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2021

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April 2021

NIOSH Science and Service Awards 2021

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

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James P. Keogh Award for Outstanding Service in Occupational Safety and Health

James P. Keogh Award for Outstanding Service in Occupational Safety and Health

This award recognizes a current or former NIOSH employee for exceptional service in the field of occupational safety and health.

James P. Keogh, M.D., worked throughout his life for peace and social change. He sought to safeguard workers through education about hazards, and he advocated workplace protections.

Dr. Keogh's earliest work in academic medicine identified dimethylaminopropionitrile as the causal agent in an outbreak of bladder neuropathy in the 1970s. Dr. Keogh could determine this because—unlike many of the clinicians initially contacted by the workers—he took their complaints seriously and applied clear public health principles to his investigation.

Throughout his life, he listened carefully to workers, characterized hazards and diseases, and then fearlessly worked to identify compensation for the individual and prevention strategies for others. Dr. Keogh was instrumental in including construction workers in the Maryland Occupational Safety and Health lead standard, a full decade before the federal standard included them. He was a leading medical educator who always focused on the need to incorporate clinical compassion with public health prevention. His most outstanding legacy, however, was his fierce determination to put knowledge into practice to benefit the worker.

James P. Keogh Awardee

Dr. Maryann D'Alessandro

Dr. D'Alessandro is recognized worldwide for her commitment to advancing personal protective technologies to reduce workplace injuries, illness, and death. As Director of the NIOSH National Personal Protective Technology Laboratory, her efforts directly enhance workforce safety and health both nationally and globally, and her emergency response contributions relating to personal protective equipment (PPE) are unsurpassed.

Widespread shortages of the N95 respirator, the most common type used in healthcare, were reported even before the COVID-19 outbreak became a pandemic. In response, Dr. D'Alessandro led the federal effort to quickly coordinate activities for the Food and Drug Administration's (FDA), Emergency Use Authorization (EUA). This effort allowed the use of other NIOSH-approved respirators, such as elastomeric and powered air purifying, not normally used in healthcare, and significantly increased the inventory of respirators immediately available for healthcare providers.

Dr. D'Alessandro also led discussions with manufacturers to increase production by bringing previously approved products back to market, reviving production locations, or establishing new facilities. Her innovative thinking established a process allowing non-traditional manufacturers to obtain temporary NIOSH approvals for new respiratory devices. Her leadership helped reduce respirator approval times from 60-90 days to 7-14 days, and more than doubled the number of monthly approvals. Her efforts supported the nation's largest respirator manufacturer to more than quadruple U.S. production from 22 million in 2019, to 95 million by the end of 2020, and double global production from 1 billion to 2 billion annually.

During an influx of imported respirators. Dr. D'Alessandro and her staff developed an abbreviated, scientifically valid filtration test, revealing that over 60 percent of more than 400 international respirators were substandard. Sixty models, representing potentially millions of substandard respirators, were removed from the FDA's EUA list. Working with state and local governments, her efforts led to the capture of 2.5 million counterfeit products at the nation's borders. Many international organizations requested assistance, recognizing NIOSH's reputation as the world's leading resource for PPE expertise.

Previous James P. Keogh Awardees

2020: Christopher Coffey

2019: Leslie Nickels

2018: Pete Kovalchik

2017: Diane Porter

2016: Thomas R. Waters

2015: Kathleen Kreiss

2014: Albert E. Munson

2013: Michael Attfield

2012: Alice Suter

2011: Linda Rosenstock

2010: James W. Collins

2009: John Howard

2008: Mitch Singal

2007: Steven Sauter

2006: Marilyn Fingerhut

2005: Rosemary Sokas

2004: Dawn Castillo

2003: James A. Merchant

2002: Philip J. Landrigan

2001: William Edward Halperin

2000: Richard A. Lemen

Alice Hamilton Award for Occupational Safety and Health

This award recognizes the scientific excellence of NIOSH technical and instructional materials. Categories include Behavioral and Social Science, Communication and Guidance, Engineering and Control, Epidemiology and Surveillance, Exposure and Risk Assessment, Methods and Laboratory Science, Research Service, and, new for 2021, COVID-19 Communication and COVID-19 Research. The annual award honors Dr. Alice Hamilton (1869–1970), a pioneering researcher and occupational physician.

Many early laws to improve workers' health derived from the work of one talented researcher—Alice Hamilton, MD. Born into a prominent Indiana family (her sister was the well-known classicist, Edith Hamilton), Dr. Hamilton graduated from the University of Michigan Medical School in 1893. After joining the Women's Medical School of Northwestern University in 1897, she moved into Jane Addams' Hull House in Chicago and opened a well-baby clinic for poor families in the neighborhood. There, she began to study the underlying social problems related to their pains, strange deaths, lead palsy, "wrist drop," and many widowed women.

In 1908, Dr. Hamilton published one of the first articles on occupational health in the United States. Two years later, she began exploring occupational toxic disorders. Relying primarily on "shoe leather epidemiology," and the emerging science of toxicology, she pioneered occupational epidemiology and industrial hygiene in the United States. Her scientifically persuasive findings caused sweeping reforms to improve the health of workers.

In 1919, Dr. Hamilton became assistant professor of industrial medicine at Harvard Medical School and the school's first female faculty member. While there, she served two terms on the Health Committee of the League of Nations. Upon retiring from Harvard at age 66, she became a consultant to the U.S. Division of Labor Standards and president of the National Consumers League.

On February 27, 1987, NIOSH dedicated the Alice Hamilton Laboratory for Occupational Safety and Health, in Cincinnati, Ohio, in her honor.

Alice Hamilton Award Finalists

Finalists are listed alphabetically by nomination title.

Behavioral and Social Science

Comparing self-reported and O*NET-based assessments of job control as predictors of self-rated health for non-Hispanic whites and racial/ethnic minorities

Fujishiro K, Koessler F [2020]. Comparing self-reported and O*NET-based assessments of job control as predictors of self-rated health for non-Hispanic whites and racial/ethnic minorities. PLoS One *15*(8):e0237026.

Do injured workers receive opioid prescriptions outside the workers' compensation system? The case of private group health insurances

Asfaw A, Quay B, Chang C-C [2020]. Do injured workers receive opioid prescriptions outside the workers' compensation system? The case of private group health insurances. J Occup Environ Med *62*(9):515–522.

Occupational injury and psychological distress among U.S. workers: the National Health Interview Survey, 2004-2016

Gu JK, Charles LE, Fekedulegn D, Ma CC, Violanti JM, Andrew ME [2020]. Occupational injury and psychological distress among U.S. workers: the National Health Interview Survey, 2004–2016. J Saf Res *74*:207–217.

Communication and Guidance

3D printing with filaments: health and safety questions to ask

NIOSH [2020]. 3D printing with filaments: health and safety questions to ask. By Glassford E, Dunn KL, Dunn KH, Hammond D, Tyrawski J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2020-115.

3D printing with metal powders: health and safety questions to ask

NIOSH [2020]. 3D printing with metal powders: health and safety questions to ask. By Glassford E, Dunn KL, Dunn KH, Hammond D, Tyrawski J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2020-114.

COVID-19 Communication

Interim Guidance for Businesses and Employers Responding to Coronavirus Disease 2019 (COVID-19)

Dahm M, Delaney L, Dowell C, Dunn KL, Edmonson M, Garcia A, King B, Martin S, Mead K, Novicki E, Shugart J, Topmiller J. A set of products to assist businesses and employers in reducing COVID-19 among workers.

NIOSH Science Blogs to Address PPE Concerns and Questions During COVID-19

Boyles H, Casey M, Cichowicz J, Coffey C, D'Alessandro M, Greenawald L, Hornbeck A, Kilinc-Balci FS, Pollard J, Powell J, Powers J, Rottach D, Sinkule E, Snyder J, Williams W. A series of blogs addressing COVID-19 concerns and questions related to personal protective equipment.

Optimizing Personal Protective Equipment (PPE) Supplies

Bell M, Bergman M, Britton J, Casey M, Christensen B, Cichowicz J, Cole G, Dahm M, de Perio M, D'Alessandro M, Delaney L, Dowell C, Dunn KL, Edmonson M, Fazio G, Fisher E, Forrester C, Fries M, Fritz JE, Greenawald L, Gupta N, Harris J, Harney J, Kallen A, Kilinc-Balci FS, Kosmoski C, Kuhar D, Metzler R, Niemeier RT, Norton E, Patel A, Pillai S, Radonovich L, Schaefer M, Stein R, Tyrawski J, Young M. A set of resources to assist healthcare facilities in optimizing supplies of personal protective equipment.

What Grocery and Food Retail Workers Need to Know about COVID-19

Jacklitsch B, Edmondson M, King B, Caruso D. A fact sheet with recommendations for reducing COVID-19 among grocery and food retail workers.

COVID-19 Research

Characteristics of health care personnel with COVID-19—United States, February 12-April 9, 2020

Burrer SL, de Perio MA, Hughes MM, Kuhar DT, Luckhaupt SE, McDaniel CJ, Porter RM, Silk B, Stuckey MJ, Walters M [2020]. Characteristics of health care personnel with COVID-19—United States, February 12-April 9, 2020. MMWR *69*(15):477–481.

Filtering facepiece respirators with an exhalation valve: measurements of filtration efficiency to evaluate their potential for source control

NIOSH [2020]. Filtering facepiece respirators with an exhalation valve: measurements of filtration efficiency to evaluate their potential for source control. By Portnoff L, Schall J, Brannen J, Suhon N, Strickland K, Meyers J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2021-107.

Key and Emerging Worker Safety and Health COVID-19 Research Updates

Weber A, Whelan E, Estill C, Hirst D, MacMahon K, Marsh S, Novakovich J, Pana-Cryan R, Pollard J, Rocheleau C, Weissman D, Burton N, Christensen B, Dunn KH, Fryman S, Hartley D, Hartley T, Martin S, Mazurek J, Mead K, Noti J, Quay B, Radonovich L, Reichard A, Shockey T, Velazquez-Kronen R, Wassell J. A set of products for the CDC COVID-19 Response highlighting current information on topics relevant to worker safety and health.

Engineering and Control

A technique to measure respirator protection factors against aerosol particles in simulated workplace settings using portable instruments

Vo E, Horvatin M, Bergman M, Wu B, Zhuang Z [2020]. A technique to measure respirator protection factors against aerosol particles in simulated workplace settings using portable instruments. J Occup Environ Hyg *17*(5):231–242.

Estimation of the critical external heat leading to the failure of lithium-ion batteries

Tang W, Tam WC, Yuan L, Dubaniewicz T, Thomas R, Soles J [2020]. Estimation of the critical external heat leading to the failure of lithium-ion batteries. Appl Therm Eng *179*:115665.

Reducing ultrafine particulate emission from multiple 3D printers in an office environment using a prototype engineering control

Dunn KL, Hammond D, Menchaca K, Roth G, Dunn KH [2020]. Reducing ultrafine particulate emission from multiple 3D printers in an office environment using a prototype engineering control. J Nanoparticle Res *22*(5):112.

Epidemiology and Surveillance

Impact of workplace injury on opioid dependence, abuse, illicit use and overdose: a 36-month retrospective study of insurance claims

Asfaw A, Boden LI [2020]. Impact of workplace injury on opioid dependence, abuse, illicit use and overdose: a 36-month retrospective study of insurance claims. Occup Environ Med *77*(9):648–653.

Population-based age adjustment tables for use in occupational hearing conservation programs

Flamme GA, Deiters KK, Stephenson MR, Themann CL, Murphy WJ, Byrne DC, Goldfarb DG, Zeig-Owens R, Hall C, Prezant DJ, Cone JE [2020]. Population-based age adjustment tables for use in occupational hearing conservation programs. Int J Audiol *59*(Suppl 1):S20–S30.

Work-related adverse respiratory health outcomes at a machine manufacturing facility with a cluster of bronchiolitis, alveolar ductitis and emphysema (BADE)

Cummings KJ, Stanton ML, Kreiss K, Boylstein RJ, Park J-H, Cox-Ganser JM, Virji MA, Edwards NT, Segal LN, Blaser MJ, Weissman DN, Nett RJ [2020]. Work-related adverse respiratory health outcomes at a machine manufacturing facility with a cluster of bronchiolitis, alveolar ductitis and emphysema (BADE). Occup Environ Med *77*(6):386–392.

Exposure and Risk Assessment

A cumulative risk perspective for occupational health and safety (OHS) professionals

Niemeier RT, Williams PRD, Rossner A, Clougherty JE, Rice GE [2020]. A cumulative risk perspective for occupational health and safety (OHS) professionals. Int J Environ Res Public Health *17*(17):6342.

Estimation of the number of workers exposed to respirable crystalline silica by industry: analysis of OSHA compliance data (1979-2015)

Doney BC, Miller WE, Hale JM, Syamlal G [2020]. Estimation of the number of workers exposed to respirable crystalline silica by industry: analysis of OSHA compliance data (1979–2015). Am J Ind Med *63*(6):465–477.

Exposures and emissions in coffee roasting facilities and cafés: diacetyl, 2,3-pentanedione, and other volatile organic compounds

LeBouf RF, Blackley BH, Fortner AR, Stanton M, Martin SB, Groth CP, McClelland TL, Duling MG, Burns DA, Ranpara A, Edwards N, Fedan KB, Bailey RL, Cummings KJ, Nett RJ, Cox-Ganser JM, Virji MA [2020]. Exposures and emissions in coffee roasting facilities and cafés: diacetyl, 2,3-pentanedione, and other volatile organic compounds. Front Public Health *8*:561740.

Methods and Laboratory Science

Biological effects of inhaled hydraulic fracturing sand dust. II. Particle characterization and pulmonary effects 30 d following intratracheal instillation

Fedan JS, Hubbs AF, Barger M, Schwegler-Berry D, Friend SA, Leonard SS, Thompson JA, Jackson MC, Snawder JE, Dozier AK, Coyle J, Kashon ML, Park J-H, McKinney W, Roberts JR [2020]. Biological effects of inhaled hydraulic fracturing sand dust. II. Particle characterization and pulmonary effects 30 d following intratracheal instillation. Toxicol Appl Pharmacol *409*:115282.

Inhalation of *Stachybotrys chartarum* fragments induces pulmonary arterial remodeling

Croston TL, Lemons AR, Barnes MA, Goldsmith WT, Orandle MS, Nayak AP, Germolec DR, Green BJ, Beezhold DH [2020]. Inhalation of *Stachybotrys chartarum* fragments induces pulmonary arterial remodeling. Am J Respir Cell Mol Biol *62*(5):563–576.

Physicochemical characterization and genotoxicity of the broad class of carbon nanotubes and nanofibers used or produced in U.S. facilities

Fraser K, Kodali V, Yanamala N, Birch ME, Cena L, Casuccio G, Bunker K, Lersch TL, Evans DE, Stefaniak A, Hammer MA, Kashon ML, Boots T, Eye T, Hubczak J, Friend SA, Dahm M, Schubauer-Berigan MK, Siegrist K, Lowry D, Bauer AK, Sargent LM, Erdely A [2020]. Physicochemical characterization and genotoxicity of the broad class of carbon nanotubes and nanofibers used or produced in U.S. facilities. Part Fibre Toxicol *17*:62.

Resolution of pulmonary inflammation induced by carbon nanotubes and fullerenes in mice: role of macrophage polarization

Lim CS, Porter DW, Orandle MS, Green BJ, Barnes MA, Croston TL, Wolfarth MG, Battelli LA, Andrew ME, Beezhold DH, Siegel PD, Ma Q [2020]. Resolution of pulmonary inflammation induced by carbon nanotubes and fullerenes in mice: role of macrophage polarization. Front Immunol *11*:1186.

Research Service

Evaluating the potential for unintentional occupational exposure to fentanyl and fentanyl analogues among medicolegal death investigators and autopsy technicians

Chiu SK, Li JF, Nolte KB [2020]. Evaluating the potential for unintentional occupational exposure to fentanyl and fentanyl analogues among medicolegal death investigators and autopsy technicians. J Forensic Sci *65*(4):1324–1327.

Evaluation of occupational exposures to illicit drugs at forensic sciences laboratories

NIOSH [2020]. Evaluation of occupational exposures to illicit drugs at forensic sciences laboratories. By Broadwater KR, Jackson DA, Li JF. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH Report No. HHE-2018-0116-3370.

Alice Hamilton Awardees and Honorable Mentions

Behavioral and Social Science Awardee

Occupational injury and psychological distress among U.S. workers: the National Health Interview Survey, 2004-2016

Gu JK, Charles LE, Fekedulegn D, Ma CC, Violanti JM, Andrew ME [2020]. Occupational injury and psychological distress among U.S. workers: the National Health Interview Survey, 2004–2016. J Saf Res *74*:207–217.

Injuries at work may negatively influence mental health due to lost or reduced working hours and financial burden of treatment. Our objective was to investigate, in U.S. workers the prevalence of serious psychological distress (SPD) by injury status (occupational, non-occupational, and no injury) and injury characteristics, and the association between injury status and SPD. Self-reported injuries within the previous three months were collected annually for 225,331 U.S. workers in the National Health Interview Survey (2004-2016). Psychological distress during the past 30 days was assessed using the Kessler 6 (K6) questions with Likert-type scale (0-4, total score range: 0-24). SPD was defined as K6 >/= 13. Prevalence ratios (PR) from fitted logistic regression models were used to assess relationships between injury and SPD after controlling for covariates. The prevalence of SPD was 4.74%, 3.58%, and 1.56% in workers reporting occupational injury (OI), non-occupational injury (NOI), and no injury, respectively. Workers with head and neck injury had the highest prevalence of SPD (Prevalence: OI=7.71%, NOI=6.17%), followed by workers with scrape/bruise/burn/bite (6.32% for those with OI). Workers reporting OI were two times more likely to have SPD compared to those without injury (PR=2.19, 95% CI: 1.62-2.96). However, there was no significant difference in SPD between workers with OI and workers with NOI (PR=0.98, 95% CI: 0.65-1.48). The prevalence of SPD varied by injury status with the highest being among workers reporting OI. We found that the workers reporting OI were significantly more likely to have SPD than those without injury, but not more than those with NOI. Mental health management programs by employers are necessary for workers who are injured in the workplace.

Behavioral and Social Science Honorable Mention

Comparing self-reported and O*NET-based assessments of job control as predictors of self-rated health for non-Hispanic whites and racial/ethnic minorities

Fujishiro K, Koessler F [2020]. Comparing self-reported and O*NET-based assessments of job control as predictors of self-rated health for non-Hispanic whites and racial/ethnic minorities. PLoS One *15*(8):e0237026.

The Occupational Information Network (O*NET) database has been used as a valuable source of occupational exposure information. Although good agreement between O*NET and self-reported measures has been reported, little attention has been paid to O*NET's utility in racially/ethnically diverse samples. Because O*NET offers job-level information, if different racial groups have different experiences under the same job title O*NET measure would introduce systematic measurement error. Using the General Social Survey data (n = 7,041; 437 occupations), we compared self-report and O*NET-derived measures of job control in their associations with self-rated health (SRH) for non-Hispanic whites and racial/ethnic minorities. The correlation between self-report and O*NET job control measures was moderate for all gender-race groups (Pearson's r = .26 - .40). However, the logistic regression analysis showed that the association between O*NET job control and SRH was markedly weaker for racial/ethnic minorities than for non-Hispanic whites. The self-reported job control was associated with SRH in similar magnitudes for both groups, which precluded the possibility that job control was relevant only for non-Hispanic whites. O*NET may not capture job experience for racial/ethnic minorities, and thus its utility depends on the racial/ethnic composition of the sample.

Communication and Guidance Awardee

3D printing with metal powders: health and safety questions to ask

NIOSH [2020]. 3D printing with metal powders: health and safety questions to ask. By Glassford E, Dunn KL, Dunn KH, Hammond D, Tyrawski J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2020-114.

This poster from the NIOSH Nanotechnology Research Center cites health and safety questions with different control options and information to reduce exposure to potential hazards. Characterization of Potential Hazards: What potential hazards are associated with metal powder 3D printing? What metals are in the powder? Are there known health effects from the metals (see safety data sheets) or can they be reactive with the air? What is the work environment like (for example, an open or isolated area)? Work Activities: Could the work activities cause exposure? How are you handling the metal powders? What is the likelihood of exposure? Can you change the way you do the activity to reduce the likelihood of exposure (high potential to low)? Be aware of the other printing activities occurring nearby. Engineering Controls: Based on the work activity or step in the printing process, what engineering controls will reduce the likelihood of exposure? What are the key design and operational requirements for the control? Consider fire and explosion hazard of metal powder when selecting controls. Administrative Controls: Have you considered your workplace practices and policies? Have you set up a plan for waste management? Have you considered what to do in case of a spill? Personal Protective Equipment (PPE): If the measures above do not effectively control the hazard, what PPE can be used? Have you considered PPE for other safety hazards (such as static, fire, explosion, and laser)?

Communication and Guidance Honorable Mention

3D printing with filaments: health and safety questions to ask

NIOSH [2020]. 3D printing with filaments: health and safety questions to ask. By Glassford E, Dunn KL, Dunn KH, Hammond D, Tyrawski J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2020-115.

This poster from the NIOSH Nanotechnology Research Center cites health and safety questions with different control options and information associated with 3D printing. Are there known health effects from the filaments (for example, see safety data sheets)? What is the work environment like (for example, open or isolated area)? Work Activities: Could the work activity cause exposures? What is the likelihood of exposure? Can you change the way you do the activity to reduce the likelihood of exposure (high potential to low)? Engineering Controls: Based on the work activity, what engineering controls will reduce the likelihood of exposure? What are the key design and operational requirements for the control? Administrative Controls: Have you considered your workplace practices and policies? Have you set up a plan for waste management? Have you considered what to do in case of a chemical spill? Personal Protective Equipment (PPE): If the measures above do not effectively control the hazard, what PPE can be used? Have you considered PPE for other safety hazards (for example, thermal gloves to prevent burns from hot printer heads)?

COVID-19 Communication Awardee

Interim Guidance for Businesses and Employers Responding to Coronavirus Disease 2019 (COVID-19)

Dahm M, Delaney L, Dowell C, Dunn KL, Edmonson M, Garcia A, King B, Martin S, Mead K, Novicki E, Shugart J, Topmiller J. A set of products to assist businesses and employers in reducing COVID-19 among workers.

The Interim Guidance for Businesses and Employers was the first CDC document published on general business worker safety and health at the onset of the COVID-19 response, filling a need during a time of rising concern and scarcity of information. The initial version was published February 1, 2020, before the first U.S. COVID-19 death and during the containment phase of the response. It provided guidance to workplaces on preparing an emergency response plan, using emergency preparedness best practices, and instituting fundamental industrial hygiene principles to reduce workplace exposures to SARS-CoV-2. In March 2020, as community spread in the U.S. was identified and the response moved into the mitigation phase, the guidance was substantially revised, shifting from planning considerations to policies and practices that businesses and employers could implement immediately. The General Business FAQ was also introduced in March 2020 as a supplement to the Interim Guidance for Businesses and Employers to better meet the information needs of employers and workers. The FAQ was expanded three times in 2020 to address new questions about cloth face coverings, physical distancing, and germicidal ultraviolent disinfection. In May 2020, the Resuming Business Toolkit was released transforming the guidance into a checklist to prepare for resuming operations and providing workplaces with an easy-to-use, interactive tool to navigate protection options for workers. Each iteration of the Interim Guidance for Businesses and Employers has been based on the science at the time and industrial hygiene best practices. The guidance document has more than 10 million views, more than any other CDC worker safety and health guidance document.

COVID-19 Communication Awardee

Optimizing Personal Protective Equipment (PPE) Supplies

Bell M, Bergman M, Britton J, Casey M, Christensen B, Cichowicz J, Cole G, Dahm M, de Perio M, D'Alessandro M, Delaney L, Dowell C, Dunn KL, Edmonson M, Fazio G, Fisher E, Forrester C, Fries M, Fritz JE, Greenawald L, Gupta N, Harris J, Harney J, Kallen A, Kilinc-Balci FS, Kosmoski C, Kuhar D, Metzler R, Niemeier RT, Norton E, Patel A, Pillai S, Radonovich L, Schaefer M, Stein R, Tyrawski J, Young M. A set of resources to assist healthcare facilities in optimizing supplies of personal protective equipment.

Personal protective equipment (PPE) is used every day by healthcare personnel (HCP) to protect themselves, patients, and others when providing care. In February 2020, the COVID-19 Response Worker Safety and Health team anticipated the impending nationwide PPE shortage and developed an innovative approach to optimize supplies of N95 respirators followed by other PPE components in healthcare settings during times of limited supply while maximizing the level of protection offered to HCP. Webpages on strategies for optimizing PPE supplies, including N95 respirators, then isolation gowns, facemasks, eye protection, gloves, elastomeric respirators, and powered air purifying respirators, an accompanying Summary for Healthcare Facilities, and guidance to increase respirator supply were developed for managers of respiratory protection programs, occupational health services, and infection prevention programs in healthcare facilities. In March 2020, the team developed the PPE Burn Rate Calculator and PPE Tracker App to assess current PPE stock and PPE burn or consumption rate. The PPE Burn Rate Calculator is an Excel spreadsheet created with fine-tuned mathematical formulas that track supply and calculate burn rate. The PPE Tracker App is a mobile application based on the PPE Burn Rate Calculator, optimized for iOS and Android devices. It allows users to track inventory by boxes or number of individual units, add to digital inventory levels upon restocking, calculate burn rate by PPE type or number of patients, and download or share reports via email. To date, the app has been downloaded over 14,000 times and the calculator over 160,000 times, and the suite of webpages have received over 14.4 million hits, demonstrating the need for and importance of this information for healthcare facilities.

COVID-19 Research Awardee

Filtering facepiece respirators with an exhalation valve: measurements of filtration efficiency to evaluate their potential for source control

NIOSH [2020]. Filtering facepiece respirators with an exhalation valve: measurements of filtration efficiency to evaluate their potential for source control. By Portnoff L, Schall J, Brannen J, Suhon N, Strickland K, Meyers J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2021-107.

This technical report summarizes research undertaken by the National Personal Protective Technology Laboratory to provide improved science-based recommendations on the use of filtering facepiece respirators (FFRs) with an exhalation valve. FFR models with an exhalation valve are thought to increase the wearer's comfort at high work rates and be suitable for longer periods of use. However, respiratory secretions expelled by wearers may exit along with air through the exhalation valve. A concern with FFRs with an exhalation valve is that individuals may spread disease if unfiltered, virus-laden aerosols pass through the valve. Therefore, the question has emerged about the effectiveness of using an FFR with an exhalation valve for source control—i.e., to filter respiratory secretions to prevent disease transmission to others—and whether the valve should be covered with a surgical mask, procedure mask, or a cloth face covering that does not interfere with the respirator fit. The findings in this report are based on tests of 13 FFR models from 10 different manufacturers. These findings show that FFRs with an exhalation valve provide respiratory protection to the wearer and can also reduce particle emissions to levels similar to or better than those provided by surgical masks, procedure masks, or cloth face coverings. This study also shows that modifications to these respirators can further reduce particle emissions. Specifically, the use of an electrocardiogram pad or surgical tape secured over the valve from the inside of the FFR can provide source control similar to that of an FFR with no exhalation valve. These findings have important implications for guidance on source control and mitigation.

COVID-19 Research Honorable Mention

Characteristics of health care personnel with COVID-19—United States, February 12-April 9, 2020

Burrer SL, de Perio MA, Hughes MM, Kuhar DT, Luckhaupt SE, McDaniel CJ, Porter RM, Silk B, Stuckey MJ, Walters M [2020]. Characteristics of health care personnel with COVID-19—United States, February 12–April 9, 2020. MMWR *69*(15):477–481.

What is already known about this topic? Limited information is available about COVID-19 infections among U.S. health care personnel (HCP). What is added by this report? Of 9,282 U.S. COVID-19 cases reported among HCP, median age was 42 years, and 73% were female, reflecting these distributions among the HCP workforce. HCP patients reported contact with COVID-19 patients in health care, household, and community settings. Most HCP patients were not hospitalized; however, severe outcomes, including death, were reported among all age groups. What are the implications for public health practice? It is critical to ensure the health and safety of HCP, both at work and in the community. Improving surveillance through routine reporting of occupation and industry not only benefits HCP, but all workers during the COVID-19 pandemic.

Engineering and Control Awardee

Reducing ultrafine particulate emission from multiple 3D printers in an office environment using a prototype engineering control

Dunn KL, Hammond D, Menchaca K, Roth G, Dunn KH [2020]. Reducing ultrafine particulate emission from multiple 3D printers in an office environment using a prototype engineering control. J Nanoparticle Res *22*(5):112.

Recent studies have shown that high concentrations of ultrafine particles can be emitted during the 3D printing process. This study characterized the emissions from different filaments using common fused deposition modeling printers. It also assessed the effectiveness of a novel engineering control designed to capture emissions directly at the extruder head. Airborne particle and volatile organic compound concentrations were measured, and particle emission rates were calculated for several different 3D printer and filament combinations. Each printer and filament combination was tested inside a test chamber to measure overall emissions using the same print design for approximately 2 h. Emission rates ranged from 0.71 × 10(7) to 1400 × 10(7) particles/min, with particle geometric mean diameters ranging from 45.6 to 62.3 nm. To assess the effectiveness of a custom-designed engineering control, a 1-h print program using a MakerBot Replicator+ with Slate Gray Tough polylactic acid filament was employed. Emission rates and particle counts were evaluated both with and without the extruder head emission control installed. Use of the control showed a 98% reduction in ultrafine particle concentrations from an individual 3D printer evaluated in a test chamber. An assessment of the control in a simulated makerspace with 20 printers operating showed particle counts approached or exceeded 20,000 particles/cm^3 without the engineering controls but remained at or below background levels (< 1000 particles/cm^3) with the engineering controls in place. This study showed that a low-cost control could be added to existing 3D printers to significantly reduce emissions to the work environment.

Engineering and Control Honorable Mention

Estimation of the critical external heat leading to the failure of lithium-ion batteries

Tang W, Tam WC, Yuan L, Dubaniewicz T, Thomas R, Soles J [2020]. Estimation of the critical external heat leading to the failure of lithium-ion batteries. Appl Therm Eng *179*:115665.

A detailed experimental investigation on the critical external heat leading to the failure of lithium-ion (Li-ion) batteries was conducted using an accelerating rate calorimeter (ARC) at NIOSH. Several types of commercial Li-ion batteries were selected for the study, including an iron phosphate Li-ion battery (LFP), a lithium-titanate battery (LTO), and a lithium-nickel-manganese-cobalt-oxide battery (NMC). Each battery was placed in a specially designed, sealed, steel canister and heated in the ARC. Battery voltage throughout the test was monitored and used to indicate the time to a battery failure. Three thermocouples, one attached to the battery surface, one measuring air temperature inside the canister, and one attached to the canister's internal surface, were used to record temperature changes during the heating tests. Different thermal behaviors were observed for the various battery types. An analytical model was developed to estimate the total external heat received by the battery using the measured temperatures. Experimental data ranked the batteries tested in terms of the heat to failure as: LFP 26,650 (11 kJ) > LFP 18650 (4.3 kJ) > NMC 18650 MH1 (3.6 kJ) - LTO 18650 (3.6 kJ) > NMC 18650 HG2 (3 kJ). Total heat normalized to the battery nominal energy capacity was also calculated and ranked as: LTO 18650 - LFP 26650 - LFP 18650 > NMC 18650 MH1 - NMC 18650 HG2. The test and analysis method developed can be extended to other types of batteries with a cylindrical shape. Results from this work provide insights into the thermal safety of Li-ion batteries and can help enhance battery thermal design and management.

Epidemiology and Surveillance Awardee

Population-based age adjustment tables for use in occupational hearing conservation programs

Flamme GA, Deiters KK, Stephenson MR, Themann CL, Murphy WJ, Byrne DC, Goldfarb DG, Zeig-Owens R, Hall C, Prezant DJ, Cone JE [2020]. Population-based age adjustment tables for use in occupational hearing conservation programs. Int J Audiol *59*(Suppl 1):S20–S30.

In occupational hearing conservation programs, age adjustments may be used to subtract expected age effects. Adjustments used in the United States came from a small dataset and overlooked important demographic factors, ages, and stimulus frequencies. The present study derived a set of population-based age adjustment tables and validated them using a database of exposed workers. The study design was a cross-sectional population-based study with a retrospective longitudinal cohort study for validation. Data from the U.S. National Health and Nutrition Examination Survey (unweighted n=9937) were used to produce these tables. Male firefighters and emergency medical service workers (76,195 audiograms) were used for validation. Cross-sectional trends implied less change with age than assumed in current U.S. regulations. Different trends were observed among people identifying with non-Hispanic Black race/ethnicity. Four age adjustment tables (age range: 18-85) were developed (women or men; non-Hispanic Black or other race/ethnicity). Validation outcomes showed that the population-based tables matched median longitudinal changes in hearing sensitivity well. These population-based tables provide a suitable replacement for those implemented in current U.S. regulations. These tables address a broader range of worker ages, account for differences in hearing sensitivity across race/ethnicity categories and have been validated for men using longitudinal data.

Epidemiology and Surveillance Honorable Mention

Impact of workplace injury on opioid dependence, abuse, illicit use and overdose: a 36-month retrospective study of insurance claims

Asfaw A, Boden LI [2020]. Impact of workplace injury on opioid dependence, abuse, illicit use and overdose: a 36-month retrospective study of insurance claims. Occup Environ Med *77*(9):648–653.

The objective of this study was to examine the impact of workplace injury on opioid dependence, abuse and overdose (opioid-related morbidity) and if the severity of injury would increase the hazard of these health effects. We used MarketScan databases to follow injured and the propensity score matched non-injured workers, both without prior opioid-related diagnoses. Using a Cox proportional hazard model, we examined the impact of workplace injury on opioid-related morbidity. The hazard of opioid-related morbidity for injured workers was 1.79 times than that of matched non-injured workers (95% CI 1.89 to 3.60). For medical-only and lost-time injured workers, it was respectively 1.54 (95% CI 1.02 to 2.32) and 2.91 (95% CI 1.75 to 4.84) times that of non-injured workers. Reducing workplace injury and the severity of workplace injury, as well as efforts to ensure appropriate opioid prescribing for injured workers, may help to reduce the societal costs of opioid use.

Exposure and Risk Assessment Awardee

Exposures and emissions in coffee roasting facilities and cafés: diacetyl, 2,3-pentanedione, and other volatile organic compounds

LeBouf RF, Blackley BH, Fortner AR, Stanton M, Martin SB, Groth CP, McClelland TL, Duling MG, Burns DA, Ranpara A, Edwards N, Fedan KB, Bailey RL, Cummings KJ, Nett RJ, Cox-Ganser JM, Virji MA [2020]. Exposures and emissions in coffee roasting facilities and cafés: diacetyl, 2,3-pentanedione, and other volatile organic compounds. Front Public Health *8*:561740.

Volatile organic compound (VOC) exposures during coffee roasting, packaging, grinding, and flavoring can negatively impact workers' respiratory health. Inhalational exposures to diacetyl and 2,3-pentanedione can cause obliterative bronchiolitis. This study summarizes exposures to and emissions of VOCs in 17 coffee roasting and packaging facilities including 10 cafés. We collected 415 personal and 760 area full-shift, and 606 personal task-based air samples for diacetyl, 2,3-pentanedione, 2,3-hexanedione, and acetoin using silica gel tubes; and 296 instantaneous activity and 312 instantaneous source air measurements for 18 VOCs using evacuated canisters. The highest personal full-shift exposures to diacetyl [geometric mean (GM) 21 parts per billion (ppb); 95th percentile (P95) 79ppb] and 2,3-pentanedione (GM 15ppb; P95 52ppb) were measured for flavored coffee production workers. These workers had the highest percentage of measurements above NIOSH's recommended exposure limit (REL) for diacetyl (95%) and 2,3-pentanedione (77%). Personal exposures to diacetyl (GM 0.9ppb; P95 6.0ppb) and 2,3-pentanedione (GM 0.7ppb; P95 4.4ppb) were lowest for non-coffee flavoring, non-production workers. The highest personal full-shift exposures to diacetyl and 2,3-pentanedione were flavoring workers (GM 34 and 38ppb), packaging workers (GM 27 and 19ppb) and grinder operators (GM 26 and 22ppb), respectively, in flavored coffee facilities, and packaging (GM 8.0 and 4.4ppb) and production workers (GM 6.3 and 4.6ppb) in non-flavored coffee facilities. Baristas had full-shift exposures below the RELs (GM 4.1ppb diacetyl; GM 4.6ppb 2,3-pentanedione). Tasks, activities, and sources associated with flavoring in flavored coffee facilities, and grinding in non-flavored coffee facilities had the highest diacetyl and 2,3-pentanedione GM and P95 estimates. Controlling emissions and isolating higher exposure areas from main production space and administrative or non-production spaces are essential for maintaining exposure control.

Exposure and Risk Assessment Honorable Mention

Estimation of the number of workers exposed to respirable crystalline silica by industry: analysis of OSHA compliance data (1979-2015)

Doney BC, Miller WE, Hale JM, Syamlal G [2020]. Estimation of the number of workers exposed to respirable crystalline silica by industry: analysis of OSHA compliance data (1979–2015). Am J Ind Med *63*(6):465–477.

Respirable crystalline silica (RCS) can potentially cause silicosis, lung cancer, and renal failure. The current study estimates the percentages of workers potentially overexposed to concentrations of RCS dust and silicosis proportional mortality rates (PMRs) by industry. Occupational Safety and Health Administration compliance inspection sampling data for RCS collected during 1979 to 2015 were used to estimate percentages of workers exposed. The results were used in combination with U.S. Census Bureau estimates to produce industry specific worker population estimates for 2014. Estimates of the numbers and percentages of workers exposed to RCS concentrations at least 1, 2, 5, and 10 times the NIOSH recommended exposure limit (REL) were calculated by industry using the 2002 North American Industry Classification System. Silicosis PMRs by industry were estimated using National Center for Health Statistics multiple cause of death data. RCS concentrations/workers exposed were highest in the poured concrete foundation and structure contractors; commercial and institutional building construction; and masonry contractors. Approximately 100,000 workers were exposed above the RCS REL, and most (79%) worked in the construction industry. Tile and terrazzo contractors (12%); brick, stone, and related construction merchant wholesalers (10%); masonry contractors (6%) and poured concrete foundation and structure contractors (6%) were the highest percentages of workers potentially overexposed. PMRs were highest for the structural clay product manufacturing and the foundries industries. Conclusion: Percentages of workers exposed to RCS varied by industry and in some industries, workers are exposed over 10 times the REL. Exposures can be reduced below the REL by implementing the hierarchy of controls.

Methods and Laboratory Science Awardee

Resolution of pulmonary inflammation induced by carbon nanotubes and fullerenes in mice: role of macrophage polarization

Lim CS, Porter DW, Orandle MS, Green BJ, Barnes MA, Croston TL, Wolfarth MG, Battelli LA, Andrew ME, Beezhold DH, Siegel PD, Ma Q [2020]. Resolution of pulmonary inflammation induced by carbon nanotubes and fullerenes in mice: role of macrophage polarization. Front Immunol *11*:1186.

Pulmonary exposure to certain engineered nanomaterials (ENMs) causes chronic lesions like fibrosis and cancer in animal models due to unresolved inflammation. Resolution of inflammation involves time-dependent biosynthesis of lipid mediators (LMs), particularly, specialized pro-resolving mediators (SPMs). We analyzed inflammatory and pro-resolving responses to fibrogenic multi-walled carbon nanotubes (MWCNTs, Mitsui-7) and low-toxicity fullerenes (fullerene C60, C60F). Pharyngeal aspiration of MWCNTs at 40 microg/mouse or C60F above 640 microg/mouse elicited pulmonary effects in B6C3F1 mice. Both ENMs stimulated acute inflammation at day 1, transitioning to histiocytic inflammation by day 7. By day 28, the lesion in MWCNT-exposed mice progressed to fibrotic granulomas yet remained as alveolar histiocytosis in C60F-exposed mice. Flow cytometric profiling of whole lung lavage cells revealed neutrophil recruitment was greatest at day 1, declining to 36.6% of that level in MWCNT- and 16.8% in C60F-treated mice by day 7, and to basal levels by day 28. Both ENMs induced high levels of proinflammatory leukotriene B4 and prostaglandin E2 and SPMs resolvin D1 and E1. MWCNTs and C60F induced time-dependent M1 and M2 macrophage polarization in the lung and elevated type 1 or type 2 cytokine levels, respectively. M1 macrophages exhibited preferential induction of arachidonate 5-lipoxygenase activating protein (ALOX5AP); M2 macrophages had high-level expression of arachidonate 15-lipoxygenase (ALOX15). Macrophage polarization in vitro differentially induced ALOX5AP in M1 macrophages or ALOX15 in M2 macrophages resulting in increased preferential biosynthesis of proinflammatory LMs or SPMs. MWCNTs increased the M1- or M2-specific production of LMs. These findings support a mechanism where persistent ENM-induced neutrophilic inflammation is actively resolved through time-dependent macrophage polarization and enhanced biosynthesis of specialized LMs via distinct ALOX pathways.

Methods and Laboratory Science Honorable Mention

Inhalation of *Stachybotrys chartarum* fragments induces pulmonary arterial remodeling

Croston TL, Lemons AR, Barnes MA, Goldsmith WT, Orandle MS, Nayak AP, Germolec DR, Green BJ, Beezhold DH [2020]. Inhalation of *Stachybotrys chartarum* fragments induces pulmonary arterial remodeling. Am J Respir Cell Mol Biol *62*(5):563–576.

Stachybotrys chartarum is a fungal contaminant within the built environment and a respiratory health concern in the United States. The objective of this study was to characterize the mechanisms influencing pulmonary immune responses to repeatedly inhaled *S. chartarum*. Groups of B6C3F1/N mice repeatedly inhaled viable trichothecene-producing *S. chartarum* conidia (strain A or strain B), heat-inactivated conidia, or high-efficiency particulate absolute-filtered air twice per week for 4 and 13 weeks. Strain A was found to produce higher amounts of respirable fragments than strain B. Lung tissue, serum, and BAL fluid were collected at 24 and 48 hours after final exposure and processed for histology, flow cytometry, and RNA and proteomic analyses. At 4 weeks after exposure, a T-helper cell type 2-mediated response was observed. After 13 weeks, a mixed T-cell response was observed after exposure to strain A compared with a T-helper cell type 2-mediated response after strain B exposure. After exposure, both strains induced pulmonary arterial remodeling at 13 weeks; however, strain A-exposed mice progressed more quickly than strain B-exposed mice. BAL fluid was composed primarily of eosinophils, neutrophils, and macrophages. Both the immune response and the observed pulmonary arterial remodeling were supported by specific cellular, molecular, and proteomic profiles. The immunopathological responses occurred earlier in mice exposed to high fragment-producing strain A. The rather striking induction of pulmonary remodeling by *S. chartarum* appears to be related to the presence of fungal fragments during exposure.

Research Service Awardee

Evaluation of occupational exposures to illicit drugs at forensic sciences laboratories

NIOSH [2020]. Evaluation of occupational exposures to illicit drugs at forensic sciences laboratories. By Broadwater KR, Jackson DA, Li JF. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH Report No. HHE-2018-0116-3370.

The NIOSH Health Hazard Evaluation Program received a request from managers at a state police forensic sciences division concerned about potential occupational exposure to illicit drugs among employees at eight controlled substances laboratories. Employees performed forensic analysis on a variety of evidence collected by submitting law enforcement agencies. We visited seven laboratory facilities at least once and four laboratories a second time to learn more about work-related health concerns and to measure work-related exposures among employees in the controlled substances units (CSUs). We measured exposures to cocaine, fentanyl, heroin, and methamphetamine in air, on hands, and on surfaces in the CSU laboratories and office areas; assessed the ventilation chemical hoods and the airflow among laboratory areas, hallways, and administrative areas; held confidential medical interviews; tested chemists' urine for cocaine, fentanyl, heroin, methamphetamine, and several metabolites (breakdown products) of these drugs; and reviewed relevant records. We found work-related exposures to controlled substances being handled at work. Cocaine, fentanyl, heroin, and methamphetamine were found in air and wipe samples; and cocaine and its metabolite, fentanyl and its metabolite, and methamphetamine were found in employee urine. No symptoms associated with exposure to cocaine, fentanyl, heroin, or methamphetamine were reported. While the health and safety written programs were thorough, we identified potential factors contributing to workplace exposures. We provided recommendations to assist the laboratories in minimizing exposures to these substances. These included improving and enforcing existing workplace practices meant to reduce occupational exposure to controlled substances: changing evidence handling policies, improving access to ventilated workspaces, improving hand hygiene, using personal protective equipment consistently, and cleaning laboratory workplaces in accordance with the safety manual.

Research Service Honorable Mention

Evaluating the potential for unintentional occupational exposure to fentanyl and fentanyl analogues among medicolegal death investigators and autopsy technicians

Chiu SK, Li JF, Nolte KB [2020]. Evaluating the potential for unintentional occupational exposure to fentanyl and fentanyl analogues among medicolegal death investigators and autopsy technicians. J Forensic Sci *65*(4):1324–1327.

Recent increases in deaths in the United States from synthetic opioids such as fentanyl and fentanyl analogues (fentanyls) have raised concerns about possible occupational exposures to these potent agents. Medicolegal death investigators and autopsy suite staff might perform job tasks involving exposure to fentanyls. The potential for exposure to fentanyls among medicolegal death investigators and autopsy technicians at a state medical examiner's office was evaluated through review of caseload characteristics, injury and illness logs, and procedures and policies and discussions with management and employee representatives. The evaluation showed that this medical examiner's office had low potential for work-related exposure to fentanyls; its standard operating procedures and personal protective equipment requirements should reduce the potential for occupational exposure. Medicolegal death investigation agencies can develop and implement guidance to control exposures and provide workforce education and training to reduce the potential for work-related exposure to fentanyls.

Alice Hamilton Awards 2020 Updates
Behavioral and Social Science

The impact of a crash prevention program in a large law enforcement agency

Tiesman HM, Gwilliam M, Rojek J, Hendricks S, Montgomery B, and Alpert G. 2019. Am J Ind Med *62*(10):847-858.

Law enforcement officers face many occupational hazards and stressors, including driving. Officers may need to drive more hazardously when responding to emergencies. Officers drive in inclement weather and often patrol when not responding to calls. Other risk factors include shift work and sleep deficits, behavioral factors such as excessive speed, and limited opportunities for driver training. Subsequently, motor-vehicle crashes (MVCs) remain a leading cause of on-duty death for officers. Yet, research into interventions and preventive practices remain scant and evidence-based programs are virtually non-existent.

Therefore, NIOSH investigators in the Division of Safety Research partnered with the Department of Justice (DOJ) to scientifically evaluate an agency-developed multi-faceted crash prevention program. To date, it is the only evaluation of a crash prevention program in law enforcement. This paper describes the development of the Las Vegas Metropolitan Police Department's crash prevention program, our quasi-experimental design, and the pre- and post-intervention injury and crash results. After initiating the program, MVC rates decreased 14%. In comparison, MVC rates at the control agencies increased during the same time. Motor-vehicle injury (MVI) rates decreased 31% after the program's introduction, while rates in the control agencies increased or remained constant. More importantly, MVC rates among patrol officers (front-line officers) decreased 21%, and MVI rates decreased 48%. As for next steps in this research, we are developing a Department of Justice co-branded fact sheet geared to agency leaders and command staff. The fact sheet includes evidence-based and actionable steps to keep officers safe on the road and includes a link to the Law Enforcement Officer Motor Vehicle Safety topic webpage.

Communication and Guidance

Technical report: the NIOSH occupational exposure banding process for chemical risk management

NIOSH [2019]. Technical report: the NIOSH occupational exposure banding process for chemical risk management. By Lentz TJ, Seaton M, Rane P, Gilbert SJ, McKernan LT, Whittaker C. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2019-132.

This technical report describes a systematic process that uses qualitative and quantitative information on selected health endpoints to assign chemicals to exposure ranges expected to protect worker health. This process is intended to address the thousands of commercially available chemicals that lack authoritative occupational exposure limits.

Since the technical report's publication, additional efforts have focused on disseminating it to occupational safety and health practitioners and promoting its use for assessing myriad chemicals in the workplace. Toward these ends, the technical report has been presented in workshops and professional development courses throughout 2019-20 and at several American Industrial Hygiene Association (AIHA) conferences, including the AIHA University Occupational Exposure Banding Virtual Conference in February-March 2020, and the Society for Chemical Hazard Communication Virtual Fall Conference in November 2020. Additional conferences and workshops planned for 2020, including two international events, were cancelled because of the COVID-19 pandemic.

In early 2021, the authors prepared a draft manuscript, entitled *Toxicological endpoints and banding criteria employed in the NIOSH occupational exposure banding process for chemical risk management*, for submission to a peer-reviewed journal. The manuscript describes the methodology used to develop the NIOSH occupational exposure banding process. It also presents the toxicological basis of the NIOSH occupational exposure banding criteria and provides information to supplement the technical report. Additional goals related to this research effort are to enhance the knowledge and practice of exposure banding strategies for chemical risk management, especially for chemicals in the workplace that lack authoritative guidance.

Engineering and Control

Dust Control Handbook for Industrial Minerals Mining and Processing – Second Edition. NIOSH Report of Investigations 9701

Dust Control Handbook for Industrial Minerals Mining and Processing Second Edition. Cecala, A.B., O'Brien, A.D., Schall, J., Colinet, J.F., Franta, R.J., Schultz, M.J., Hass, E.J., Robinson, J., Patts, J.R., HolenB.M., Stein, R., Weber, J., Strebel, M., Wilson, L., Ellis, M. NIOSH RI 9701, DHHS Publication No: 2019-124, 362 pp.

This handbook was produced by a 22-member dust control task force. Fifteen of these members contributed significantly to writing the 362-page document and were granted authorship. The handbook represents a highly successful collaborative effort of government and industry toward protecting the health of U.S. mine workers. It is intended to be a living document, continually updated to provide state-of-the-art dust control technology on proven and effective techniques that lower workers' dust exposures during all stages of minerals processing. The handbook describes both the dust-generation process and the control strategies necessary to enable mine operators to reduce workers' dust exposure. Although primarily designed for industrial minerals operations, the handbook's engineering and control strategies can be used by all types of mining operations, as well as by other industries such as construction and agriculture.

Controlling respirable crystalline silica (RCS) dust exposures in the mining industry is complex because workers can be exposed from such a vast array of processes and dust sources. Ore is mined underground, in open pits, and in quarries before undergoing a series of crushing, grinding, cleaning, drying, and product sizing sequences as it is processed into a marketable commodity. Because these operations are highly mechanized, they can process high volumes of mined ore, which generate large quantities of dust, often creating elevated levels of RCS dust and other contaminants and exposing workers. To the authors' knowledge, this handbook is the only document that provides an array of dust control techniques for the various processes throughout the entire mining process.

Epidemiology and Surveillance

Maternal occupational oil mist exposure and birth defects, National Birth Defects Prevention Study, 1997-2011

Siegel M, Rocheleau CM, Johnson CY, Waters MA, Lawson CC, Riehle-Colarusso T, Reefhuis J, The National Birth Defects Prevention Study [2019]. Maternal occupational oil mist exposure and birth defects, National Birth Defects Prevention Study, 1997-2011. Int J Environ Res Public Health *16*(9):1560

This study was the first to analyze associations between maternal occupational oil mist exposure and a spectrum of birth defects. The most highly exposed workers to oil mists are in the machinery, metal fabrications, and transportation equipment industries—heavily male-dominated fields. Studies in these occupations often have too few women to study female-specific health impacts, and even fewer pregnancies, even though adverse outcomes can lead to life-long health effects for offspring. The study found that most exposed women worked in textile and apparel manufacturing occupations—female-dominated fields.

Reproductive hazards are especially important to study in female-dominated industries, where many workers are of child-bearing age. Our findings highlight that occupational health research priorities should not be based solely on the most highly exposed workers, but also workers whose underlying characteristics (including sex and reproductive status) place them at unique risk.

The partnership with the National Center on Birth Defects and Developmental Disabilities' National Birth Defects Prevention Study (NBDPS) that allowed us to perform this analysis of oil mist exposure continues. NIOSH scientists and partners continue to use NBDPS data to investigate maternal and paternal occupations and exposures related to birth defects and other adverse reproductive health outcomes in offspring. Recent publications describe associations between birth defects and maternal occupational exposures to polycyclic aromatic hydrocarbons (PAHs) and solvents (Santiago-Colón et al., 2020; Spinder et al., 2020; Patel et al., 2020). NIOSH scientists are also preparing a manuscript on nail technician and hairdresser occupations and a spectrum of birth defects; completing a report on PAHs and neural tube defects; and investigating effects of noise and solvent exposures on maternal and fetal health.

Exposure and Risk Assessment

Respirable coal mine dust in underground mines, United States, 1982-2017

Brent C. Doney, David Blackley, Janet M. Hale, Cara Halldin, Laura Kurth, Girija Syamlal, A. Scott Laney. Respirable coal mine dust in underground mines, United States, 1982-2017

This study summarized the mass concentration and quartz mass percent of respirable coal mine dust samples from U.S. underground coal mines by year, mining occupation, and geographical area. Although the percent of samples exceeding the permissible exposure limit (PEL) declined, approximately 5 percent of 681,000 respirable dust samples exceeded the PEL, and 19 percent of 211,000 quartz samples exceeded the applicable standard.

Following publication, the researchers published a companion study on surface mines (Respirable coal mine dust at surface mines, United States, 1982-2017), the first comprehensive assessment of its kind. During 1982-2017, the mean concentration for respirable dust was higher in central Appalachia compared to the rest of the United States. Greater than 15 percent of respirable coal mine dust samples analyzed for quartz content exceeded the PEL. Furthermore, nearly one-third of samples from drilling occupations exceeded the respirable dust PEL, consistent with the epidemiological data indicating that this surface mining occupation presents a higher risk for pneumoconiosis.

This study garnered national media attention (National Public Radio-Frontline report Regulators Resist Call for Action in Response to Black Lung Epidemic). It also informed public conversation and Congressional testimony addressing the epidemic of severe pneumoconiosis in Appalachian coal miners. The respirable dust and quartz concentration findings presented could further our understanding of differences in the distribution of respiratory disease and help guide interventions to reduce exposure. Recent Mine Safety and Health Administration rulemaking and subsequent NIOSH medical surveillance standards enhanced prior regulatory requirements, including PEL reductions, and established ongoing medical surveillance for surface miners. Enhanced surveillance will facilitate identifying pneumoconiosis and could help prevent progression of disease in some miners.

Highly sensitive lab on a chip (LOC) immunoassay for early diagnosis of respiratory disease caused by respirable crystalline silica (RCS)

Upaassana VT, Ghosh S, Chakraborty A, Birch ME, Joseph P, Han J, Ku BK, Ahn CH [2019]. Highly sensitive lab on a chip (LOC) immunoassay for early diagnosis of respiratory disease caused by respirable crystalline silica (RCS). Anal Chem *91*(10):6652- 6660.

Exposure to airborne respirable crystalline silica (RCS) from construction, hydraulic fracturing, and mining is a significant occupational health problem in the United States. Early detection or monitoring of pulmonary responses to RCS, including lung inflammation and early identification of silicosis, is critical. The known hazards, large number of exposed workers, and the proposed new Occupational Safety and Health Administration permissible exposure limit of 50 micrograms per cubic meter (μg/m3) of air highlight this need.

Silicosis is currently used as one health outcome for crystalline silica dust dose-response assessments. Clinical detection of silicosis is dependent on the detection of radiological abnormalities based on X-ray films, which are a late (10 to 15 years following exposure) and irreversible manifestation of disease. The silica-related diseases could be more effectively treated and prevented if RCS-related biomarkers were identified and measured at an early stage of disease progression, underscoring the need for a point-of-care test for early diagnosis.

After designing a highly sensitive lab on a chip (LOC) immunoassay, researchers characterized it for tumor necrosis factor (TNF-a), a protein biomarker that causes lung inflammation from RCS exposure. Using plasma from RCS-exposed rats and newly designed LOC devices for detecting potential biomarkers TNF-α for lung inflammation and Clara cell protein 16 (CC16) for lung damage, researchers tested serum of coal workers exposed to RCS. The results from 20 workers indicated that the LOCs could detect potential biomarkers such as TNF-α and CC16 with acceptable uncertainty. In addition, researchers are developing a prototype field-portable biomonitoring system to help identify at-risk workers through early detection of toxic aerosol exposures.

Severe lung disease characterized by lymphocytic bronchiolitis, alveolar ductitis, and emphysema (BADE) in industrial machine-manufacturing workers

Cummings KJ, Stanton ML, Nett RJ, Segal LN, Kreiss K, Abraham JL, Colby TV, Franko AD, Green FHY, Sanyal S, Tallaksen RJ, Wendland D, Bachelder VD, Boylstein RJ, Park J-H, Cox-Ganser JM, Virji MA, Crawford JA, Green BJ, LeBouf RF, Blaser MJ, Weissman DN [2019]. Severe lung disease characterized by lymphocytic bronchiolitis, alveolar ductitis, and emphysema (BADE) in industrial machine-manufacturing workers. Am J Ind Med *62*(11):927- 937.

The NIOSH Respiratory Health Division conducted a health hazard evaluation during 2012–2016 at a paper converting equipment manufacturing facility where five employees with a previously unrecognized severe occupational lung disease described as B-cell lymphocytic bronchiolitis, alveolar ductitis, and emphysema (BADE) were identified. All five were non-smokers without common epidemiologic linkages outside of the workplace. All worked in production areas of the facility with potential metalworking fluid (MWF) exposure. The primary MWF used was designed to promote the growth of *Pseudomonas pseudoalcaligenes*. Initial work identified an association between the microbial composition of the MWF and the microbial profile present within the lungs of workers with BADE.

MWF exposure is associated with hypersensitivity pneumonitis, asthma, and other respiratory illnesses; however, the primary cause of associated respiratory disease and the observed BADE in MWF-exposed workers is currently unknown. In addition to the 2019 American Journal of Industrial Medicine publication, two additional manuscripts were published in 2020 detailing the HHE findings.

Cummings KJ, Stanton ML, Kreiss K, Boylstein RJ, Park JH, Cox-Ganser JM, Virji MA, Edwards NT, Segal LN, Blaser MJ, Weissman DN, Nett RJ [2020]. Work-related adverse respiratory health outcomes at a machine manufacturing facility with a cluster of bronchiolitis, alveolar ductitis and emphysema (BADE). Occup Environ Med *77*(6):386-392.

Wu BG, Kapoor B, Cummings KJ, Stanton ML, Nett RJ, Kreiss K, Abraham JL, Colby TV, Franko AD, Green FHY, Sanyal S, Clemente JC, Gao Z, Coffre M, Meyn P, Heguy A, Li Y, Sulaiman I, Borbet TC, Koralov SB, Tallaksen RJ, Wendland D, Bachelder VD, Boylstein RJ, Park J-H, Cox-Ganser JM, Virji MA, Crawford JA, Edwards NT, Veillette M, Duchaine C, Warren K, Lundeen S, Blaser MJ, Segal LN [2020]. Evidence for environmental-human microbiota transfer at a manufacturing facility with novel work-related respiratory disease. Am J Respir Crit Care Med *202*(12):1678-1688.

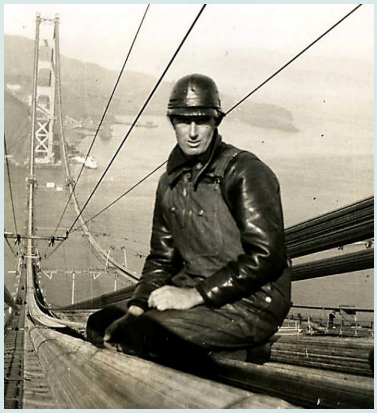
Researchers in the NIOSH Health Effects Laboratory Division and Respiratory Health Division are pursuing funding as part of continued efforts to identify the cause(s) for the cluster of BADE cases previously identified among employees in the machine manufacturing facility. We are specifically interested in identifying potential mechanisms influencing the pulmonary response following exposure to the bioconcept MWF.

Bullard-Sherwood Research to Practice Award

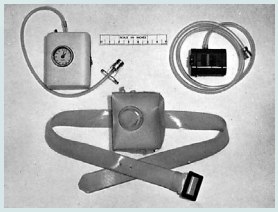
This award recognizes outstanding efforts by NIOSH scientists and their partners in applying occupational safety and health research to prevent work-related injury, illness, and death. These awards highlight efforts that demonstrate noteworthy impact through partnerships.

The award is named in honor of two distinguished inventers who made significant improvements in workplace injury and illness prevention.

Edward W. Bullard designed the first "hard hat" as protective headgear for miners with his "Hard Boiled Hat," so-called due to the steam used to harden it during manufacturing. Later, he adapted his helmet to protect workers building the Golden Gate Bridge from falling rivets, leading to the bridge site becoming the first designated "Hard Hat Construction Area." Mr. Bullard also designed and sold another helmet specifically to protect sandblasting workers at the bridge site. Similar to the Hard Boiled Hat, this helmet included a hood, or "canopy," a see-through window, and an air supply. The helmets helped to prevent death and injury during the project and in the years since. Even so, 11 workers died at the bridge site—including 10 in 1937 when a scaffold collapsed. Today, about 6 million hard hats are sold annually throughout the world. Mr. Bullard's family-owned company still produces many of those hard hats, as well as modern sandblasting helmets.



A Golden Gate construction worker wears a Bullard "hard boiled hat" in this photograph, circa 1936. Credit: Labor Archives and Research Center, J. Paul Leonard Library, San Francisco State University



The personal air sampler system designed by R. Jeremy Sherwood, as it appeared in a 1960 Annals of Occupational Hygiene article announcing its invention. From: Sherwood RJ, Greenhalgh DMS [1960]. A personal air sampler. Ann Occup Hyg 2:127–132, https://doi.org/10.1093/annhyg/2.2.127.

R. Jeremy (Jerry) Sherwood merged research and industrial hygiene by inventing the first practical, personal sampling pump in the late 1950s. Until then, sampling occurred in a specific area, or while an industrial hygienist followed a worker while carrying bulky equipment. Using the newly developed personal sampling pump, Mr. Sherwood demonstrated that area sampling often severely underestimated worker exposures. Soon, personal sampling pumps became the staple that they are today. He also developed a miniature sampler for sulfur dioxide that became commercially available and was widely used throughout Europe. Finally, his research on respirators led to the first fit testing. While at the International Labour Organization and later at the World Health Organization, Mr. Sherwood trained others in occupational safety and health, particularly in developing countries, benefiting workers around the world.

Bullard-Sherwood Research to Practice Finalists

Finalists are listed alphabetically by project name.

Intervention

Coordinating Research to Practice: Activities that Informed the Release and Authorized Use of Millions of Expired Respirators from U.S. Stockpiles

Greenawald L, Moore S, Yorio P

Protected as Promised: Validating Respirator Performance, Providing Interventions, and Assuring Quality

D'Alessandro M, Attwood W, Brannen J, Buller S, Butcher J, Calvert C, Casey M, Cichowicz J, Fernando R, Fries M, Gavel K, Greenawald L, Harris J, Hillen J, Hsiao C, Jacobs R, Kiederer M, Kiefer E, Kochenderfer V, Lei Z, Luncinski L, Miller C, Obranovich K, Palcic J, Peterson J, Powell J, Powers J, Rafky L, Reed H, Reeder A, Rehak T, Sadeghpour N, Senk M, Sewchok H, Shahan M, Sheets R, Sporrer J, Stein R, Strickland K, Suhon N, Tyszkiewicz M, Whitson A, Wiltanger P, Wolfe C, Vojtko R, Yekich M, Zhuang Z

Reusability of Filtering Facepiece Respirators (FFRs)

Fisher E, Bergman M, Boyles H, Cichowicz J, D'Alessandro M, Horvatin M, Meyers J, Micciche M, Pollard J, Quinn T, Rengasamy A, Streeter R, Strickland K, Vo E, Vollmer B, Wilson A, Xu S, Zhuang Z

Knowledge

COVID-19 in the Wildland Fire Environment – Understanding a New Risk on the Fireline

Navarro K, Alexander E, Brown L, Butler C, Cnudde M, Flanigan Sawyer K, Garbe R, Goeller M, Handrigan M, Haston D, Hicks B, McCray L, Mattfeldt M, Millstein D, Symonds J, Short K, Sol J, Thompson M, Valentine K, Wilcox C, Williams G

NPPTL International Respirator Assessments to Support the COVID-19 Response

Powers J, Andrews A, Boutin B, Duling M, Harris J

Progress in Corrections Worker Health: The National Corrections Collaborative Utilizing a Total Worker Health® Strategy

Grubb P, Cherniack M, El Ghaziri M, Jaegers L, Monteiro C

Technology

A Novel Method For Intelligent Monitoring To Improve Miner Safety During Conveyor System Operation and Maintenance

Parks D, Jacksha R, McNinch M, Miller A, Raj V

ESPnano - Handheld Nanoparticle Collection Device

King G, Miller A

Practical Application of a Dampness and Mold Assessment Tool in Schools

Park J, Cox-Ganser J, Game S, Martin M

Bullard-Sherwood Research to Practice Awardees and Honorable Mentions

Intervention Awardee

Coordinating Research to Practice: Activities that Informed the Release and Authorized Use of Millions of Expired Respirators from U.S. Stockpiles

Greenawald L, Moore S, Yorio P

During a national emergency, millions of U.S. healthcare personnel may face high-consequence infectious disease exposures. N95 filtering facepiece respirators (N95s) are a type of personal protective equipment (PPE) for infection prevention commonly stockpiled by hospitals and government facilities in large quantities to prepare for surge demands. During the COVID-19 pandemic, N95 supplies were in great need among healthcare personnel and other frontline workers, yet stockpile shortages were evident nationwide. Additionally, many stockpiled N95s had been stored beyond their manufacturer-designated shelf life, which voids the NIOSH-approval and, if used, would be in violation of the Occupational Safety and Health Administration.

Thus, policymakers urgently needed to know if stockpiled N95s that were past their shelf life or had been stored for long time periods would provide lifesaving protections to healthcare personnel. In response, NIOSH accelerated and disseminated the results of a 2017 NIOSH National Personal Protective Technology Laboratory sampling and evaluation of thousands of PPE from stockpiles across the country. Published as 11 NIOSH PPE CASE reports, and in coordination with partners (e.g., U.S. Department of Health and Human Services Office of the Assistant Secretary for Response, Food and Drug Administration), this empirical data directly informed several COVID-19 response efforts. These efforts included 1) the Strategic National Stockpile's release of N95s stored for long periods; 2) the FDA's Emergency Use Authorization, permitting the use of NIOSH-approved respirators past their shelf life in healthcare settings; 3) CDC's guidance regarding releasing stockpiled N95s past their shelf life; and 4) CDC's guidance describing the use of expired N95s as a contingency and crisis strategy. This intervention drove urgent policy decisions to allow the distribution and use of hundreds of millions of stockpiled respirators, protecting healthcare personnel and other frontline workers against infectious diseases.

Intervention Honorable Mention

Protected as Promised: Validating Respirator Performance, Providing Interventions, and Assuring Quality

D'Alessandro M, Attwood W, Brannen J, Buller S, Butcher J, Calvert C, Casey M, Cichowicz J, Fernando R, Fries M, Greenawald L, Hillen J, Hsiao C, Jacobs R, Kiederer M, Kiefer E, Kochenderfer V, Lei Z, Luncinski L, Miller C, Obranovich K, Palcic J, Peterson J, Powell J, Powers J, Rafky L, Reed H, Reeder A, Rehak T, Sadeghpour N, Senk M, Sewchok H, Gavel K, Suhon N, Wiltanger P, Tyszkiewicz M, Sheets R, Yekich M, Stein R, Wolfe C, Vojtko R, Whitson A, Sporrer J, Strickland K, Shahan M, Zhuang Z, Harris J

Filtering facepiece respirators (FFRs) are the most common respiratory protective devices (RPDs) used in healthcare settings. With the onset of the COVID-19 pandemic and increased demand for RPDs, healthcare facilities faced severe FFR shortages. In response, NIOSH's Respirator Approval Program (RAP) effectively engaged partners and stakeholders in research to practice efforts to expand RPD supply options. RAP coordinated with CDC and the Food and Drug Administration (FDA), resulting in issuance of an FDA Emergency Use Authorization permitting the use of other effective, but not typically used in healthcare, NIOSH-approved respirators (e.g., elastomeric and powered air purifying respirators, or PAPRs). Additionally, the RAP expedited publication of the Interim Final Rule Approval Tests and Standards for Air Purifying Particulate Respirators, allowing manufacturers to utilize modern technology to produce smaller and lighter-weight PAPRs having the same effective particulate protections, while increasing workplace utility for today's diverse workforce. Focusing inward, the RAP also improved respirator approval operations, effectively reducing processing times by 80 percent while ensuring all performance and quality assurance standards were met.

More than 800 approvals were completed, and hundreds of new respirator configurations were certified and made available to users. In addition, multiple incidences of respirator approval violations and Conformity Assessment notices were identified and published to provide updated information about NIOSH-approved respirators and the guidance necessary for effective application processing. Furthermore, a process was established to allow non-traditional manufacturers to seek NIOSH approvals for their devices. Robust communication efforts also ensued to inform stakeholders about implications and proper use of these devices. These combined efforts in coordination with policymakers, manufacturers, and stakeholders expanded supply options to prevent and reduce exposure to the SARS-CoV-2 virus.

Knowledge Awardee

NPPTL International Respirator Assessments to Support the COVID-19 Response

Powers J, Harris J, Andrews A, Duling M, Boutin B

The NIOSH National Personal Protective Technology Laboratory (NPPTL) developed the International Respirator Assessment to quantify the filtration efficiency of non-NIOSH-approved personal respiratory protection devices that were initially qualified for emergency use by the Food and Drug Administration (FDA). This temporary authorization was needed to support the availability of respiratory protection at least equivalent to NIOSH-approved N95 filtering facepiece respirators for U.S. workers due to the respirator shortage associated with COVID-19 pandemic.

Using a modified version of the standard test procedure for filter efficiency, NPPTL provided users an understanding of the filtration performance that may be expected when purchasing or using a non-NIOSH approved international respiratory protection device. The results suggested that there was considerable range in filtration efficiency for most of the models assessed. Further, all units in 40 percent of the assessments tested below 95 percent. On May 7, 2020, informed by these results, the FDA removed 57 respirators from their International Emergency Use Authorization list. The FDA also instituted new sampling and evaluation procedures designed to increase the statistical power and the ability for each assessment to uncover distinct pockets of filtration performance within consistently labeled respiratory protection devices. While filtration efficiency shows how well the filter media performs, users must ensure a proper fit is achieved. This assessment procedure provided useful information about the filtration efficiency of respiratory protection devices that may be used by workers in national emergency situations.

Knowledge Honorable Mention

COVID-19 in the Wildland Fire Environment–Understanding a New Risk on the Fireline

Navarro K, McCray L, Butler C, Flanigan Sawyer K, Garbe R, Wilcox C, Symonds J, Handrigan M, Haston D, Cnudde M, Sol J, Mattfeldt M, Thompson M, Short K, Goeller M, Brown L, Alexander E, Millstein D, Williams G, Valentine K, Hicks B

The 2020 wildfire season tested the capacity and resiliency of the wildland fire community. Wildland firefighters perform arduous work under difficult conditions in remote locations for shifts often longer than 24 hours, and for up to 21 days. Wildfire incidents can be an ideal environment for the transmission of infectious diseases, including SARS-CoV-2, due to close living and working conditions, limited access to hygiene supplies, and a workforce that responds to incidents all over the country on short notice. Furthermore, these occupational factors may increase susceptibility to SARS-CoV-2 infection and severity of COVID-19 illness.

In early April 2020, the COVID-19 Interagency Wildland Fire Medical and Public Health Advisory Team (MPHAT) was established to address medical and health-related issues specific to wildland fire management operations during the COVID-19 pandemic. A first of its kind within the wildland fire community, MPHAT convened a diverse group of subject matter experts in medical and public health, risk management, logistics, and equipment and technology from CDC/NIOSH, Fire Management Board, Department of the Interior, U.S. Forest Service, and National Wildfire Coordinating Group. After reviewing CDC guidance and studies on COVID-19, MPHAT presented practical recommendations to the wildland fire community, which resulted in a productive collaboration that developed COVID-19 protocols and practices, including planning, prevention, and mitigation for wildland fire operations. Further, MPHAT published additional guidance for screening, prevention and mitigation strategies, hazard assessments, laboratory testing, contact tracing, and case investigation for wildland fire agencies and personnel. The diversity and dedication of all MPHAT partners were key to its success.

Technology Awardee

Practical Application of a Dampness and Mold Assessment Tool in Schools

Park J, Cox-Ganser J, Martin M, Game S

People who work in damp buildings are more likely than those who do not to report health problems, including respiratory symptoms, development or worsening of asthma, allergic rhinitis, and bronchitis. Extending beyond measurement of indoor microbes to determine the extent of contamination and exposure, research suggests that finding and correcting sources of dampness is the more effective way to prevent health problems. As school buildings also face dampness and mold issues, a need for the development of a practical tool that could be easily applied by school facility managers, health professionals, or lay people was needed.

Using results from two prior NIOSH studies on respiratory disease and mold exposures, researchers developed a prototype Dampness and Mold Assessment Tool (DMAT). In partnership with schools in Maine, Connecticut, Pennsylvania, and Colorado, the prototype was tested and further developed to meet the needs of users. Published on the NIOSH Indoor Environmental Quality website in 2019, the DMAT is an observational assessment that prompts users in scoring dampness-related factors based on the severity or size of the damaged area for every component (i.e., furnishings, supplies, and surfaces) of the room. Based on these factor scores on each room component, a room-specific score or room-component-specific score can be easily calculated and used for prioritizing remediation.

Technology Honorable Mention

ESPnano - Handheld Nanoparticle Collection Device

King G, Miller A

Exposure to hazardous airborne particles can lead to respiratory illness, cardiovascular disease, and lung cancer. The smallest of these particles are easily inhaled and not effectively filtered by the nose or upper respiratory system, allowing them to deeply penetrate the lungs. With rapidly evolving advances in nanotechnology, researchers sought to explore the effects of airborne ultrafine and nano-sized particles to human health. While many devices existed to measure airborne particle concentration, a technology gap existed.

NIOSH researchers identified the need for a field-portable device to collect representative samples of airborne nanoparticles. Originating as a pilot project within the NIOSH Nanotechnology Research Center, NIOSH researchers teamed with a Gonzaga University student team to develop a successful prototype electrostatic precipitator (ESP) nanoparticle sampler. With this demonstrated potential, and in partnership with a company, the technology was further developed and ultimately licensed and commercialized. The commercially available ESPnano handheld particle sampler (www.espnano.com) has become an important tool for industrial hygienists and safety professionals to collect representative samples of inhalable, respirable, and submicron particles (including nanoparticles) for offline analyses. This technology fills a unique gap in air quality monitoring, and its worldwide use is evidenced by many citations of the original work as well as published references to its application for the characterization of hazardous airborne particulate matter and in occupational exposure studies.

Plain Language Award

The Plain Writing Act of 2010 requires that federal agencies provide clear communication that the public can understand and use. NIOSH encourages plain language in all of its communication products. Established in 2017, this award recognizes NIOSH fact sheets, brochures, infographics, and web topic pages that demonstrate excellence in applying plain language principles.

Awards are given in two categories:

Before and After: Recognizes a revised NIOSH-branded brochure, infographic, fact sheet, or web topic page that includes both an original, difficult to read version and the revised version that uses plain language principles. Judges consider the improvements.

Original: Recognizes a NIOSH-branded brochure, infographic, fact sheet, or web topic page created originally using plain language principles.

Plain Language Award Finalists

Finalists are listed alphabetically by project name.

Before and After

Fire Fighter Fatality Investigation and Prevention Program

Kline K, Webb S, Bowyer M, Funke J

WTC Health Program - What conditions are covered by the Program?

Hurwitz E, Iker K, Spring I, Higdon B, Wolfe R, Bossie C

Original

Coronavirus (COVID-19) and the WTC Health Program

Hurwitz E, Spring I, Iker K, Bossie C, Higdon B, Wolfe R

Prevent Struck-by Incidents at Crash Scenes

Stefanick M, Funke J, Romano N, Lincoln J, Tiesman H, Knuth R

Row House Fire Fighting Tactics

Webb S, Marsh S, Loflin M, Kline K, Hales T

Plain Language Awardees and Honorable Mentions

Before and After Awardee

Fire Fighter Fatality Investigation and Prevention Program

Kline K, Webb S, Bowyer M, Funke J

This one-page informational fact sheet provides information about the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP). It includes high-level information about the program and its goals, the investigation process, and a link to completed reports. This fact sheet replaces a dated four-fold brochure. We overhauled the content in the brochure following plain language best practices and included new text to better address questions someone new to the FFFIPP may have, such as: who are FFFIPP investigators or how are investigations conducted?

Additionally, we used this as an opportunity to think about how this product is typically shared. Most often, this fact sheet is shared via electronic communications, such as a PDF attachment or link. It is also printed and shared with people who are assisting with investigations. It was evident that the four-fold brochure was not conducive for viewing information online since text crosses several columns with the cover of the brochure appearing on the second page. Also, modifying the format from a brochure to a fact sheet, we updated the design to align with other parts of the FFFIPP communication suite of products, such as the FFFIPP report.

Before and After Honorable Mention

WTC Health Program - What conditions are covered by the Program?

Hurwitz E, Iker K, Spring I, Higdon B, Wolfe R, Bossie C

The new Covered Conditions fact sheet and corresponding webpage of the World Trade Center (WTC) Health Program website incorporates plain language principles of headers, lists, icons, sectioning text, and white space. The main purpose of this fact sheet is to share information on the kinds of conditions that may be covered for treatment in the WTC Health Program. The WTC Health Program did not previously have a fact sheet with this kind of information. However, many outreach groups had created fact sheets comprising lists of hundreds of conditions that the WTC Health Program covers. In fact, the WTC Health Program website supported this, as well, with a long list of conditions that may be covered. These lists were not in plain language, nor were they the official lists of conditions. In fact, the WTC Health Program became concerned that members may not apply if they do not see their condition listed among a list of hundreds of conditions.

Therefore, this new fact sheet and corresponding webpage outlines that the WTC Health Program covers many different conditions in five unique categories. Each category is then outlined with examples of common conditions. The fact sheet and webpage also provide a simple description of certification of the conditions, so members understand that there is a process to receive treatment for any WTC-related health conditions.

Original Awardee

Row House Fire Fighting Tactics

Webb S, Marsh S, Loflin M, Kline K, Hales T

Fire fighting is a high-risk job. Historically, about 90 fire fighters die in the line-of-duty each year. The NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP), which started in 1998, conducts fire fighter fatalities investigations. The program has published over 760 reports that summarize the findings of these investigations and provide accounts of incidents and recommendations for preventing future deaths. Based on findings from both a 2008 FFFIPP evaluation and 2017 needs assessment, the fire service recommended the FFFIPP take the previously published information and develop concise, easy-to-use, actionable, materials that describe proper fire fighting strategy and tactics for select structures to more effectively educate the fire service and prevent fireground injuries and deaths.

To achieve this goal, we developed a fact sheet and supplemental printable poster using existing FFFIPP line-of-duty death reports specific to row house fire fighting tactics. Row houses are a common and often iconic housing style in many large cities, but also are present in many small towns. The characteristics of row houses that make them unique also pose a challenge to the fire service during fire suppression. To address these challenges, the fact sheet includes a three-dimensional graphic showing both the interior and exterior of a row house, proven fire fighting tactics, and areas of possible fire spread. The fact sheet provides the information necessary for fire officers and fire fighters to quickly make important life-saving decisions, not just for themselves, but for possible building occupants, too.

Original Honorable Mentions

Coronavirus (COVID-19) and the WTC Health Program

Hurwitz E, Spring I, Iker K, Bossie C, Higdon B, Wolfe R

At the beginning of the COVID-19 pandemic, the Communications Unit was able to create new COVID-19 resources for members. This included a series of webpages and a fact sheet. The fact sheet is available online and was mailed to all World Trade Center (WTC) Health Program members with a letter from NIOSH Director Dr. John Howard.

The new Coronavirus (COVID-19) and the WTC Health Program webpage incorporates plain language principles of headers, lists, icons, sectioning text, and action words. The main purpose of this webpage is to reinforce the pertinent CDC resources, share new mental health and social assistance resources, give details on the WTC Health Program's response to COVID-19, and provide information on how to continue receiving WTC-related health care during the pandemic. The fact sheet provides this same information in a printable format. The mental health and social assistance webpages provide New York-based and national resources that members can take advantage of during the COVID-19 pandemic and afterwards. Both webpages also include the same plain language principles.

Prevent Struck-by Incidents at Crash Scenes

Stefanick M, Funke J, Romano N, Lincoln J, Tiesman H, Knuth R

This infographic explains how law enforcement officers can reduce the risk of being struck by other vehicles while working at crash scenes. Placed in the context of the information highlighted in the introduction, the infographic outlines four concrete actions that law enforcement officers can take to stay safe from moving vehicles while outside the patrol vehicle at crash scenes. The takeaway message is: "You can lower your risk," and the call to action is to follow the concise actions provided in the infographic and to visit the NIOSH Fatality Assessment and Control Evaluation Program and law enforcement motor vehicle safety webpages for related resources.

Service Excellence Award

These awards focus on both the management and operations side of the Institute and recognize NIOSH staff who provide excellent administrative and managerial support to the Institute's mission and projects.

The awards recognize distinction in four categories: Excellence in Administration, Excellence in Leadership, Excellence in Workforce Development, and Excellence in Workforce Diversity.

Excellence in Administration recognizes one current NIOSH employee or group of NIOSH employees each year for exceptional administrative support. This award honors the contributions made by employees in administrative occupations to increase the effectiveness or efficiency of a division, laboratory, or office.

Excellence in Leadership recognizes one current NIOSH employee per grade grouping (GS-14 and above, GS-11 to GS-13, and GS-9 and below) each year for exceptional personal leadership. This award honors the efforts made by employees to exhibit leadership at NIOSH.

Excellence in Workforce Development recognizes one current NIOSH employee or group of NIOSH employees each year for exceptional contributions that promote development of the NIOSH workforce. This award acknowledges those who mentor, teach, promote, or design activities that develop the workforce.

Excellence in Workforce Diversity recognizes one current NIOSH employee or group of NIOSH employees whose actions promote the creation and support of a diverse NIOSH workforce. This award acknowledges those whose efforts promote the recognition and value of diversity, including recognition of health equity issues.

Service Excellence Award Finalists

Finalists are listed alphabetically by nominee or team name.

Excellence in Administration

Administrative Support Team, National Personal Protective Technology Laboratory:

Sarah Babyak, Jessica Butcher, Michael Dojcak, Barbara Ginsburg, Lacy Hannon, John Hillen, Heather Reed, Barbara Sheppard, Melanie Street, Dawn Zubasic

Rachel Dwyer, Division of Field Studies and Engineering

Rosmarie Hagedorn, Division of Science Integration

Dawn Zubasic, National Personal Protective Technology Laboratory

Excellence in Leadership

GS-14 and above

Jonisha Pollard, National Personal Protective Technology Laboratory

CAPT Sarah Unthank, Division of Science Integration

Jeffrey Welsh (retired), Pittsburgh Mining Research Division

GS-11 to GS-13

Michael Bergman, National Personal Protective Technology Laboratory

GS-9 and below

Gene R. Hill, Division of Safety Research

Excellence in Workforce Development

No nominations were submitted for this category.

Excellence in Workforce Diversity

No nominations were submitted for this category.

Service Excellence Awardees

Excellence in Administration Awardee

Administrative Support Team, National Personal Protective Technology Laboratory (NPPTL)

Top, from (L to R) John Hillen, Lacy Hannon, Heather Reed, Sarah Babyak, Jessica Butcher, Michael Dojcak, Barbara Ginsburg, Barbara Sheppard, Melanie Street, Dawn Zubasic.

With little preparation, the NPPTL Administrative Team immediately pivoted to full-time telework while doubling (or tripling) its operational output. The exceptional support provided by the NPPTL Administrative Team resulted in awarded contracts, fully executed interagency agreements (IAAs) and intergovernmental personnel act agreements (IPAs), government purchase card requests, and new hires through recruitment activities.

The awarded contracts resulted in NPPTL's ability to partner with private industry and academia to examine the reuse and extended use of N95 respirators, evaluate respirator performance, consider decontamination methods for filtering facepiece respirators, develop performance standards, and continue the National Framework for Personal Protective Equipment (PPE) Conformity Assessment. The executed IAA packages allowed NPPTL to survey the needs for respiratory protection from the national healthcare industry, combat emerging counterfeit issues associated with the NIOSH certification of N95 masks, and implement the NIOSH Respirator Approval Program (RAP). The executed IPAs provided NPPTL opportunities to engage with academia to provide public safety workers guidance on the proper selection, use, and decontamination of PPE and provide statistical analyses in support of the RAP's modernization of national readiness. The hiring of engineers and quality assurance specialists provided the support needed to meet the significant increase in demand for testing and evaluation. Our health communications new hires have been critical in responding to hundreds of emails received during the COVID-19 pandemic regarding proper respirator use, and other general questions and concerns. While the NPPTL Administrative Team has provided outstanding support to NPPTL over the last several years, it was their commitment to excellence during the COVID-19 pandemic that truly tested the caliber and tenacity of this amazing team.

Excellence in Leadership: GS-14 and above Awardee

CAPT Sarah Unthank, Division of Science Integration (DSI)

CAPT Unthank demonstrated exceptional leadership in successfully overcoming two major challenges: leading the merger of two NIOSH divisions into one new division (DSI) and leading that new division through the workplace challenge of the COVID-19 pandemic. Novel challenges needed to be addressed quickly, remotely, and with creativity and sensitivity. Leading the response to the reorganization and the COVID-19 pandemic required demands of CAPT Unthank that were far beyond her routine activities and responsibilities.

CAPT Unthank was the strong role model needed to lead the new division safely and effectively under challenging conditions to ensure the continued fulfillment of the NIOSH mission. She had a significant impact on workplace quality by proactively preparing staff for remote telework and leading remote social activities which improved comradery and morale. She served as the division deployment coordinator, tracking and coordinating the deployment of 44 missions. She also exemplified commitment to the NIOSH mission by serving as the public inquiries lead for the NIOSH-Info Unit on the CDC Incident Management System Worker Safety and Health Team.

CAPT Unthank led the development of the DSI Cares website, which resulted in increased communication among DSI staff and improved morale. She was a leader in developing the DSI Blueprint for Action Diversity and Inclusion plan, directing a workgroup to identify areas of focus, critical needs, and solutions to address key goals. These efforts raised DSI staff's awareness of and interest in these important topics.

Excellence in Leadership: GS-11 to GS-13 Awardee

Michael Bergman, National Personal Protective Technology Laboratory (NPPTL)

Mr. Bergman played a key role in establishing the NPPTL post-decontamination N95 filtering facepiece respirator (FFR) assessment program. He led the protocol development, managed the onsite testing, and trained lab personnel, including three new hires, to run the tests. He interacted with the outside organizations who submitted samples and often provided support and consultation to stakeholders and various organizations on the interpretation of the results.

His other actions and achievements include responding to webmail inquiries, participating in numerous conference calls with the Food and Drug Administration (FDA) and outside organizations regarding respirator decontamination, and being first author on a 2020 *Journal of The International Society for Respiratory Protection paper titled A Review of Decontamination Methods for Filtering Facepiece Respirators*. His contributions informed FDA decisions related to FFR decontamination Emergency Use Authorizations. He also led an in-house study to evaluate the protective capabilities of masks made from cotton T-shirts, began an assessment of N95 FFR fit while subjects are wearing "skin protectants" such as bandages and medical tapes to prevent skin damage, and wrote FFR user guidance. Mr. Bergman exemplified service excellence and executed these tasks with exceptionally high quality.

Mr. Bergman's outstanding services and leadership are well beyond his GS-12 grade level. His research is accelerating the availability of respiratory protection for the healthcare community and critical infrastructure industries. His efforts contributed greatly to focus areas for the COVID-19 response and research effort to improve the health and safety of respirator users. In addition, his efforts helped encourage healthcare workers and policy makers to make evidence-based decisions for extending respirator supplies.

Excellence in Leadership: GS-9 and below Awardee

Gene R. Hill, Division of Safety Research (DSR)

Mr. Gene Hill exhibited outstanding leadership in addressing several important administrative issues for DSR during 2020. These included training a new program operations assistant (POA), serving as the DSR lead in implementing the new Study Tracking and Reporting System (STARS), serving as the lead in implementing the new Credit Card Purchasing System (CCPS), and providing office supplies to DSR staff.

During the early implementation of STARS, Mr. Hill volunteered to take the lead to broaden his understanding of the system to help train POAs who would be responsible for inputting project information into STARS. Mr. Hill's efforts to train the new POA and implement two new administrative systems significantly helped DSR and allowed the smooth transition to STARS and CCPS.

Mr. Hill's initiative to provide staff with basic office supplies demonstrated to our staff that DSR continued to consider their needs, however small. He secured approval from DSR management and the NIOSH Morgantown Facilities Management Office to use the NIOSH parking lot to distribute supplies and developed a staggered schedule for staff to pick up their supplies, while ensuring that all COVID-19 safety protocols were followed during distribution.

His position as program specialist did not require volunteering to take the lead in any of these activities. However, his efforts are indicative of his proactive approach and demonstrate a strong commitment to advancing the mission of DSR and NIOSH. His efforts have made a positive impact on the DSR workplace, helping to reduce the burden on both administrative and research staff.

Director's Intramural Award for Extraordinary Science

Science excellence is the foundation upon which NIOSH generates new knowledge to assure safe and healthful work for all.

This award recognizes the outstanding contributions and dedication of NIOSH staff to science excellence. The award honors experienced scientists, early career scientists, and scientific support staff whose collective body of work has resulted in significant contributions to the NIOSH mission.

The **Lew Wade Distinguished Career Scientist Award** recognizes a permanent employee or fellow who has made extraordinary scientific contributions to their field of work.

The **Early Career Scientist Award** recognizes a permanent employee or fellow who has received a masters or doctorate degree in a scientific discipline in the past five years.

The **Scientific Support Award** recognizes technical or administrative staff who are permanent employees or fellows that provide invaluable contributions to the successful completion of NIOSH scientific activities.

Director's Intramural Award for Extraordinary Science Finalists

Finalists are listed alphabetically.

Lew Wade Distinguished Career Scientist

Claire Caruso

Elizabeth Whelan

Early Career Scientist

Brenda Jacklitsch

Miriam Siegel

Scientific Support

Seleen Collins

Kelly Vanoli

Director's Intramural Award for Extraordinary Science Awardees

Lew Wade Distinguished Career Scientist

CAPT Elizabeth Whelan

CAPT Elizabeth Whelan is an epidemiologist in the Division of Field Studies and Engineering. In her exemplary 30-year NIOSH career, she has conducted critical health outcomes research, identified new problems and areas of research, and mentored numerous staff.

Early in her career, CAPT Whelan made important scientific contributions in the areas of polychlorinated biphenyl and take-home lead exposures. Her 2007 paper, Work Schedule During Pregnancy and Spontaneous Abortion, is considered one of the best on the subject and led to the NIOSH shiftwork and reproductive outcomes webpage.

CAPT Whelan's leadership and expertise were critical in establishing the Disaster Science Responder Research (DSRR) Program allowing for timely and scalable responder-based occupational safety and health research to be implemented before, during, and after a public health emergency. CAPT Whelan is the Deputy Team Lead on CDC's COVID-19, Worker Safety and Health Team, Science and Research Unit, where she implemented the novel DSSR Program approaches into the COVID-19 response.

CAPT Whelan has been in a leadership role at NIOSH for 23 years, first as a Team Leader and for the past 16 years as the Chief of the Field Research Branch (FRB). She has been instrumental in developing prioritizing strategies and leveraging data to meet NIOSH's needs. Among these are developing high quality exposure data for the National Toxicology Program; investigating mortality and cancer incidence among firefighters leading to the Firefighter Cancer Registry; and establishing productive collaborations leading to the NIOSH Center for Workers Compensation Studies. She has been instrumental in mentoring and supporting staff and established an early career scientist group in FRB to discuss research topics and needs.

Early Career Scientist

Brenda Jacklitsch

Dr. Brenda Jacklitsch is a research health scientist in the Division of Science Integration and the coordinator for the NIOSH Small Business Assistance Program. Her research involves designing and evaluating educational products for employers and workers with limited resources and access to professional occupational safety and health (OSH) assistance.

Dr. Jacklitsch led the scientific team in publishing the NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments, a well-recognized and often referenced work in the OSH community. She worked collaboratively with OSHA (Occupational Safety and Health Administration) on cobranded products, including *OSHA-NIOSH Infosheet: Protecting Workers from Heat Illness*, and the updated Heat Safety Tool App to include recommendations and information from the criteria document, and coauthored with OSHA two heat-related MMWR (*Morbidity and Mortality Weekly Report*) manuscripts.

Dr. Jacklitsch has been a valuable contributor to numerous CDC/NIOSH emergency response activities. She deployed as the Fact Sheet Coordinator for the COVID-19 Response where she assisted in developing 20 fact sheet topics and was the technical expert for the heat stress and grocery and retail worker fact sheets.

Dr. Jacklitsch's outstanding OSH contributions include over 50 scientific and lay presentations and numerous scientific and NIOSH numbered publications on topics of COVID-19, heat stress, outdoor worker safety, small business, and climate change. She is routinely consulted by scientists in other federal agencies, academia, and industry for her technical expertise. As an early career scientist, Dr. Jacklitsch has already established herself as an expert in the topics of heat stress, outdoor worker OSH educational needs, and small business OSH. She continues to excel in these topic areas and has carved out a niche specific to her translation research interests.

Scientific Support

Kelly Vanoli

Kelly Vanoli, IT specialist in the Division of Field Studies and Engineering, is the lead software engineer on the NIOSH Industry and Occupation Computerized Coding System (NIOCCS). NIOCCS is a web-based software tool that assigns standard and analyzable codes to industry and occupation (I&O) text. Kelly has worked diligently to improve the system's capacity and functioning, resulting in the system coding over 45 million I&O records, to date, with nearly 800 U.S. and international users.

NIOCCS version 4 (V4) recently launched, providing significant improvements to auto-coding performance, speed, accuracy, scalability and maintenance burden. Due to Kelly's innovative approach, V4 is exponentially faster with an estimated auto-coding rate of 2,200 records per minute, thus reducing manual coding from 20 percent to 5-10 percent, saving user and staff time, and leading to commensurate cost savings for NIOSH and its partners. Recently, NIOCCS has played a central role in the COVID-19 response. NIOCCS has been used to code I&O data for over 100,000 records representing more than 30 jurisdictions and including death records, seroprevalence survey responses, and case reports.

Kelly's mastery of machine learning methods has impacted other real-time I&O coding opportunities that once seemed impenetrable. He developed an I&O template for the CDC EPI Info software, enabling I&O data coding at the point of collection in field surveys. He masterminded and executed the I&O auto-coding web service, enabling real-time I&O data coding from any platform using only a web call.

The success of NIOCSS and the expansion in the magnitude of coding would not have been possible without Kelly's innovative thinking, consistent high-level work, and numerous contributions to development, maintenance, and reengineering.

Director's Intramural Award for Extraordinary Science 2019 Awardee Updates

Distinguished Career Scientist Awardee Update

Christine Whittaker

Dr. Whittaker used the funds from the 2019 Distinguished Career Scientist award to support an ORISE Collegiate Leader in Occupational Safety and Health student, Ms. Ann Parker. Ms. Parker was a University of Cincinnati graduate student working on her master's degree in industrial hygiene. She worked on a project correlating measures of respiratory depression in rodents with NIOSH Immediately Dangerous to Life and Health values. The broader goal of this project was to develop a deeper understanding of how sensory irritation data can be used to assess risks to workers in a variety of occupational scenarios. In addition, this work formed the basis of Ms. Parker's master's thesis.

The seed money that began this project continues to pay dividends. While working on this issue, Ms. Parker and other students mined data from the NIOSH *Pocket Guide to Chemical Hazards*. The *Pocket Guide* contains a wealth of information on chemical hazards. However, mining the *Pocket Guide* is difficult because the database was set up for displaying NIOSH guidance, not for research. To make the *Pocket Guide* more accessible for health policy research, Dr. Whittaker has begun a project to develop a research version, adding publicly available NIOSH data on the health basis of recommended exposure limits and other variables. The goal of this project is to increase the transparency and consistency of NIOSH science policy recommendations by providing a public database that contains occupational safety and health information in a form accessible to researchers.

Early Career Scientist Awardee Update

Rebecca Guerrin

Dr. Rebecca Guerin, a supervisory social scientist in the Division of Science Integration, used her 2019 Early Career Scientist (ECS) award to develop expertise in Translation Research, commonly referred to as Dissemination and Implementation (D&I) science, enrolling in the online D&I Science Graduate Certificate Program at the University of Colorado, Denver, Anschutz Medical Center.

Dr. Guerin has been applying D&I approaches to a program of research to integrate workplace safety and health skills into secondary school curricula to reduce occupational health disparities among younger workers. Dr. Guerin has also collaborated with researchers from the Finnish Institute for Occupational Health on assessing intermediate implementation outcomes using D&I approaches. Several articles featuring Dr. Guerin's D&I research have been published in high-impact journals. She has presented on D&I in occupational safety and health research domestically at the annual American Public Health Association and National Institutes of Health D&I conferences, and internationally, including at the 10th International Conference on the Prevention of Accidents at Work, in Vienna, Austria, in 2019. Dr. Guerin was an invited lecturer at the 2020 Nordic Institute for Advanced Training in Occupational Health course on knowledge translation in Oslo, Norway, postponed due to the COVID-19 pandemic.

Through the ECS award, Dr. Guerin has also built a network of D&I research collaborators, with whom she developed a D&I primer for OSH, which is currently under journal review. Moreover, Dr. Guerin is applying her D&I knowledge and partnerships to lead the Translation Research Topic Area of the NIOSH Evaluation Capacity Building Plan. Dr. Guerin provides consultation to NIOSH scientists on enhancing research outcomes through D&I and will continue to build expertise and partnerships in this area.

Scientific Support Awardee Update

Carl Sunderman

Mr. Sunderman used funds from the 2020 Distinguished Career Scientist award to purchase a replacement control board for the reflow oven in the electronics lab at the Spokane Mining Research Division. Just before the award, the reflow oven's control board failed and required replacement. A reflow oven is an essential piece of electronic prototyping equipment. It is used to solder surface mount components to a printed circuit board and works similarly to a kitchen toaster oven. The reflow oven is repaired and working normally.

Since then, Mr. Sunderman has continued to support projects in the Spokane Mining Research Division. His electronics work includes developing the control board for a cloud-enabled remote lock-out, tag-out device for use in conveyor safety applications. The miniaturized one-inch-square circuit connects over a radio protocol to a cloud server. It also controls the sensors and actuators and displays data on a low power LCD. Mr. Sunderman also developed a controller for a dust collection system used to contain silica dust. The controller communicates over WiFi with a cloud server that displays dust concentration and alerts the system to activate the dust collector actuators.

Mr. Sunderman has continued to support the laboratory by setting up a wet lab for the measurement of corrosion rates from ground support materials. As the mining environment is often corrosive to ground support structures, this lab will allow researchers to quantify the degree of corrosion given the type of host rock present in problematic areas of a mine. He also continues to support the materials testing lab with custom test programs.

NIOSH Nominations for the 2021 Charles C. Shepard Science Award

CDC/ATSDR established the Charles C. Shepard Science Award in 1986 in honor of Charles C. Shepard, MD, an internationally recognized microbiologist whose career was marked by a pursuit of scientific excellence. He served as chief of the Leprosy and Rickettsia Branch at CDC for more than 30 years, until his death on February 18, 1985. The Charles C. Shepard Science Award recognizes excellence in science at CDC and ASTDR. An award is presented for scientific publications in the following areas: Assessment, Prevention and Control, Laboratory Science, Data Methods and Study Design. An award is also presented for Lifetime Scientific Achievement.

Due to the COVID-19 pandemic, the Charles C. Shepard Award is delayed, and the nominations and awardees are not available at this time. NIOSH will post this information to the NIOSH Charles C. Shepard Award website when it becomes available.