters are at risk for both injury and death when on active duty from mainly overexertion and sudden events such as slips, falls, contact with an object, or impact from objects. The device developed through this research project will allow monitoring of the firefighter's physiological health and sudden health events allowing the device to contact the supervisor to reduce the number of injuries and death from overexertion and to request immediate assistance for the sudden events. The results of the project demonstrate the possibility to combine basic health assessment devices into a smaller wearable platform that can be used as a warning system in the workplace.

#### **Targeted Research Training (TRT)**

**Program Director: Tiina Reponen, PhD**

A group of trainees and faculty in the Occupational Safety and Health (OSHE) program participated in an UC Accelerator project and an Ohio I-CORPS program. Firefighter garments developed in Nanoworld within the OSHE program were determined to be a potentially good product-market fit. The fabric is a carbon nanotube hybrid material that is lightweight, flame retardant, spreads heat, and filters particles and toxic gases from the environment. Thus, it can significantly improve the safety of firefighting. The product is being developed through a collaboration with industry product developers (Lion Products) and industry stakeholders (Local Fire Chief). This product was based on the results from our TRT program that was previously focused on heat stress in firefighters.

The current focus of the TRT program is on home healthcare professionals where we have conducted preliminary pilot studies in the home healthcare simulator at Maple Knoll Retirement Community. These studies have started to document the aerosol flow in homes that differs from the more clinical environment of hospitals or long-term care facilities. Preliminary data were

collected on the exposures expected for home healthcare workers when utilizing cleaning products in the home.

## **Outreach**

### **Program Director: Kermit Davis, PhD, CPE**

Our social media tool, CERKL, continues to be a major pathway to disseminate information about our programs to the regional stakeholders, which include local, state, and federal government officials as well as industry contacts. The current enrollments in this outreach tool for the ERC programs are: 325 in Industrial Hygiene program, 86 in Occupational Health Nursing, 29 in Occupational Medicine, and 539 in Occupational Safety Engineering. Each of the groups actively distribute information about the program including job postings, announcements of symposia, summaries of thesis and dissertations, and awards for trainees and faculty.

Part of the outreach program included a new program that targeted collaborations between multiple ERC CE programs to develop an online course. The Mountain and Plains ERC and Johns Hopkins ERC are currently working on the development a self-paced online course for occupational health nurses called Occupational Health Nursing Online Review Course. This collaboration will provide a state-of-the-art course using experts from both ERCs.

## **Continuing Education**

### **Program Director: Amit Bhattacharya, PhD, CPE**

We continued to offer robust courses in occupational and industrial hygiene and safety. In the reporting period, we offered 37 unique courses to 1,586 trainees. The highlights during this reporting period were: 1) our courses took our experienced faculty to Egypt, 2) we trained US Air Force School of Aerospace in toxicology and risk assessment and 3) we expanded our online efforts by offering three webinar courses.

## **Industrial Hygiene**

### **Program Director: Kermit Davis, PhD, CPE**

Reviews of our Industrial Hygiene Program often highlight positive feedback from students on the field workplace hazard characterization course. Students conduct a full site assessment, conduct an exposure assessment, and develop practical recommendations. This partnership with local businesses teaches the students by doing while providing a service that improves worker health. In visits over the last two years such surveys have directly resulted in the following impacts for local businesses and workers: 1) reduced noise exposures in a liquid mixing room through replacement of an agitator muffler, 2) decreased solvent exposures via repairs to a local exhaust ventilation system, 3) eliminated powder leaks and aerosols in a dry product blending operation, 4) reduced potential silica exposures through substitution of blasting cabinet materials, and 5) documented the value of using electric fork trucks to reduce warehouse carbon monoxide levels.

## **Biomonitoring**

### **Program Director: Glenn Talaska, PhD, CIH**

The Biomonitoring Program launched an effort to enhance our education and research capacity to include physiologically-based pharmacokinetic (PBPK) modeling techniques. There are few academic programs in the country that offer expertise in this area. Such models represent mathematical descriptions of the disposition of chemicals in the body following exposure and are the state of the science for interpreting biological exposure marker data. To

improve access to such tools we are also improving model access by converting from proprietary software to open source R coding. To enable this development over the reporting period we developed and offered a new graduate course on toxicologic modeling for biological monitoring applications and are building this innovation in several current graduate student research projects.

### **Occupational Medicine**

#### **Program Director: Andrew Freeman, MD, MS**

Our Occupational Medicine residents have continued to impact the field of occupational safety and health through their innovation and leadership. We have recent graduates within large organizations guiding health and safety programs including Dow Chemical, Wright Patterson Air Force Base,, and Procter & Gamble. One resident worked on an Ohio Bureau of Workers' Compensation project that is linking drug combinations to future injuries, and he serves on a national panel of experts looking at ways to improve drug safety. Finally, another resident led a team that conducted a LEAN management project uncovering inefficiencies and recommending improvements for chemotherapy therapeutic trials at UC Hospital.

### **Occupational Health Nursing**

#### **Program Director: Susan Reutman, RN, PhD**

An Occupational Health Nursing (OHN) graduate is the Clinical Manager of the Workplace Violence Prevention Program in of the Veteran's Health Administration (VHA) Central Office. He developed and promulgated a model of workplace violence with components that address prevention through education, threat assessment and reduction, and improved incident reporting. His model has been applied at 142 VHA hospitals and affiliated clinics where it has promoted consistent protection of patients, visitors, and staff. Model concepts have been incorporated in the national VHA employee safety effort, which was a factor in improving in VHA workplace violence reporting by up to seven-fold.

Another OHN graduate is a tenured Associate Professor in the School of Nursing at Duke University. There, she serves as a Senior Fellow in the Duke University Center for Aging and Human Development. Her translational research focus areas span and bridge best nursing care practices in occupational health and long-term care settings.