The University of Iowa
Education and Research Center
NIOSH Training Grant T42OH008491

Annual Report
July 1, 2024 - June 30, 2025

Heartland CENTER FOR OCCUPATIONAL Health & Safety

ERC Summary

The vision of the Heartland Center for Occupational Health and Safety is to be the leading educational and outreach resource for workplace safety and health in Federal Region VII (Iowa, Kansas, Missouri and Nebraska). The Center's mission is to reduce injuries, illnesses, and fatalities of workers by expanding and strengthening the occupational health and safety workforce with well-trained and well-informed professionals. The Center serves as a resource for the region by providing interdisciplinary graduate-level training that will increase the number of highly knowledgeable and experienced occupational health and safety (OHS) professionals. The Center consists of 5 academic training programs including industrial hygiene, occupational safety, ergonomics, agricultural safety and health, and occupational injury prevention. The Center's outreach and continuing education programs enhance the capabilities of occupational health and safety professionals to reduce the high rates of occupational disease and injury. These programs provide practical information for the professional development of OHS professionals, and serve as a conduit of OHS-related information throughout the region. Through the scientific and professional expertise of its faculty and staff, the Heartland Center is well positioned to address OHS issues unique to the region that is dominated by agriculture and industries supporting agriculture. A vigorous pilot grant program results in impactful research projects, many of which address these regional concerns. Heartland Center strengths include: a rigorous evaluation and planning administrative structure; the productive research capacity of its faculty; a commitment to interdisciplinary training and research, active continuing education and outreach programs, and strong institutional support of Center activities.

Relevance

The major rationale for the Heartland Center is to address OSH problems unique to Federal Region VII, in particular a demand for trained OHS professionals in this region with its high rural population. The Heartland Center trains over 30 graduate-level students each year who obtain jobs directly related to their training in industry, academia, and government agencies. The Center's continuing education program, which serves nearly 1200 professionals annually, improves their ability to reduce the high regional rates of occupational disease and injury. The Center also reaches out to over 10,000 regional businesses through an outreach program that provides consultation and current information to increase awareness of occupational health and safety issues in Region VII.

Key Personnel

ERC Website:
https://heartland.public-health.uiowa.edu/

Patrick O'Shaughnessy Center Director	patrick-oshaughnessy@uiowa.edu 319.335.4202
Thomas Peters Center Deputy Director: Director, Industrial Hygiene Academic Training Program	thomas-m-peters@uiowa.edu 319.335.4436
Nir Keren Director, Occupational Safety Academic Training Program; Director, Pilot Project Research Training Program	nir@iastate.edu 515.294.2580
Carri Casteel Director, Occupational Injury Prevention Academic Training Program	carri-casteel@uiowa.edu 319.384.4388
Nathan Fethke Director, Ergonomics Academic Training Program	nathan-fethke@uiowa.edu 319.467.4653
Diane Rohlman Director, Agricultural Safety and Health Academic Training Program	diane-rohlman@uiowa.edu 319.384.4007
Tammi Goerdt Director, Continuing Education; Director, Center Outreach	tammi-goerdt@uiowa.edu 319.335.4423

High Impact Accomplishments

The 2024–2025 reporting period comprised a number of high-impact accomplishments of faculty, staff, and trainees of the Heartland Center Education and Research Facility (ERC) at the University of Iowa (UI). The most notable of these are provided below.

Innovative Breakthroughs in Silica Detection Emerges from the IH

Exciting developments are underway in the Industrial Hygiene (IH) Program at the University of Iowa, where faculty and trainees are pioneering a faster, more affordable method to measure respirable crystalline silica—a hazardous substance linked to serious occupational diseases. Under the guidance of **Dr. Tom Peters**, **MS trainee Matthew Saylor** is leading thesis research that leverages the unique optical properties of quartz under polarized light microscopy (PLM). Quartz's birefringence and interference colors allow for precise sizing and identification, and when paired with the open-source image analysis platform ImageJ, researchers can automate the process to determine the percentage of crystalline silica in samples.

This novel approach could revolutionize field analysis by offering a rapid and cost-effective alternative to the current standard, powdered X-ray diffraction. Even more promising, previous studies suggest PLM could be adapted for smartphone-based systems, opening the door to mobile, in-field detection. As technology continues to advance, this research positions the IH Program at the forefront of practical, scalable solutions for workplace health and safety.

Dr. Patrick O'Shaughnessy is also investigating crystalline silica measurement techniques through a round-robin approach to determine whether laboratory measurements of crystalline silica mass on a filter using the standard X-Ray diffraction (XRD) method corresponds to the weight of silica deposited on a filter measured with an analytical balance. Results of this effort indicate that the XRD method is underreporting deposited mass. These results will be used to initiate an effort to establish more accurate laboratory methods.

Drones Take Flight to Uncover Hidden Air Contaminants Near Swine Barns

In a cutting-edge effort to better understand the environmental impact of livestock operations, Dr. Thomas Peters and MS trainee McCulley at the University of Iowa are deploying swarms of drones to track airborne pollutants emitted from swine barns. Their research focuses on how contaminants like particulate matter (PM), ammonia (NH□), and hydrogen sulfide (H□S) disperse into surrounding communities—potentially affecting air quality and public health.

What sets this study apart is its use of autonomous drones equipped with advanced sensors, capable of collecting high-resolution data across different altitudes and distances. The team has successfully programmed a coordinated swarm of drones to fly in precise patterns, capturing air quality data that traditional ground-based methods often miss. Fieldwork is currently underway at barns of varying sizes and under diverse weather conditions. The insights gained from this innovative approach could shape future environmental assessments and inform policy decisions aimed at protecting rural communities from hidden air borne hazards.

Agricultural Safety and Health Program Influences Workers Globally and Locally

Trainees in the Agricultural Safety and Health (ASH) Training Program have actively learned from and disseminated research findings through international collaborations, local conferences, webinars, and hands-on learning experiences. As part of a training grant funded by the Fogarty International Center and the National Institute of Environmental Health Sciences, students and faculty from the American University of Beirut traveled to Iowa to participate in a short course on agricultural safety. During the course, they attended lectures by trainee **Anna Proctor** (PhD, 2025) on injury prevention for young agricultural workers and by trainee **Matison Howard** (PhD, 2025) on highly pathogenic avian influenza. The group also joined other ASH trainees on a site visit to a robotic dairy farm, gaining exposure to cutting-edge agricultural technologies and their implications for worker safety.

ASH Trainees **Caroline Powell** (MS, 2026) and **Elizabeth Foster** (MS, 2026) expanded their global perspectives through preceptorships at the National Centre for Farmer Health in Australia, supported by the College of Public Health Global Travel Awards. Powell's work focused on emergency preparedness in agricultural communities, examining social and environmental factors, while Foster explored how precision agriculture technologies can improve both productivity and safety outcomes.

Trainee **Mary (Molly) Rhodes** (PhD, 2026) received a fellowship through the Center for Arabic Study Abroad to study Arabic and conduct a research project in Jordan, where she is interviewing farmers about their pesticide safety knowledge.

Locally, trainee **Chase Lovercheck** (MS, 2025) presented research at the Midwest Rural Agricultural Safety and Health Conference, and trainee Caroline Powell co-led an AgriSafe webinar with trainee Audrey Tran Lam titled *"Environmental Health Literacy and Agricultural Exposures: Where Ag Safety and Cancer Prevention Meet."* These diverse activities reflect the program's commitment to advancing agricultural health and safety through both global engagement and local outreach.

From Classroom to Contaminants: Industrial Hygiene Trainees Dive into Real-World Risk

For two University of Iowa Industrial Hygiene MS students, summer internships proved to be more than just a resume booster—they were a full immersion into the complex, hands-on world of occupational health. **JT Bonds**, one of the program's rising stars, spent his internship with a consulting firm where he explored nearly every facet of the industrial hygiene profession. From investigating moisture and mold issues to conducting indoor air quality assessments, noise monitoring, and sampling for hazardous substances, Bonds found himself in a range of environments—from residential homes to pharmaceutical labs and manufacturing plants. "It was a crash course in the field," Bonds said.

"I got to work with specialized equipment, learn calibration techniques, and collect meaningful data that informed real decisions." By the end of his internship, Bonds had earned the trust to independently manage smaller remediation projects and contribute to larger ones. He also gained insight into the operational backbone of industrial hygiene—handling chains of custody, inspecting gear, coordinating with manufacturers, and drafting final reports. With mentorship guiding him throughout, Bonds emerged with a solid foundation in both technical skills and professional practice.

Meanwhile, fellow trainee Cindy Rico Chavez took her talents to Climax Molybdenum Co., where she bridged the gap between academic theory and industrial reality.

Chavez applied NIOSH sampling methods to evaluate workplace hazards including ammonia, benzene, soluble molybdenum, and silica. She worked with advanced detection tools like Ventis Pro 5 monitors, UMEX-300 badges, noise dosimeters, and gas monitors. Her standout project involved assessing ammonia exposure risks. Chavez analyzed personal and area sampling data against OSHA, NIOSH, and company standards, and created heat maps to pinpoint high-exposure zones and tasks that occasionally exceeded short-term limits. "This internship pushed me to think critically and communicate effectively," Chavez said. "It was rewarding to contribute to projects that directly impact worker health and safety."

Both Bonds and Chavez exemplify the power of experiential learning in preparing the next generation of industrial hygienists. Their stories reflect a growing emphasis on real-world training, where students not only learn the science—they live it.

Advancing Agricultural Health Through Research and Funding Success

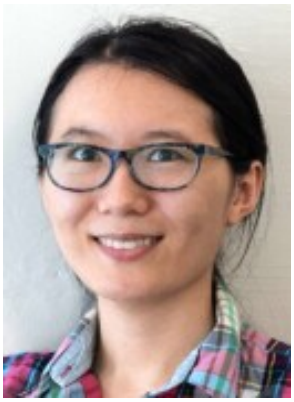
Trainees in the Agricultural Safety and Health (ASH) Training Program have demonstrated strong research productivity and success in securing competitive funding. Trainee **Anna Proctor** (PhD, 2025) was awarded a pilot grant from the Great Plains Center for Agricultural Health for her project *"Conversations about Safety: Protecting Young Farm Workers."* Trainee Mary (Molly) Rhodes (PhD, 2026) received a pilot grant from the Heartland Center for her dissertation research examining *"Neonicotinoids and Reproductive Health Outcomes."* Additionally, trainees **Caroline Powell** (MS, 2026) and **Elizabeth Foster** (MS, 2026) were awarded Global Public Health Travel Grants to support their international preceptorships in Australia.

Trainee **Matison Howard** (PhD, 2025) co-authored a publication in the *Journal of Safety Research* titled *"Teen Perceptions of Parental Monitoring and Its Impact on Their Risky Road Behavior: An Analysis of the National Youth Risk Behavior Survey"*. Trainee **Ernesto Mendez** (PhD, 2026) also contributed to a publication in *Archives of Environmental and Occupational Health* titled *"Impact of Chlorpyrifos Exposure on Lung Function in Egyptian Adolescent Agriculture Workers"*. These accomplishments highlight the program's emphasis on fostering independent research, scholarly dissemination, and global engagement among its trainees.

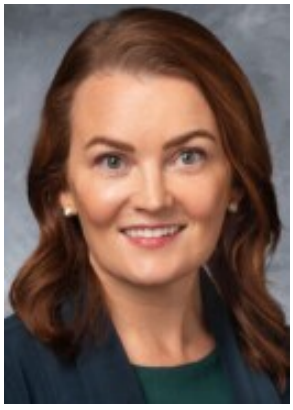
Center Highlights and Activities

Industrial Hygiene Program Expands Faculty, Broadens Horizons in Exposure

The University of Iowa's Industrial Hygiene Program is entering a new era of innovation and interdisciplinary strength with the addition of two exceptional faculty members: Dr. Jin Pan and Dr. Kathryn Dalton. Their arrival marks a strategic expansion in both expertise and vision, positioning the program at the forefront of exposure science and public health research.



Dr. Jin Pan, Assistant Professor of Occupational and Environmental Health, brings a global academic pedigree and a cutting-edge research portfolio. With degrees from Tsinghua University, UC Berkeley, and Virginia Tech, and postdoctoral training in environmental engineering, Dr. Pan specializes in aerosol physics and biological aerosol detection. Her research zeroes in on airborne transmission of respiratory pathogens—including influenza, coronavirus, and Pseudomonas species—and explores the use of ultraviolet light as a preventive measure in occupational settings. She will play a pivotal role in developing engineering controls to reduce inhalation exposure to infectious aerosols in the workplace.



Joining her is **Dr. Kathryn Dalton**, PhD, VMD, MPH, whose multidisciplinary approach to exposure science is reshaping how researchers think about health across human, animal, and environmental systems. An Assistant Professor in the Department of Occupational and Environmental Health, Dr. Dalton investigates microbial dynamics and environmental exposures that contribute to respiratory and infectious diseases. Her work spans the urban-rural continuum and employs multi-omic methods to explore the "One Health Microbiome"—a concept that examines the interconnected health impacts of human-animal-environment interactions. Her current projects include studying home exposures affecting children with asthma, tick-borne disease risks among agricultural workers, and antimicrobial resistance from both occupational and community perspectives. Her research has been featured in top-tier journals and major media outlets including The New York Times and The Washington Post.

Together, Drs. Pan and Dalton bring a powerful synergy to the Industrial Hygiene Program, expanding its scope beyond traditional occupational exposures.

Their expertise strengthens the program's capacity in indoor air quality and ambient environmental exposures, laying the groundwork for a broader focus on general exposure assessment. This evolution not only enhances the academic experience for IH MS trainees but also increases the appeal of program graduates to allied disciplines such as environmental health, epidemiology, and public policy.

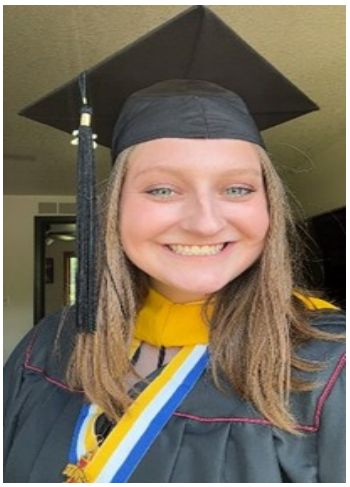
"This expansion allows us to pursue funding from a wider range of sources and build bridges across disciplines," said program director Dr. Tom Peters. "We're preparing our students to be leaders in a rapidly changing landscape of public health and environmental science." With these new appointments, the Industrial Hygiene Program is poised to become a national leader in exposure science—where innovation meets impact, and the classroom meets the real world.

Occupational Safety Trainee Investigates Safety Issues in Rural Iowa High Schools

John Temple (MS, 2025), a trainee in the Occupational Safety program, completed his studies in May 2025. His thesis title was: *A qualitative assessment of classroom safety issues experienced by rural secondary experiential instructors in Iowa*. The safety needs regarding the most experienced career and technical education (CTE) safety issues are unknown amongst experiential instructors in rural Iowa high schools. Ten issues were identified from STEM and CTE classrooms across the country as being the most impactful CTE safety issues affecting instructors currently: overcrowding and workspace design; safety training of educators; adequacy of machinery and facilities; PPE use and availability; lack of, or confusion on, PPE policy and safety audits; lack of engineering controls, eyewash stations, and safety showers, lack of district safety programs and preps and time pressure on instructors; OSHA, SDS, chemical handling and storage, and first aid programs; and unsafe behaviors and interventions. Are these issues still issues in rural Iowa agricultural classrooms? If so, what resources are needed? If not, what has been done to alleviate the issue? Three agricultural, two general science, two industrial technology, and one family and consumer science instructor were interviewed. Preps and time for safety, district support of instructor safety training and policy, and instructor safety resources, especially regarding SDS and chemical handling, were considered the major issues by this group. PPE use, appropriate attire, and student behavior were also reoccurring issues. Building connection and trust with students while weeding out bad behaviors was suggested as a solution. Participants asked for standardization and aggregation of safety instruction resources, as well as consistency with district on safety policy. Third party curricula, collaboration with fellow instructors, and experience were identified as solutions to instructor safety training and safety instruction in the classroom. Mr. Temple is now working as an occupational safety professional with PMX Industries.

Relationship Between Leadership Styles and Safety Performance for Occupational Safety Managers Explored

Mallory Leazer (MS, 2025), a trainee in our occupational safety program performed her thesis research titled: *The relationships between leadership styles, leadership skills, and safety performance for occupational safety managers.* Ms Leazer partnered with a Midwest workers' compensation insurance provider to identify safety managers for her study and get access to workers' compensation claims. The first portion of the project focused on the leadership styles and leadership skills of safety managers,' and the assessment was completed through an electronic survey that assessed leadership with questionnaires made by Peter Northouse. The second portion of the project focused on comparing the leadership styles and skills of safety managers to workers' compensation data. This was completed to assess both the leadership and the safety performance at the companies where the respondents worked. Comparing the first project results to the second helped answer the objective of the research which was determining if relationships exist between leadership skills, leadership styles, and workers' compensation. Overall, this research helped to contribute to the occupational health and safety discipline by further examining the relationships between leadership and safety performance. Based on the findings, teaching current and future safety professionals the importance of learning leadership skills and leadership styles can help to further improve workplace safety. Ms. Leazer is now working as an occupational safety profes-



US Marine Corps Veterans Study Injury and Violence in the Military

The Occupational Injury Prevention program is proud to have two trainees who are US Marine Corps veterans. Joshua Gautreaux (pictured on the left) is a second-year PhD student in Occupational and Environmental Health and an Operation Enduring Freedom Marine Corps veteran. He is conducting research on workplace incivility and health, health behaviors, and injury outcomes among Iowa National Guard service members. Mr. Gautreaux's dissertation research will examine health and self-harm behaviors in the period between ending active-duty military service and transitioning to veteran status.

Nicholas Lioto (pictured on the right) is a first-year PhD student interested in examining unique exposures among veteran and active-duty military populations, such as intense physical demands and exposure to hazardous substances during deployments, on injury and health outcomes. Mr. Lioto has an MS in Industrial Hygiene from the University of Iowa and a background in occupational safety management.

Health Outcomes of Multiple Jobholders Investigated

Tyler Guzowski, MS, a doctoral trainee of the Heartland Center's Ergonomics Training Program has been awarded pilot funding from the NIOSH-funded Healthier Workforce Center of the Midwest (HWC) to support his doctoral dissertation research. Mr. Guzowski is interested in occupational health outcomes among those who routinely work two or more jobs, or "multiple jobholders," which is a prevalent but under-studied employment experience in the United States. His research will leverage data from the General Social Survey (https://gss.norc.org/) and its Quality of Worklife module (https://gss.norc.org/us/en/gss/quality-of-worklife.html) to explore important questions about the effects of jobholding status on both musculoskeletal and mental health. The project will build upon existing evidence examining health implications of multiple jobholding using relevant occupational exposure data,