The Midwest Center for Occupational Health and Safety

RESEARCH-TO-PRACTICE:
SELECTED EXAMPLES FROM THE MCOHS

The MCOHS (http://www.mcohs.umn.edu) is a center of excellence that is preparing the next generation of occupational health and safety practitioners, educators and researchers. This interdisciplinary center is a collaborative effort that engages the faculty, staff and students of the University of Minnesota, and HealthPartners' Institute for Education and Research as well as external stakeholders from the private and public sectors throughout the region.

Below are selected research projects that have and will continue to have an effect on occupational health and safety:

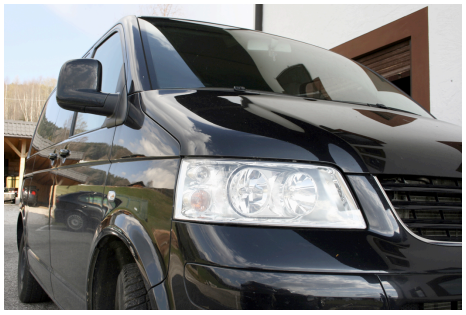
Reducing the Burden of Injuries On Agricultural Operations

Agriculture ranks among the most hazardous industries. Dr. Susan Gerberich leads a team of co-investigators and students to conduct major injury prevention studies that are the basis of regional research-to-practice efforts. These studies investigate the incidence, risk factors and consequences of agricultural and other injuries in Minnesota, Wisconsin, North and South Dakota and Nebraska. The study results are used to identify intervention efforts, using input from regional Agricultural Extension leaders working directly with operators and communities. Dissemination has also been accomplished through numerous peer-reviewed publications and presentations in local, national and international arenas.

Developing a Quality Improvement Intervention to Protect Oncology Healthcare Workers

Approximately 8 million health care workers are unnecessarily exposed to highly toxic drugs used to treat cancer; these antineoplastic drugs can contribute to negative health effects for these workers. Occupational health nursing PhD student, Catherine Graeve, industrial hygiene PhD student, Susan Arnold, Dr. McGovern, and others, partnered with a major Midwestern hospital and its outpatient chemotherapy infusion clinic to evaluate workers' exposures to antineoplastic drugs. Study findings revealed that workers' use of personal protective equipment was lower than recommended and chemical residue was identified in several locations, thus, providing baseline information for a tailored health and safety intervention to protect workers from exposures. (Graeve et al, 2017, Jan., Workplace Health & Safety, http://journals.sagepub.com/toc/whsd/current)

Nanoparticle Releases During Vehicle Recycling



Most parts from automobiles are reused or recycled at the end of the useful lives of the vehicles. Because car manufacturers now use nanocomposite materials in their vehicles, they are concerned that workers involved in recycling components from automobiles may receive harmful exposures to airborne nanoparticles emitted from the parts as they are shredded for recycling.

Dr. Raynor and MPH student, Jessica Ingraham, used a range of sampling instruments and analytical techniques to evaluate airborne particles generated as a granulator shreds nanocomposite test plaques and test plaques that did not contain nanoparticles. This work was performed in conjunction with Argonne National Laboratory and the U.S. Council for Automotive Research. The study suggested that recycling of nanoclay-reinforced plastics does not have a strong potential to generate more airborne nanoparticles than recycling of conventional plastics, nor does it have a strong potential to generate unique airborne nanoparticles of the composited nanomaterial.

Rollover Protective Structure Rebate Program Funded

Tractor rollovers are the single deadliest type of injury incident on farms in the United States. Dr. Adrienne Landsteiner, occupational health services research and policy alumna, and an epidemiologist from the MN Department of Health Center for Occupational Health and Safety, collaborated with representatives of state agencies, the MN legislature, agricultural industry, and health and safety personnel, to prevent the number of fatalities occurring within Minnesota's agricultural sector by supporting a bill for a Rollover Protective Structure Rebate Program initiative in 2016. The bill was approved and $250,000 was allocated to the program; additional support has been received from private donations.

Preventing Violence against Teachers

Dr. Gerberich and a team of co-investigators and students have been providing translation of research data from the Minnesota study of "Violence Against Teachers: Etiology and Consequences," to practice throughout the school systems, in collaboration with their dedicated advisory board of teachers. Risk factor identification, which serves as a basis for development of relevant interventions, includes consideration of various environmental factors, assault deterrents, violence policies, and school financial resources. To date, results have been disseminated at numerous major professional meetings, including audiences involving teachers, and in peer-reviewed publications.

Breastfeeding among Employed Women

The U.S. continues to have one of the lowest breastfeeding rates in the industrialized world, despite evidence of the health benefits for infants and mothers. Most employed women in the U.S. return to work by three months postpartum, such that employment policies that support longer duration of breastfeeding in line with Healthy People 2020 are needed.

To facilitate employers' efforts in making worksites "breastfeeding friendly," Julie Alcorn-Webb, MA, an occupational health nursing MPH student and director of the MCOHS continuing education program, partnered with the Minnesota Breastfeeding Coalition (MBC) and the Minnesota Department of Health. Julie produced a toolkit of resources based on research of effective worksite lactation programs to guide MBC Coalition members as they work with employers to meet state criteria for a Breastfeeding Friendly Workplace. Website: https://mnbreastfeeding coalition.org/ four-steps-to-meeting-mbc-objective-1-toolkit/.

Quantitative Aid for Decision Making in Industrial Hygiene

Drs. Ramachandran and Mulhausen, and PhD students Perry Logan, Susan Arnold, and Monika Vadali have developed quantitative methods for incorporating professional judgment and exposure modeling into industrial hygiene decision-making. They have been conducting a NIOSH-funded study that looks at the accuracy and determinants of such decisions. Industrial hygienists from major companies such as 3M, Intel Corporation, Pfizer Inc., Rohm and Haas, Merck, and W.L. Gore, are collaborating in the study. Results indicate that targeted training dramatically improves decision-making accuracy.

Physical Fitness Program for Law Enforcement

Law enforcement officers must be physically fit to safely and effectively perform their jobs. Scientific literature suggests that law enforcement officers have lower than average physical fitness levels. Yet there are no national fitness standards for these officers.

MPH student, Christina Cusic, MD, designed a framework for developing fitness programs for law enforcement to address this need and decrease risk of illness and mortality. She used this framework to help develop a structured physical fitness program for the Plymouth, Minnesota Police Department. Over 55% of the officers participated in baseline fitness assessments and continue to exercise at the newly remodeled on-site facility. This framework is being used in other public safety departments for implementation of similar programs. Her work also supports the need for national fitness standards for law enforcement.

Taconite Workers Health Study

Drs. Ramachandran and Raynor and doctoral student, Jooyeon Hwang

Minnesota houses one of the world's largest bodies of iron ore, and supplies 65% of the ore needed for North American steel production. Mining has been conducted in the state since the early part of the previous century. During that time, thousands of workers have been employed in this industry. Worker studies in the early 1990s indicated the presence of abnormal chest x-rays, suggestive of silica-related exposures. More recently, a cohort of taconite workers has indicated an apparent excess of mesothelioma, as determined via the state's cancer surveillance system. Although undoubtedly related to asbestos exposure, the exact cause of this problem and its significance, along with a comprehensive view of the health of this industry is being determined.

Led by several MCOHS investigators (Drs. Mandel, Alexander, Ramachandran, Raynor, Perlman), and involving students (Jooyeon Hwang, Elizabeth Allen, Nnaemeka Odo, Christine Lambert, Jinny Johnson, Monika Vadali), several worker studies are in progress and include:

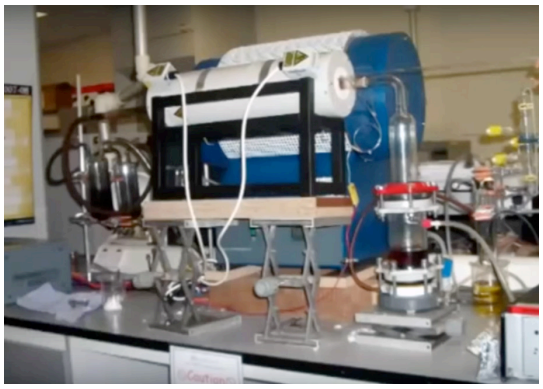
- Cohort mortality study of all causes of death in taconite workers (n=68,000);
- Cancer incidence study that focuses on the major cancers associated with asbestos exposure;
- Screening survey of occupational lung disease within current and former taconite workers and their spouses;
- Workplace exposure assessment that utilizes current and past exposure data and complements the above-mentioned studies.

Use of Advanced Air Nozzles to Reduce Noise Levels

Nancy Bergman and Kurt Prieve (IH MS students) and Dr. Raynor, studied the use of advanced air nozzles to control noise levels in industrial settings. Ms. Bergman found that installation of advanced air nozzles on a punch press reduced noise dose by 50-75%. Mr. Prieve measured average sound level reductions of about 9 dB when air guns with advanced nozzles replaced existing conventional air guns.

In both cases, the greatest reductions were observed for frequencies greater than 1,000 Hz, to which human hearing is most sensitive and where the greatest damage from excessive noise occurs. Honeywell and 3M Company are using these findings to make changes in air nozzles in their manufacturing environments in order to reduce noise exposures.

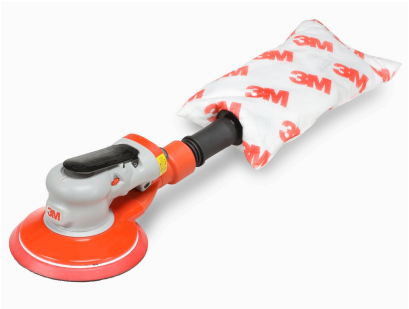
Midwest Emerging Technologies Public Health and Safety Training (METPHAST) Program



With funding from the National Institute for Environmental Health Sciences, Dr. Raynor, Dr. Ramachandran, and former MCOHS Continuing Education Director Ruth Rasmussen

work on the METPHAST Program with colleagues from the University of Iowa and Dakota County Technical College. The goal of the program is to ensure that emerging technologies grow without causing illness or injury to workers and the public. The program's primary objective is to develop a comprehensive array of web-based modules on nanotechnology health and safety that can be used by instructors to create academic lessons, courses and continuing education initiatives that serve the unique needs of different learners. The METPHAST Program is developing 20 web-based modules to train professionals to work safely with engineered nanomaterials and two academic courses that will be offered jointly by the University of Minnesota and the University of Iowa. Content will be made freely available to instructors and learners in several ways, including through the METPHAST Program's YouTube at https://www.youtube.com/channel/UC8OS96CgraPftseRCo4hjuw.

Comparison of Emissions between Self-Generated Vacuum and Conventional Sanding Systems

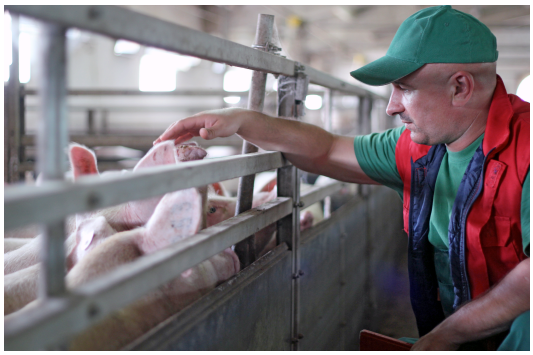


Conventional abrasive sanding generates high concentrations of particles. MPH student David Liverseed and Dr. Raynor conducted research at 3M Company to understand the differences in particle emissions between a conventional random orbital sanding system and a self-generated vacuum random orbital sanding system with an attached particle filtration bag. Particle concentrations were measured for each system in a controlled test chamber when the sanders were used on oak wood, chromate-painted steel panels, and gel-coated fiberglass panels. Higher concentrations were always measured during conventional sanding. Depending on the substrate being sanded, concentrations were between 300 and almost 5000 times greater for the conventional sanding system than the self-generated vacuum sanding system. The data suggest that workers using conventional sanding systems could utilize the self-generated vacuum sanding system technology to reduce exposure to potentially-hazardous particles.

Evaluating Measures to Reduce Exposure to Mouse Urine Protein

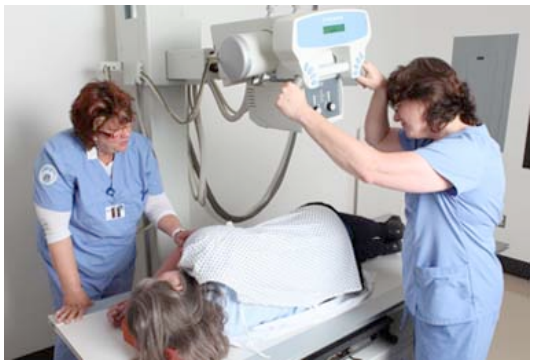
MS students Joe Hexum and Ning Lee and MPH student Rebecca Burton have worked with Dr. Ramachandran and Dr. Raynor on projects to understand the best ways to control exposures to airborne mouse urine protein (MUP) among workers who transfer research mice between cages and dump bedding from dirty cages. Exposures to MUP can lead to severe allergic reactions, and preventing exposure is an important priority for the Research Animal Resources office and the Department of Environmental Health and Safety at the University of Minnesota. Initial research indicated persistent problems in historical sampling for MUP because different methods were used at different times and sites, convoluting analyses of the effectiveness of different types of ventilation controls. After standardizing sampling procedures, later work indicated that biosafety cabinets and clean benches are not sufficiently protective for workers during cage changing. Respiratory protection should be required for animal care staff during cage changing even while using biosafety cabinets.

Preventing Zoonotic Disease in Agriculture Exposed Populations



In collaboration with the NIOSH-funded Upper Midwest Agriculture Safety and Health Center (UMASH), Drs. Alexander and Bender and occupational epidemiology student, Evan Sorely, are working with the Minnesota Department of Health on the epidemiology of infectious diseases acquired from agricultural exposures. Agricultural workers, their families and visitors to their farms are potentially exposed to a number of zoonotic agents, including cryptosporidium, E. coli, salmonella, and campylobacter. The incidence of these conditions appears to be higher in populations exposed to agriculture; but, the exact rates are difficult to estimate. This project will also characterize antibiotic resistant patterns in these infections that occur to people working in agriculture.

Characterizing the Risk of Chronic, Low Dose Ionizing Radiation Exposure on the Risk of Developing Cataracts



Drs. MacLehose and Alexander and former PhD student, Craig Meyer, are completing a study of cataract incidence in the U.S. Radiologic Technologists (USRT) study. Radiologic technologists are exposed to ionizing radiation from a variety of sources and there is considerable growth in the use of medical imaging procedures and radiotherapy, which has contributed to a six-fold increase in average annual population dose from medical radiation since 1980. This study characterized the risk of long-term, low dose ionizing radiation exposure on the risk of developing cataracts in a population of over 90,000 radiologic technologists. The results of this study will provide needed information for evaluating cataract risk from ionizing radiation exposure, something that is currently being debated by the International Commission on Radiological Protection.

Our Setting: The University of Minnesota

The University of Minnesota has an enrollment of approximately 51,000 students on its Twin Cities campus, with a total enrollment of 65,000 students across its five campus locations. The University is one of the largest in the country and ranks among the top universities in the United States in terms of quality of education; it also ranks among the top public institutions in terms of federal monies received. The Twin Cities campus in Minneapolis and St. Paul is comprised of 17 colleges and professional schools and offers the full range of academic and professional degrees.

Website: http://www.umn.edu/

Our Setting: the School of Public Health

The School of Public Health is a top-ranking research institution with a strong reputation for its educational programs. Through excellence in education, research, and community engagement, the school advances health — from scientific discovery to public impact — by enhancing population health and preventing disease in the U.S. and globally.

Website: http://sph.umn.edu/

UNIVERSITY OF MINNESOTA

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CONTACT INFORMATION:

Susan Goodwin Gerberich, PhD, Director
Midwest Center for Occupational Health and Safety
Division of Environmental Health Sciences
School of Public Health, University of Minnesota
420 Delaware Street SE – MMC – 807
Minneapolis, Minnesota 55455
Telephone: 612-626-5464 or
1-877-366-2647 (1-877-36-MCOHS)
E-mail: gerbe001@umn.edu
Website: www.mcohs.umn.edu