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Service Excellence Award

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James P. Keogh Award

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NIOSH Science and Service Awards 2020

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

Contents

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 Award Winner

Dr. Christopher C. Coffey

Dr. Coffey is recognized worldwide as a researcher in respiratory protection, a topic we have seen come into the spotlight with the current pandemic. His wealth of experience as a NIOSH researcher providing national and global leadership in preventing workplace illnesses and injuries began four decades ago in respirator certification and concluded with serving as the Associate Director for Science for the NIOSH National Personal Protective Technology Laboratory from 2011 to 2020.

Dr. Coffey's research improved the state of worker protection and helped lead to the establishment of a classification scheme for particulate air-purifying respirators that was established by NIOSH in 1995 and incorporated into federal regulation. His groundbreaking laboratory and workplace studies on respirator performance served to reduce exposures to inhalation hazards, with an emphasis on filtering facepiece respirators.

Dr. Coffey has been the lead researcher on the fit and filtration of these devices and is recognized worldwide for his research translation in influential respiratory protection policies, standards and guidelines. The results from his research have been used to establish federal regulations for respirator performance and use, national and international standards, test practices, and respirator policies and guidelines.

While his research has been outstanding and far reaching, Dr. Coffey has demonstrated exemplary leadership in identifying research needs and conducting research programs. His intelligent, disciplined, and committed leadership is seen in the creative and innovative approaches in NPPTL's research portfolio.

His research has led to numerous respirator technological contributions spanning design, performance requirements, performance testing, workplace testing and use. He has been recognized by his peers, including receiving the prestigious AIHA John M. White Award on three occasions.

Dr. Coffey recently retired from NIOSH after 41 years of service to the Institute. Through his work, Dr. Coffey has demonstrated exceptional commitment to the field of occupational safety and health.

Previous James P. Keogh Award Winners

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 and Research Service. 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 North-western 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 alphabetized by first author.

Behavioral and Social Science

Swanson LR, Bellanca JL [2019]. If the technology fits: an evaluation of mobile proximity detection systems in underground coal mines. Min Metall Explor *36*(4):633-645.

Tiesman HM, Gwilliam M, Rojek J, Hendricks S, Montgomery B, Alpert G [2019]. The impact of a crash prevention program in a large law enforcement agency. Am J Ind Med *62*(10):847-858.

Tomasi SE, Fechter-Leggett ED, Edwards NT, Reddish AD, Crosby AE, Nett RJ [2019]. Suicide among veterinarians in the United States from 1979 through 2015. J Am Vet Med Assoc *254*(1):104-112.

Communication and Guidance

NIOSH [2019]. Small business international travel resource. By Van Bogaert D, Kitt M, Yeoman K, Chosewood C, Gibbins J, Nickels L, Piacentino J, Novakovich 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. 2019-165.

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.

NIOSH [2019]. Using *Total Worker Health*® concepts to address hearing health. By Themann CL, Morata T, Afanuh S. 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. 2019-155.

Engineering and Control

NIOSH [2019]. Dust control handbook for industrial minerals mining and processing. 2nd ed. By Cecala AB, O'Brien AD, Schall J, Colinet JF, Franta RJ, Schultz MJ, Haas EJ, Robinson JE, Patts J, Holen BM, Stein R, Weber J, Strebel M, Wilson L, Ellis M. Pittsburgh, PA: 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. 2019-124, RI 9701.

Xu SS, Lei Z, Zhuang Z, Bergman M [2019]. Numerical simulations of exhaled particles from wearers of powered air purifying respirators. J Int Soc Respir Prot *36*(2):66-76.

Xu XS, Welcome DE, Warren CM, McDowell TW, Dong RG [2019]. Development of a finger adapter method for testing and evaluating vibration-reducing gloves and materials. Meas *137*:362-374.

Epidemiology and Surveillance

Lawson SM, Masterson EA, Azman AS [2019]. Prevalence of hearing loss among noise-exposed workers within the Mining and Oil and Gas Extraction sectors, 2006-2015. Am J Ind Med *62*(10):826-837.

McCanlies EC, Ma CC, Gu JK, Fekedulegn D, Sanderson WT, Ludena-Rodriguez YJ, Hertz-Picciotto I [2019]. The CHARGE study: an assessment of parental occupational exposures and autism spectrum disorder. Occup Environ Med *76*(9):644-651.

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.

Exposure and Risk Assessment

Doney BC, Blackley D, Hale JM, Halldin C, Kurth L, Syamlal G, Laney AS [2019]. Respirable coal mine dust in underground mines, United States, 1982-2017. Am J Ind Med *62*(6):478-485.

Lowe BD, Dempsey PG, Jones EM [2019]. Ergonomics assessment methods used by ergonomics professionals. Appl Ergon *81*:102882.

Pollard J, Kosmoski C, Porter WL, Kocher L, Whitson A, Nasarwanji M [2019]. Operators' views of mobile equipment ingress and egress safety. Int J Ind Ergon *72*:272-280.

Methods and Laboratory Science

Harris ML, Sapko MJ [2019]. Floor dust erosion during early stages of coal dust explosion development. Int J Min Sci Technol *29*(6):825-830.

Khaliullin TO, Kisin ER, Yanamala N, Guppi S, Harper M, Lee T, Shvedova AA [2019]. Comparative cytotoxicity of respirable surface-treated/untreated calcium carbonate rock dust particles in vitro. Toxicol Appl Pharmacol *362*:67-76.

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.

Research Service

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.

NIOSH [2019]. Evaluation of exposure to radon and radon progeny in an underground tourist cavern and its connected buildings. By Zwack LM, Brueck SE, Anderson JL, Hammond DR. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Health Hazard Evaluation Report 2014-0158-3345.

Alice Hamilton Winners

Behavioral and Social Science Honorable Mention

Suicide among veterinarians in the United States from 1979 through 2015

Tomasi SE, Fechter-Leggett ED, Edwards NT, Reddish AD, Crosby AE, Nett RJ [2019]. Suicide among veterinarians in the United States from 1979 through 2015. J Am Vet Med Assoc *254*(1):104-112.

Objective: To assess proportionate mortality ratios (PMRs) for suicide among male and female US veterinarians from 1979 through 2015. Procedures: Information for veterinarians who died during 1979 through 2015 was obtained from AVMA obituary and life insurance databases and submitted to a centralized database of US death records to obtain underlying causes of death. Decedent data that met records-matching criteria were used for calculation of PMRs for suicide stratified by sex and indirectly standardized for age, race, and 5-year calendar period with 95% confidence intervals. Results: 398 deaths resulted from suicide; 326 (82%) decedents were male, 72 (18%) were female, and most (298 [75%]) were ≤ 65 years of age. The PMRs for suicide for all veterinarian decedents (2.1 and 3.5 for males and females, respectively), those in clinical positions (2.2 and 3.4 for males and females, respectively), and those in nonclinical positions (1.8 and 5.0 for males and females, respectively) were significantly higher than for the general US population. Conclusions and Clinical Relevance: Results of the study indicated that PMRs for suicide of female as well as male veterinarians were higher than for the general population. These data may help to inform stakeholders in the creation and implementation of suicide prevention strategies designed for veterinarians. In 1982, investigations of deaths due to any cause for US veterinarians who died during the years 1947 through 1977 found that the PMR for suicide among white male veterinarians was 1.7 times than that of the general US population The demographics in the veterinary profession have changed substantially over the past 3 decades. Beginning in the late 1980s, the number of female veterinary students began exceeding the number of male veterinary students. In 2017, over 60% of US veterinarians were female, and in 2016, approximately 80% of students enrolled at US veterinary medical colleges were female. In the past 50 years, society has moved away from an agriculture-based culture, and companion animals have become increasingly popular. In 2017, > 75% of US veterinarians practicing clinical medicine worked exclusively or predominantly in companion animal medicine. Understanding the PMRs for suicide among male and female US veterinarians in the context of the changing demographics and species specialization in the veterinary profession could help inform suicide prevention activities as part of a profession-wide and comprehensive suicide prevention strategy.

Behavioral and Social Science Winner

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

Tiesman HM, Gwilliam M, Rojek J, Hendricks S, Montgomery B, Alpert G [2019]. The impact of a crash prevention program in a large law enforcement agency. Am J Ind Med *62*(10):847-858.

Background: Motor vehicle crashes (MVCs) remain a leading cause of death for US law enforcement officers. One large agency implemented a crash prevention program with standard operating policy changes, increased training, and a marketing campaign. This was a scientific evaluation of that crash prevention program. Methods: MVC and motor vehicle injury (MVI) data for law enforcement officers were compared using an autoregressive integrated moving average (ARIMA) model. Two law enforcement agencies who had not implemented a crash prevention program were controls. Results: After program implementation, overall, MVC rates significantly decreased 14% from 2.2 MVCs per 100,000 miles driven to 1.9 (P = .008). MVC rates did not decrease in the control agencies. Overall, MVI rates significantly decreased 31% from 3.4 per 100 officers to 2.1 (P = .0002). MVC rates did not decrease in the control agencies. MVC rates for patrol officers significantly decreased 21% from 3.1 per 100,000 miles to 2.4. MVI rates for patrol officers significantly decreased 48% from 3.2 per 100 officers to 1.6 (P < .0001). Conclusions: Crash and injury rates can be reduced after implementation of a crash prevention program and the largest impacts were seen in patrol officers.

Communication and Guidance Honorable Mention

Using Total Worker Health® concepts to address hearing health

> NIOSH [2019]. Using *Total Worker Health*® concepts to address hearing health. By Themann CL, Morata T, Afanuh S. 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. 2019-155.

Exposure to hazardous types and levels of noise is common both at work and in daily life. Therefore, while protecting workers on the job is very important, it is also important to raise awareness and encourage protective behavior outside of work. In addition, other risk factors both on and off the job can interact with noise to increase or decrease risk. Through its Total Worker Health® (TWH) Program, the National Institute for Occupational Safety and Health (NIOSH) recommends an integrated approach to address the hearing health of workers. An integrated approach is a comprehensive consideration of risk factors intended to protect workers from work-related injury and illness and help them advance their overall health and well-being, on and off the job. The approach includes addressing exposures at work, environmental factors, and personal factors [NIOSH 20189+]. This Workplace Solutions document focuses on the application of TWH concepts to promote better hearing health and reduce the risks associated with noise exposure.

Communication and Guidance Winner

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.

In the absence of an occupational exposure limit (OEL), determining the appropriate controls to protect workers from chemical exposures can be challenging. Occupational hygienists and safety professionals use a variety of tools such as safety data sheets, exposure monitoring, medical surveillance, and toxicity testing to make risk management decisions. Yet they are challenged by having no decision-making framework to screen and discriminate the most relevant data when assessing chemical substances and developing exposure control guidance. Occupational exposure banding is a systematic process that uses qualitative and quantitative hazard information on selected health-effect endpoints to identify potential exposure ranges or categories. The NIOSH occupational exposure banding process seeks to create a consistent and documented process with a decision logic to characterize chemical hazards for chemical substances that lack OELs. It is distinguished from other hazard classification and category-based systems in several ways including: (1) a three-tiered system that allows users of varying expertise to use the process; (2) determination of potential health impacts based on nine health endpoints separately; (3) hazard-based categories linked to quantitative exposure ranges; and (4) assessment of the process via extensive evaluation exercises to determine consistency of the occupational exposure banding process with OELs. It considers the totality of the information across all of the nine standard toxicological health endpoints: (1) carcinogenicity; (2) reproductive toxicity; (3) specific target organ toxicity; (4) genotoxicity; (5) respiratory sensitization; (6) skin sensitization; (7) acute toxicity; (8) skin corrosion and irritation; and (9) eye damage/irritation; and considers multiple exposure routes (e.g., inhalation, dermal, eye, and oral) to determine the overall OEB. Occupational exposure banding uses limited chemical toxicity data to group chemical substances into one of five bands. One major benefit of occupational exposure banding is that the amount of time and data required to categorize a chemical substance into an OEB is far less than that required to develop an OEL. The NIOSH occupational exposure banding process is one approach for assessing chemical hazards and prioritizing control efforts.

Engineering and Control Honorable Mention

Development of a finger adapter method for testing and evaluating vibration-reducing gloves and materials

Xu XS, Welcome DE, Warren CM, McDowell TW, Dong RG [2019]. Development of a finger adapter method for testing and evaluating vibration-reducing gloves and materials. Meas *137*:362-374.

The objective of this study was to develop a convenient and reliable adapter method for testing and evaluating vibration-reducing (VR) gloves and VR materials at the fingers. The general requirements and technical specifications for the design of the new adapter were based on our previous studies of hand-held adapters for vibration measurement and a conceptual model of the fingers-adapter-glove-handle system developed in this study. Two thicknesses (2 mm and 3 mm) of the adapter beam were fabricated using a 3-D printer. Each adapter is a thin beam equipped with a miniature tri-axial accelerometer (1.1 g) mounted at its center, with a total weight > 2.2 g. To measure glove vibration transmissibility, the adapter is held with two gloved fingers; a finger is positioned on each side of the accelerometer. Each end of the adapter beam is slotted between the glove material and the finger. A series of experiments was conducted to evaluate this two-fingers-held adapter method by measuring the transmissibility of typical VR gloves and a sample VR material. The experimental results indicate that the major resonant frequency of the lightweight adapter on the VR material (>800 Hz) is much higher than the resonant frequencies of the gloved fingers grasping a cylindrical handle (<300 Hz). The experimental results were repeatable across the test treatments. The basic characteristics of the measured glove vibration transmissibility are consistent with the theoretical predictions based on the biodynamics of the gloved fingers-hand-arm system. The results suggest that VR glove fingers can effectively reduce only high-frequency vibration, and VR effectiveness can be increased by reducing the finger contact force. This study also demonstrated that the finger adapter method can be combined with the palm adapter method prescribed in the standardized glove test, which can double the test efficiency without substantially increasing the expense of the test.

Engineering and Control Winner

Dust control handbook for industrial minerals mining and processing. Second Edition

NIOSH [2019]. Dust control handbook for industrial minerals mining and processing. 2nd ed. By Cecala AB, O'Brien AD, Schall J, Colinet JF, Franta RJ, Schultz MJ, Haas EJ, Robinson JE, Patts J, Holen BM, Stein R, Weber J, Strebel M, Wilson L, Ellis M. Pittsburgh, PA: 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. 2019-124, RI 9701.

This handbook was written by a task force of safety and health specialists, industrial hygienists, and engineers to provide information on proven and effective control technologies that lower workers' dust exposures during all stages of mineral processing. The handbook describes both dust-generating processes and the control strategies necessary to enable mine operators to reduce worker dust exposure. Implementation of the engineering controls discussed can assist operators, health specialists, and workers in reaching the ultimate goal of eliminating pneumoconiosis and other occupational diseases caused by dust exposure in the mining industry. Designed primarily for use by industrial minerals producers, this handbook contains detailed information on control technologies to address all stages of the minerals handling process, including drilling, crushing, screening, conveyance, bagging, loadout, and transport. The handbook's aim is to empower minerals industry personnel to apply state-of-the-art dust control technology to help reduce or eliminate mine and mill worker exposure to hazardous dust concentrations—a critical component in ensuring the health of our nation's mine workers.

Epidemiology and Surveillance Honorable Mention

Prevalence of hearing loss among noise-exposed workers within the Mining and Oil and Gas Extraction sectors

Lawson SM, Masterson EA, Azman AS [2019]. Prevalence of hearing loss among noise-exposed workers within the Mining and Oil and Gas Extraction sectors, 2006-2015. Am J Ind Med *62*(10):826-837.

The purpose of this study was to estimate the prevalence of hearing loss (HL) among noise-exposed US workers within the Mining, and Oil and Gas Extraction (OGE) sectors. Audiograms of 1.9 million workers across all industries (including 9389 in Mining and 1076 in OGE) from 2006 to 2015 were examined. Prevalence and adjusted risk as compared to a reference industry (Couriers and Messengers) were estimated for all industries combined and the Mining and OGE sectors and subsectors. The prevalences of HL in Mining and OGE were 24% and 14%, respectively, compared with 16% for all industries combined. Many Mining and one OGE subsector exceeded these prevalences and most had an adjusted risk (prevalence ratio) significantly greater than the reference industry. Some subsectors, particularly in OGE, could not be examined due to low sample size. The prevalences in Construction Sand and Gravel Mining and Natural Gas Liquid Extraction were 36% and 28%, respectively. Workers within Support Activities for Coal Mining had double the risk of HL than workers in the reference industry. The many subsectors identified with high prevalences and/or worker risks for HL well above risks in the reference industry need critical attention to conserve worker hearing and maintain worker quality of life. Administrative and engineering controls can reduce worker hazardous noise exposures. Noise and ototoxic chemical exposure information is needed for many subsectors, as is audiometric testing results for OGE workers. Additional research is also needed to further characterize exposures and improve hearing conservation measures.

Epidemiology and Surveillance Winner

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.

Workers in various industries can be exposed to oil mists when oil-based fluids are aerosolized during work processes. Oil mists can be inhaled or deposited on the skin. Little research exists on the reproductive effects of oil mist exposure in pregnant workers. We aimed to investigate associations between occupational oil mist exposure in early pregnancy and a spectrum of birth defects using data from 22,011 case mothers and 8,140 control mothers in the National Birth Defects Prevention Study. In total, 150 mothers were rated as exposed. Manufacturing jobs, particularly apparel manufacturing, comprised the largest groups of exposed mothers. Mothers of infants with septal heart defects (odds ratio (OR): 1.8, 95% confidence interval (CI): 1.0-3.3), and especially peri-membranous ventricular septal defects (OR: 2.5, CI: 1.2-5.2), were more likely to be occupationally exposed to oil mists in early pregnancy than control mothers; and their rater-estimated cumulative exposure was more likely to be higher. This was the first US study evaluating associations between oil mist exposure and a broad spectrum of birth defects. Our results are consistent with previous European studies, supporting a potential association between oil-based exposures and congenital heart defects. Further research is needed to evaluate the reproductive effects of occupational oil mist exposure.

Exposure and Risk Assessment Honorable Mention

Operators' views of mobile equipment ingress and egress safety

> Pollard J, Kosmoski C, Porter WL, Kocher L, Whitson A, Nasarwanji M [2019]. Operators' views of mobile equipment ingress and egress safety. Int J Ind Ergon *72*:272-280.

A large proportion of non-fatal slips, trips, and falls (STFs) at surface mining facilities are associated with mobile equipment. Ingress and egress from mobile equipment can pose a fall risk to mobile equipment operators. The objective of this study was to determine mobile equipment operators' views of STF risks from mobile equipment and to ascertain what factors, tasks, and conditions they perceive as contributing to these risks. A thematic analysis of 23 individual interviews and 2 group interviews was conducted, with 10 overarching themes identified from the transcripts. Mobile equipment operators indicated that being unable to see their feet or the ladder rungs during descent and the presence of contaminants on the ladders caused by normal operation make egress more dangerous than ingress. The flexible rails and high heights of the lower rungs identified over 40 years ago as issues for mobile equipment operators still pose a perceived STF risk. Further, the requirements of routine maintenance tasks such as oil and filter changes, greasing, and cleaning windows pose fall risks due to inadequate access and the need to carry supplies up and down equipment ladders. In addition to the mobile equipment, hazardous ground conditions and insufficient lighting were found to be key issues around the mobile equipment and in parking areas. The findings of this work indicate that mobile equipment operators feel at risk for STFs due to the design and condition of their equipment and would like to see ladders replaced with safer stairways as the primary ingress/egress system.

Exposure and Risk Assessment Winner

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

Doney BC, Blackley D, Hale JM, Halldin C, Kurth L, Syamlal G, Laney AS [2019]. Respirable coal mine dust in underground mines, United States, 1982-2017. Am J Ind Med *62*(6):478-485.

This study summarized the mass concentration and quartz mass percent of respirable coal mine dust samples (annually, by district, and by occupation) from underground coal mines during 1982-2017. Respirable dust and quartz data collected and analyzed by Mine Safety and Health Administration (MSHA) were summarized by year, coal mining occupation, and geographical area. The older (before August 2016) 2.0 mg/m3 respirable dust MSHA permissible exposure limit (PEL) was used across all years for comparative purposes. For respirable dust and quartz, geometric mean and percent of samples exceeding the respirable dust PEL (2.0 mg/m3 or a reduced standard for samples with >5% quartz content) were calculated. For quartz samples, the average percent quartz content was also calculated. The overall geometric mean concentration for 681,497 respirable dust samples was 0.55 mg/m3, and 5.5% of the samples exceeded the 2.0 mg/m3 PEL. The overall respirable quartz geometric mean concentration for 210,944 samples was 0.038 mg/m3, and 18.7% of these samples exceeded the applicable standard. There was a decline over time in the percent of respirable dust samples exceeding 2.0 mg/m3. The respirable dust geometric mean concentration was lower in central Appalachia compared to the rest of the United States. However, the respirable quartz geometric mean concentration and the mean percent quartz content were higher in central Appalachia. This study summarizes respirable dust and quartz concentrations from coal mine inspector samples and may provide an insight into differences in the prevalence of pneumoconiosis by region and occupation.

Methods and Laboratory Science Honorable Mention

Comparative cytotoxicity of respirable surface-treated/untreated calcium carbonate rock dust particles in vitro

> Khaliullin TO, Kisin ER, Yanamala N, Guppi S, Harper M, Lee T, Shvedova AA [2019]. Comparative cytotoxicity of respirable surface-treated/untreated calcium carbonate rock dust particles in vitro. Toxicol Appl Pharmacol *362*:67-76.

Calcium carbonate rock dust (RD) is used in mining to reduce the explosivity of aerosolized coal. During the dusting procedures, potential for human exposure occurs, raising health concerns. To improve RD aerosolization, several types of anti-caking surface treatments exist. The aim of the study was to evaluate cytotoxicity of four respirable RD samples: untreated/treated limestone (UL/TL), untreated/treated marble (UM/TM), and crystalline silica (SiO2) as a positive control in A549 and THP-1 transformed human cell lines. Respirable fractions were generated and collected using FSP10 high flow-rate cyclone samplers. THP-1 cells were differentiated with phorbol-12-myristate-13-acetate (20 ng/ml, 48 h). Cells were exposed to seven different concentrations of RD and SiO2 (0-0.2 mg/ml). RD caused a slight decrease in viability at 24 or 72 h post-exposure and were able to induce inflammatory cytokine production in A549 cells, however, with considerably less potency than SiO2. In THP-1 cells at 24 h, there was significant dose-dependent lactate dehydrogenase, inflammatory cytokine, and chemokine release. Caspase-1 activity was increased in SiO2- and, on a lesser scale, in TM- exposed cells. To test if the increased toxicity of TM was uptake-related, THP-1 cells were pretreated with Cytochalasin D (CytD) or Bafilomycin A (BafA), followed by exposure to RD or SiO2 for 6 h. CytD blocked the uptake and significantly decreased cytotoxicity of all particles, while BafA prevented caspase-1 activation but not cytotoxic effects of TM. Only TM was able to induce an inflammatory response in THP-1 cells; however, it was much less pronounced compared to silica.

Methods and Laboratory Science Winner

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.

Respirable crystalline silica (RCS) produced in mining andconstruction industries can cause life-threatening diseases such as silicosis, lung cancer, and chronic obstructive pulmonary disease (COPD). These diseases could be more effectively treated and prevented if RCS-related biomarkers were identified and measured at an early stage of disease progression, which makes development of a point of care test (POCT) platform extremely desirable for early diagnosis. In this work, a new, highly sensitive lab on a chip (LOC) immunoassay has been designed, developed, and characterized for tumor necrosis factor a (TNF-a), a protein biomarker that causes lung inflammation due to RCS exposure. The designed LOC device is composed of four reservoirs for sample, enzyme conjugated detection antibody, wash buffer, and chemiluminescence substrate in liquid form, along with three spiral reaction chambers for test, positive control, and negative control. All reservoirs and spiral microchannels were connected in series and designed to perform sequential delivery of immunoassay reagents with minimal user intervention. The developed LOC measured TNF-a concentrations as low as 16 pg/mL in plasma from RCS-exposed rats and also had a limit of detection (LOD) of 0.5 pg/mL in spiked artificial serum. In addition, the analysis time was drastically reduced to about 30 min, as opposed to hours in conventional methods. Successful implementation of a highly sensitive, chemiluminescence-based immunoassay on a preloaded LOC with proper quality control, as reported in this work, can pave the way toward developing a new rapid POCT platform for in-field clinical diagnosis.

Research Service Honorable Mention

Evaluation of exposure to radon and radon progeny in an underground tourist cavern and its connected buildings

> NIOSH [2019]. Evaluation of exposure to radon and radon progeny in an underground tourist cavern and its connected buildings. By Zwack LM, Brueck SE, Anderson JL, Hammond DR. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Health Hazard Evaluation Report 2014-0158-3345.

The Health Hazard Evaluation Program received a request from the US National Park Service because of concerns about potential exposures to radon and radon decay products at a tourist cave and a connected building. We visited the park four times to assess radon concentrations in different seasons. During our visits, we met with employer and employee representatives, measured employees' exposures to radon and radon decay products, modeled employee exposures to ionizing radiation and compared them to occupational dose limits and evaluated ventilation within the visitor's center. Radon gas concentrations measured in the visitor's center were below the OSHA PEL. Tracer gas measurements indicated that radon was entering the visitor's center through the elevator shafts that attach it to the main cavern below. Modifications of the building ventilation system, to prevent the entry and mixing of cavern air with air from the visitor's center, should reduce radon levels. Radon concentrations measured inside the main cavern were also below the OSHA PEL. However, employees working in the cavern have the potential to exceed the OSHA whole body ionizing radiation dose limits, depending upon the time spent in the cave. We recommended using airlocks to isolate the main cavern elevators from the rest of the visitor's center, creating and implementing a radon management program, tracking the number of hours employees work inside the cavern, and educating employees on the risks of radon and ionizing radiation.

Research Service Winner

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.

A cluster of severe lung disease occurred at a manufacturing facility making industrial machines. We aimed to describe disease features and workplace exposures. Clinical, functional, radiologic, and histopathologic features were characterized. Airborne concentrations of thoracic aerosol, metalworking fluid, endotoxin, metals, and volatile organic compounds were measured. Facility airflow was assessed using tracer gas. Process fluids were examined using culture, polymerase chain reaction, and 16S ribosomal RNA sequencing. Five previously healthy male never-smokers, ages 27 to 50, developed chest symptoms from 1995 to 2012 while working in the facility's production areas. Patients had an insidious onset of cough, wheeze, and exertional dyspnea; airflow obstruction (mean FEV1 = 44% predicted) and reduced diffusing capacity (mean = 53% predicted); and radiologic centrilobular emphysema. Lung tissue demonstrated a unique pattern of bronchiolitis and alveolar ductitis with B-cell follicles lacking germinal centers, and significant emphysema for never-smokers. All had chronic dyspnea, three had a progressive functional decline, and one underwent lung transplantation. Patients reported no unusual nonoccupational exposures. No cases were identified among nonproduction workers or in the community. Endotoxin concentrations were elevated in two air samples; otherwise, exposures were below occupational limits. Air flowed from areas where machining occurred to other production areas. Metalworking fluid primarily grew Pseudomonas pseudoalcaligenes and lacked mycobacterial DNA, but 16S analysis revealed more complex bacterial communities. This cluster indicates a previously unrecognized occupational lung disease of yet uncertain etiology that should be considered in manufacturing workers (particularly never-smokers) with airflow obstruction and centrilobular emphysema. Investigation of additional cases in other settings could clarify the cause and guide prevention.

Alice Hamilton Award 2019 Winner Updates

Education and Guidance

Workplace Design Solutions: Protecting Workers During Production and Handling of Nanomaterials

Dunn KH, Topmiller JL, McCleery T, Whalen J NIOSH [2018]. Protecting workers during nanomaterial reactor operations. Workplace Design Solutions. By Dunn KH, Topmiller JL, McCleery T, Whalen 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. 2018-120.

NIOSH [2018]. Protecting workers during the handling of nanomaterials. Workplace Design Solutions. By Dunn KH, Topmiller JL, McCleery T, Whalen 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. 2018-121.

NIOSH [2018]. Protecting workers during intermediate and downstream processing of nanomaterials. Workplace Design Solutions. By Dunn KH, Topmiller JL, McCleery T, Whalen 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. 2018-122.

The health effects associated with engineered nanomaterials (ENMs) are not yet clearly understood, making it important to reduce employee exposure and manage risks. In 2013, NIOSH published Current Strategies for Engineering Controls in Nanomaterial Production and Downstream Handling Processes to provide guidance on exposure control approaches for protecting workers. These documents have been downloaded over 3,000 times and distributed at multiple meetings.

Additional guidance is the poster-sized Controlling Health Hazards When Working with Nanomaterials: Questions to Ask Before You Start. Two similar posters providing guidance on controlling 3D-printer emissions are scheduled for 2020 publication and provide a complementary set of risk management approaches. New Workplace Design Solutions are also being planned to provide approaches for controlling printer emissions to the work environment based on field and laboratory research. Laboratory assessment of localized exhaust controls and enclosures for 3D printers is currently ongoing both in the NIOSH engineering control research area and with a manufacturer. Initial tests have shown that a novel, NIOSH-designed extruder capture hood can reduce emissions from a desktop 3D printer by greater than 98%.

Effective and Efficient Ventilation Velocity for Aircraft Painting

Bennett J, Marlow D, Nourian F, Breay J, Feng A, Methner M [2018]. Effect of ventilation velocity on hexavalent chromium and isocyanate exposures in aircraft paint spraying. J Occup Environ Hyg *15*(3):167–181.

Reducing exposures of aircraft painters to hazardous metals and organics motivates design and operation of hangar ventilation systems. NIOSH researchers investigated ventilation system performance in military aircraft paint finishing hangars as a function of air velocity (V) delivered by the system to the work area. Using CFD modeling, tracer gas testing, and exposure monitoring, they examined the relationship of contaminant exposure and crossflow ventilation velocity in previous studies. There, CFD modeling showed spatial average exposures to simulated methyl isobutyl ketone of 294 and 83.6 ppm, for velocities of 0.508 and 0.381 m/s (100 and 75 fpm), respectively. In tracer gas experiments, observed supply/exhaust velocities of 0.706/0.503 m/s (136/99 fpm) were termed full-flow, and reduced velocities were termed 3/4-flow and half-flow. Half-flow showed higher tracer gas concentrations than 3/4-flow, which had the lowest time-averaged concentration, with difference in log means significant at the 95% confidence level. Half-flow compared to full-flow and 3/4-flow compared to full-flow showed no statistically significant difference. CFD modeling using these ventilation conditions agreed closely with the tracer results for the full-flow and 3/4-flow comparison, yet not for the 3/4-flow and half-flow comparison. Personal exposure monitoring for two worker groups—sprayers and sprayer helpers ("hosemen")—compared process duration means for two observed velocities. Hexavalent chromium (Cr[VI]) exposures were 500 vs. 360 µg/m3 for sprayers and 120 vs. 170 µg/m3 for hosemen, for 0.528 m/s (104 fpm) and 0.406 m/s (80.0 fpm), respectively. Hexamethylene diisocyanate (HDI) monomer means were 32.2 vs. 13.3 µg/m3 for sprayers and 3.99 vs. 8.42 µg/m3 for hosemen. These previous results led to the current study, which used CFD to complete the concentration-velocity curve with additional velocities. Efficiency of exposure control in an energy use context was found to be lowest at 0.254 m/s (50 fpm).

Figure 1. Navy artisans (sprayers and hosemen) applying primer during F-18 strike fighter aircraft paint finishing operations.

Cross-sectional Epidemiologic and Exposure Assessment Studies of Workers Exposed to Carbon Nanotubes and Nanofibers in the United States

Beard JD, Bertke SJ, Birch ME, Dahm MM, de Perio MA, Erdely A, Evans DE, Eye T, Fernback JE, Grinshpun SA, Kodali V, Mercer RR, Schubauer-Berigan MK
Beard JD, Erdely A, Dahm MM, de Perio MA, Birch ME, Evans DE, Fernback JE, Eye T, Kodali V, Mercer RR, Bertke SJ, Schubauer-Berigan MK [2018]. Carbon nanotube and nanofiber exposure and sputum and blood biomarkers of early effect among U.S. workers. Environ Int *116*:214–228.

Dahm MM, Schubauer-Berigan MK, Evans DE, Birch ME, Bertke S, Beard JD, Erdely A, Fernback JE, Mercer RR, Grinshpun SA [2018]. Exposure assessments for a cross-sectional epidemiologic study of U.S. carbon nanotube and nanofiber workers. Int J Hyg Environ Health *221*(3):429–440.

Schubauer-Berigan MK, Dahm MM, Erdely A, Beard JD, Birch ME, Evans DE, Fernback JE, Mercer RR, Bertke SJ, Eye T, de Perio MA [2018]. Association of pulmonary, cardiovascular, and hematologic metrics with carbon nanotube and nanofiber exposure among U.S. workers: a cross-sectional study. Part Fibre Toxicol *15*(1):22.

Carbon nanotubes and nanofibers (CNT/F) offer the potential for technological breakthroughs in biomedicine, electronics, and other areas. Over the past 10-15 years, concerns have arisen about their possible human health effects. Investigators evaluated early pulmonary and cardiovascular effects related to CNT exposures and relationships between biomarker response patterns of early effects in blood and sputum. They also evaluated associations between exposures and these health measures, adjusting for confounders related to lifestyle and other occupational exposures. Health measures included a medical examination, collection of whole blood, and sputum induction.

The study included 108 participants from 12 different U.S. companies producing or using CNT/F. Exposure-response analysis found most chronic clinical measures were not associated with CNT/F exposure consistent with short duration of exposure. Workers developing a respiratory allergy after beginning to work with CNT/F and increased resting heart rate were significantly associated with the exposure metric of inhalable elemental carbon. These key findings show both acute and chronic health effects associated with exposure to CNT/F at the inhalable aerosol size fraction (i.e., particles ≤ 100 μm). NIOSH has a recommended exposure limit (REL) for CNT/F set only at the respirable aerosol size fraction.

National Surveillance of Fatal and Non-fatal Vessel Disasters

Lucas DL, Case SL, Lincoln JM, Watson JR [2018]. Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. Saf Sci *101*:190–196.

The purpose of this project is to continue the national surveillance of fatal work-related injuries and fatal and non-fatal vessel disasters (e.g., sinkings, capsizings) in the U.S. fishing industry. Surveillance activities will be expanded to include non-fatal injuries and other vessel safety related incidents (e.g., fires, flooding, loss of propulsion). This project will use data from the NIOSH Commercial Fishing Incident Database (CFID) to inform the development of safety policies by regulators and companies, promote additional research by other organizations, and help target interventions.

The primary activity of this project is the continued maintenance of the CFID surveillance system. Through a formal partnership with the U.S. Coast Guard (USCG), NIOSH researchers use USCG investigative reports to populate the CFID database with information on fishing incidents. CFID currently contains data for 2000 to 2019, with data continually being added to ensure the system remains current. NIOSH researchers routinely analyze CFID to monitor fatalities and vessel disasters for the U.S. commercial fishing industry. This project allows for analysis of surveillance data and the facilitation of discussions between the fishing industry, government, and safety representatives across the country.

Another continuing activity is applying NIOSH research to practice (r2p). NIOSH researchers use CFID surveillance data findings to create relevant products, and industry partners collaborate with NIOSH to translate these findings to actionable information for workers. NIOSH researchers provide surveillance data findings for action in the form of presentations, electronic media, and industry appropriate print media.

In FY20, project researchers will continue maintaining CFID, conducting r2p efforts, responding to data requests, coordinating with NIOSH CMSHS, and providing presentations to partners and stakeholder groups. The redesigned CFID will be implemented, with project staff cleaning existing data and adding new fatality and non-fatal injury data to the system.

Short-term Pulmonary Toxicity Assessment of Pre- and Post-incinerated Organomodified Nanoclay in Mice

Stueckle TA, Davidson DC, Derk R, Kornberg TG, Battelli L, Friend S, Orandle MS, Wagner A, Dinu CZ, Sierros K, Agarwal S, Gupta RK, Rojanasakul Y, Porter DW, Wang L. 2018. Short-term pulmonary toxicity assessment of pre- and post-incinerated organomodified nanoclay in mice. ACS Nano *12*(3):2292-2310.

Understanding occupational risks of using engineered nanomaterial (ENM)-enabled products across their life cycle is paramount to responsibly develop new these technologies and protect the American worker. One class, which experiences large volume production but has received minimal toxicology assessment, is organomodified nanoclays (ONCs). ONC-enabled thermoplastic composites (NPCs) are poised to enter wide commercial use and distribution as a biodegradable plastic or filler material to improve durable plastics.

Prior to this study, little information existed on health risks associated with ONC particle pulmonary exposure and degraded composites throughout their life cycle. This study was the first to evaluate both as-produced ONC particles and their incinerated byproducts for their pulmonary toxicity potential in an animal model.

Since its completion, two additional projects were completed, with a third underway. At present, limited information exists on human health risks associated with PNC exposure during its life cycle. A critical need exists to assess emerging PNCs with projected diverse and wide-scale use for potential airborne particle release during machining and environmental stressors.

Collectively, these studies aim to understand those factors that contribute to elevated airborne nanocomposite particle hazards in the future workplace and how they contribute to adverse pulmonary outcomes along the complete life-cycle of these materials.

Preventing Deaths and Injuries of Fire Fighters Working at Basement and Other Below-Grade Fires

> NIOSH [2018]. Preventing deaths and injuries of fire fighters working at basement and other below-grade fires. Workplace Solutions. By Merinar T, Wertman S, Loflin M, Morris G. 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. 2018-154.

The NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) has conducted firefighter line-of-duty-death investigations since 1998, covering both medical and trauma-related causes of death. Since the inception of the FFFIPP, NIOSH investigators have observed recurring causes and underlying contributing factors to many of these firefighter deaths. This publication presents one example of these recurring causes of firefighter fatalities: basement and other below-grade fires.

This document provides firefighters key information on the hazards and risks associated with fighting basement and other below-grade fires, as well as recommendations they can use to reduce their risk of injury or death when facing these fires. The investigators have distributed this document widely within the fire service across the United States to provide fire departments the information they need to protect their members when fighting these extremely dangerous types of structure fires. The investigators have also used what they have learned from these and other fatality investigations to improve National Fire Protection Association standards and best practices recommendations that protect all firefighters. Finally, the investigators are constantly looking for new approaches to communicate with the fire service in ways that best suit their needs, including using infographics and fact sheets that provide critical prevention messages in an easy-to-use format.

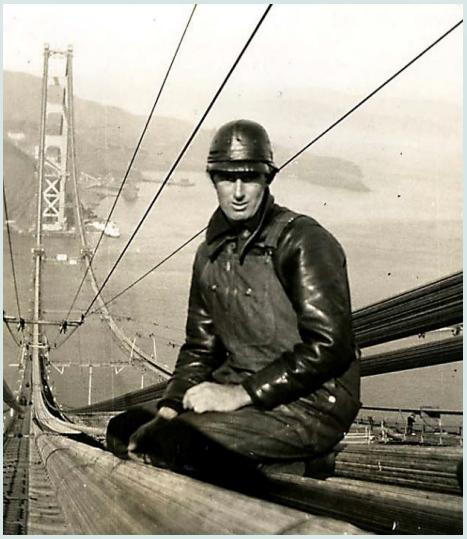
NIOSH will continue to investigate firefighter fatalities as part of its broader Research Service piece of the National Occupational Research Agenda. The FFFIPP is dedicated to providing the best recommendations possible to protect these critical first responders from the hazards they face on the job every day.

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.

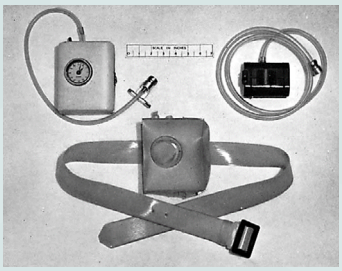
The award is named in honor of two distinguished inventers who made significant improvements in workplace injury and illness prevention.

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

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.



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,

Bullard-Sherwood Research to Practice Finalists

Finalists are listed alphabetically by project name.

Intervention

CBRN Canister Protection Capabilities against Emerging Chemical and Radiological Hazards
Szalajda, J, Greenawald, L, Palya, F, Karwacki, C, Bradley, D

Knowledge

#MySafeSummerJob and #KeepTeenWorkersSafe: Multi-agency, Social Media Campaigns to Promote Young Worker Safety and Health
Guerin, R, Jones, T, London, L, Braam, A, Shahan, K

NIOSH Aerial Lift Hazard Recognition Simulator Website, and Findings Associated with the Use of Aerial Lift as Elevator in Construction
Pan, C, Wimer, B, Ammons, D, Webb, S, Boehler, B, McGregor, I, Chiou, S, Spiker, J, Dong, R, Warren, C, Romano, N, Powers, J, Harris, J, Lutz, T

Understanding and Controlling Firefighters' Carcinogenic Exposures
Fent, K, Mayer, A, Horn, G, Smith, D, Kerber, S, Kesler, R

Technology

Crowdsourcing AI for Natural Language Processing of Injury Narratives
Siordia, C, Bertke, S, Reichard, A, Webb, S, Marovich, S, Vanoli, K, Purdin, J, Measure, A, Ballesteros, M, Friesen, M, Russ, D, Laughlin, L, Schroeder, T, Heeschen, J, Schoenbaum, M, Town, M, Minino, A

Development of a Commercially Available Refuge Alternative Thermal Simulation Tool
Yantek, D, Srednicki, J, Yan, L, Damiano, N, Bickson, J, DeGennaro, C, Yonkey, J, McElhinney, P, Lutz, T

The EXAMiner Hazard Recognition Tool
Eiter, B, Hrica, J, Bellanca, J, Helfrich, W, Cole, G, Fritz, J, Navoyski, J, Orr, T, Britton, J

Bullard-Sherwood Research to Practice Winners

Intervention Winner

CBRN Canister Protection Capabilities against Emerging Chemical and Radiological Hazards

Szalajda J, Greenawald L, Palya F, Karwacki C, Bradley D
National Personal Protective Technology Laboratory (NPPTL)

In the event of a chemical, biological, radiological, or nuclear (CBRN) hazard release, emergency responders rely on respiratory protection to prevent inhalation exposure to these hazards. NIOSH evaluates CBRN air-purifying respirator (APR) canisters by challenging the respirator filter media and carbon bed to 11 test representative agents (TRAs) representing different chemical families. This approach, dating back to the original 2001 CBRN hazard assessment, is still in use today. CBRN hazards, however, are constantly evolving in type, usage, and dissemination. So, the need was identified to evaluate the CBRN hazard assessment to ensure existing NIOSH-approved CBRN APR canisters continue to provide adequate protection from newly emerging chemical and radiological hazards. In response, NIOSH partnered with the US Army, Combat Capabilities Development Command, Chemical Biological Center (CCDC CBC), the US Naval Research Laboratory (NRL), and the Department of Homeland Security-Chemical Security Analysis Center (DHS-CSAC) to conduct an updated CBRN hazard assessment. Recent chemical hazard assessments were reviewed to generate a comprehensive list of potential chemical and radiological hazards that would be relevant to emergency responders. An evaluation process was developed to assess this new list of chemicals for consideration as new NIOSH CBRN TRAs. In partnership with CDC National Center for Environmental Health, and the Office of Public Health Preparedness and Response (OPHPR) Senior Advisor for Lab Preparedness and the Senior Advisor for Medical Countermeasures, the project team (NIOSH, CCDC-CBC, NRL, and DHS-CSAC) convened a panel that developed a consensus position in the classification of the emerging chemical and radiological hazards. Ultimately, NIOSH, DoD, and DHS determined that the current NIOSH TRAs adequately represented all chemical and radiological hazards identified in the updated CBRN Hazard Assessment, and there was no need to update the TRAs at this time. The process, however, standardized a methodology to evaluate future hazards. Results have been disseminated and will be used as the basis to update NIOSH publications, including the NIOSH CBRN Respiratory Protection Handbook and existing guidance regarding the capabilities of the CBRN APR.

Knowledge Honorable Mention

NIOSH Aerial Lift Hazard Recognition Simulator Website, and Findings Associated with the Use of Aerial Lift as Elevator in Construction

Pan C, Wimer B, Ammons D, Webb S, Boehler B, McGregor I, Chiou S, Spiker J, Dong R, Warren C, Romano N, Powers J, Harris J, Lutz T
Division of Safety Research (DSR)

Falls are a leading cause of death for construction workers. Between 2011 and 2015, 15% of the 1,533 fatal falls from elevation in the construction industry were falls from scaffolding. Aerial lifts, as some of the most widely used types of elevated equipment in the scaffolding industry, expose workers to falls. To prevent these falls and other aerial lift-related injuries and deaths, national and international standards committees identified an emerging need for improved aerial lift operator training. In response, NIOSH developed an innovative training resource—the NIOSH Aerial Lift Website and Hazard Recognition Simulator. This resource provides science-based information on the safe operation of aerial lifts with a link to an aerial lift simulator for operator training. The simulator provides a safe, controlled environment from which workers may virtually experience and navigate a realistic workplace scenario with multiple types of hazards. Over the years, the aerial lift safety resource has continued to evolve to meet the training needs of the industry. In 2019, the scissor-lift model was refined, and a boom-lift model added to the simulator website. A multi-channel communication strategy was implemented to widely disseminate the resource. As a result, there have been about 40,000 visits and views of the website from industry and almost 10,000 downloads of the simulator from end users. Adoption and use of the NIOSH Aerial Lift Website and Hazard Recognition Simulator among employers and operators is of great interest to and continues to be promoted by a number of stakeholders, including: ANSI standards committees; equipment manufacturer associations (International Safety Equipment Association, Association of Equipment); and worker training advocates (International Masonry Institute; Eckstein and Associates; Gravtec Inc.; Scaffold & Access Industry Association; and CPWR-The Center for Construction Research and Training). Internal and external partner dissemination efforts truly underscore the importance of a continuing relationship between r2p and health communications in developing technologies that support worker safety and ensuring that such technologies are delivered into the hands of workers to reduce and eliminate worker injuries and fatalities.

Knowledge Winner

Understanding and Controlling Firefighters' Carcinogenic Exposures

Fent K, Mayer A, Horn G, Smith D, Kerber S, Kesler R
Division of Field Studies and Engineering (DFSE)

While firefighters face a variety of acute hazards, the two most pressing health vulnerabilities for today's fire service are occupational exposure to carcinogens (associated cancer risk) and sudden cardiac events. Over the past 5 years, NIOSH has collaborated with the Illinois Fire Service Institute (IFSI), Underwriters Laboratories Firefighter Safety Research Institute (UL-FSRI), and Skidmore College on a series of research studies aimed at better understanding the exposures and health impacts of firefighting and the effectiveness of control interventions at reducing exposure and health risks. The NIOSH-IFSI-UL-Skidmore research team has completed three different but related studies to comprehensively evaluate the cardiovascular and chemical exposure risks to firefighters during modern residential fires and common training fires, evaluated exposures and heat stress by job assignment, attack tactic, and type of fire, and assessed decontamination procedures for PPE and skin. Subsequent results were translated into understandable and actionable recommendations designed to catch firefighters' attention. This targeted approach culminated in the development and broad distribution of an online toolkit, trade journal articles, trade and professional websites, online fire service programs, and presentations to fire service audiences. As a result, numerous fire departments throughout the country have implemented new policies requiring the routine laundering of their hoods or hood exchange programs, provide skin cleansing wipes or other means of cleaning skin post-fire, and have instituted gross on-scene decontamination practices of their turnout gear to reduce exposures. Additionally, fire training academies have implemented administrative controls and substituted fuel packages for less hazardous fuel types to lower exposures for instructors and students. While there is still much work to be done to educate firefighters, a growing number of firefighters and departments have made important changes to lessen their exposures and cancer risk.

Technology Honorable Mention

Crowdsourcing AI for Natural Language Processing of Injury Narratives

Siordia C, Bertke S, Reichard A, Webb S, Marovich S, Vanoli K, Purdin J, Measure A, Ballesteros M, Friesen M, Russ D, Laughlin L, Schroeder T, Heeschen J, Schoenbaum M, Town M, Minino A
Division of Safety Research (DSR)

Occupational injury surveillance systems collect large volumes of data to describe worker injuries, illnesses, and fatalities, monitor trends, and identify areas for targeted research and prevention. Injury narratives must be assigned standardized numeric codes to be analyzed in aggregate. Assigning these codes can be tedious and time-consuming and can introduce multiple coding inconsistencies over the life of a system. In 2018, the National Academies of Science, Engineering and Medicine published a report recommending the development of a smarter occupational safety and health (OSH) surveillance system. Also included were recommendations that NIOSH expand the use of Artificial Intelligence (AI) to process free-text data found in OSH surveillance records. In response, NIOSH assembled the multidisciplinary //m_BrainGineers team consisting of federal employees from within and external to NIOSH and CDC to explore development of a sustainable and scalable AI solution for coding data in a more efficient, consistent, and cost-effective manner. The team successfully developed, administered, and evaluated internal and external crowdsourcing competitions that attracted AI/machine learning (ML) developers and produced significantly improved natural language processing algorithms that can be adapted for use in various OSH surveillance systems. The winning algorithms from the crowdsourcing competitions were implemented in the NIOSH emergency department occupational injury dataset, resulting in ~$33,000 cost savings per year and more efficient data processing, reducing the coding lag time for each monthly dataset from about 1 month to 1 week. Additionally, the effort increased interest in AI and machine learning across CDC, establishing a network and leading to multiple internal and external partnerships collaborating to develop new, innovative AI projects. Consequently, this work could lead to cost savings, improved efficiency, and increased accuracy in other programs that adopt this approach. Finally, the data used for the competitions and top-five open-source, natural language-processing, machine-learning algorithms are publicly available via GitLab so that other public and private researchers can adopt and modify thealgorithms to intelligently automate coding in their data systems.

Technology Winner

The EXAMiner Hazard Recognition Tool

Eiter B, Hrica J, Bellanca J, Helfrich W, Cole G, Fritz J, Navoyski J, Orr T, Britton J
Spokane Mining Research Division (SMRD)

In recent years, worker injuries and fatalities have been on the rise in the metal and nonmetal mining industry. In 2018, MSHA implemented a rule requiring workplace examinations to be conducted before each shift. This rule, however, did not identify what qualifications and competencies would be needed to conduct these assessments. To assess this need, NIOSH conducted research to examine the cognitive processes associated with hazard recognition in the mining industry. Study results suggested that mineworkers, mining engineering students, and mine health and safety professionals were only able to identify 53% to 61% of hazards staged in a virtual surface mine environment involving panoramic scenes. To address this need, NIOSH translated the panoramic scenes into web- and PC-based training products for teaching hazard recognition skills and workers' abilities to conduct workplace examinations. EXAMiner (PC-based software) is preloaded with all 32 images from the study and allows users to add their own panoramic images using a smart phone or digital camera to create site-specific training scenarios. Using this feature, mines may tailor materials to their workplace, as well as continually modify the software to address the changing needs of their workforces. Performance assessment features and supplemental content are also included to help trainees learn more about workplace hazards. The EXAMiner tool has been disseminated broadly across a wide variety of channels within and outside the mining industry, including hands-on workshops. Since its release in February 2019, EXAMiner has been used in at least 17 countries and been reported on by at least 10 mining industry news web sites. Among the users are three mining companies that have trained, or plan to train, over 9,000 workers. In addition, people who saw or used EXAMiner have spread the word about the product, offered to evaluate the software, or offered suggestions for enhancing or expanding the usability of the product. EXAMiner provides a unique approach to teaching hazard recognition. Due to its customizability, EXAMiner has been used in a variety of hazardous industries, including nursing, steel, and construction. The potential for growth and substantial impact on training in hazard recognition will continue to grow as the user base continues to grow within and beyond the mining industry.

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 pages that demonstrate excellence in applying plain language principles.

Awards for winner and honorable mention are given in two categories:

Before and After Product: 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 Product: 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 Product

NIOSH Epidemic Intelligence Service (EIS)
Kloczko D, Rinsky J, Halldin C, Collins J, Castillo D, Kitt M, Elliott K, Hale C

Small Business International Travel Resource
Van Bogaert D, Kitt M, Yeoman K, Chosewood C, Gibbins J, Piacentino J, Novakovich J

World Trade Center Health Program: How to Apply
Hurwitz E, Spring I, Iker K, Higdon B, Grizzle R, Bossie C

Original Product

10 Sleep Tips for Miners
Dugdale Z, Bauerle T, Schall J, Geromi R

Slip-Resistant Shoes Reduce Food Services Worker Slip Injuries
Bell J, Webb S

Suicide and Occupation
Tiesman H, Webb S, Swanson N, Nett R, McCleery T, Hornback D, Novakovich J

Plain Language Award Winners

Before and After Product Honorable Mention

NIOSH Epidemic Intelligence Service (EIS)

Kloczko D, Rinsky J, Halldin C, Collins J, Castillo D, Kitt M, Elliott K, Hale C

This brochure replaced previous NIOSH EIS recruitment flyers that were created at various NIOSH division, laboratory, and office (DLO) levels. Each was in a different format that resulted in a lack of continuity and consistent messaging. The new NIOSH EIS brochure presented information relevant on the various opportunities available to new EIS officers at NIOSH that could be used across all DLOs to ensure clear messaging to the target audience.

Before and After Product Winner

World Trade Center Health Program: How to Apply

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

The new "how to apply" section of the WTC Health Program website incorporates plain language principles of action verbs, icons, sectioning text, and tables. The four focus pages of this entry include an overview "apply," "eligible groups," "supporting documentation," and "application" pages. The new pages are grouped together in a flow where users can walk themselves through the process of determining if they are eligible, gathering supporting documentation materials (and learning what documents will be considered), and then learning how and where to apply. This section also includes a progress bar at the top of the page to indicate to users where they are in the process.

This was the first time the application process was broken down into clear and concise steps for the user. Each page in this entry includes manageable chunks of information. Part of this update included adding a new overview page and moving the applications that were currently on the overview to a new page with a description of how to apply with paper or online. This update also includes a progress bar at the top of the page to help with navigation through the process and provides a visible cue as to what is coming next.

Original Product Honorable Mention

10 Sleep Tips for Miners

Dugdale Z, Bauerle T, Schall J, Geromi R

This infographic, aimed at U.S. miners, gives 10 practical sleep tips in three sections: environment, health, and consumables. It uses readily understandable icons for each of the 10 sleep tips to draw the reader's attention, followed by action-oriented advice that miners can use to achieve better sleep.

Although many recommendations for healthy sleep are available to the general U.S. population, the authors purposefully limited the audience takeaway messages to three areas where the mineworker population is known to have specific needs: sleep environment (e.g., bedroom), personal health (e.g., routine practices), and consumable products (e.g., tobacco). These three areas are clearly separated from each other by blue banners with white section heads printed in the negative space to help catch the eye. Within each area, a defining icon is featured using a complementary color scheme, followed by an orange, boldfaced heading to provide a concise and memorable message (e.g., "Exercise regularly"). Under each heading are practical, actionable messages that readers can take to improve their sleep, along with short tips that educate readers and help them to better grasp concepts that are often misunderstood (e.g., "Nicotine and tobacco are stimulants . . .").

With these design and content choices, this infographic is detailed and specific but also streamlined and simple. The chosen format also allows for multiple uses, such as a large poster display on a mine office safety board, an individual handout, an outline for a jobsite training session, or as part of an informal pre-shift toolbox talk.

Original Product Winner

Slip-Resistant Shoes Reduce Food Services Worker Slip Injuries

Bell J, Webb S

Food services workers are exposed to slip hazards on the job, with the most common hazard being slips on liquid contaminants (e.g., grease, water). To address this issue, a NIOSH-led research team evaluated the effectiveness of a no-cost-to-workers slip-resistant shoe program among food services workers from 226 school districts across the United States, using a randomized controlled trial study design.

This infographic highlights the key findings from the study by showing two food services workers – one who received free highly slip-resistant shoes and one who bought his/her own slip-resistant shoes. The side-by-side comparison of the two workers underscores the significant reduction in slip-rated workers' compensation injury claims – 67% for those workers whose employers provided free, 5-star rated slip-resistant shoes.

Using simple visuals, plain language, short phrases, and a clear call to action this communication product quickly conveys scientific findings.

Service Excellence Award

This award focuses on both the management and operations side of the Institute and recognizes NIOSH staff who provide excellent administrative and managerial support to the Institute's mission and projects.

The award recognizes distinction in three categories: Excellence in Administration, Excellence in Human Capital Management, and Excellence in Leadership.

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 to increase the effectiveness or efficiency of a division, laboratory or office.

Excellence in Human Capital Management recognizes one current NIOSH employee or group of NIOSH employees each year for exceptional contributions that promote development of the NIOSH workforce. This award honors the efforts made by employees to grow and develop employees throughout NIOSH.

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

Service Excellence Awards Finalists

Finalists are listed alphabetically by nominee first name or team name

Excellence in Administration

Diane Papes, Division of Science Integration

Respiratory Health Division, Field Studies Branch, Administrative Team

Shona Keefe, Spokane Mining Research Division

Excellence in Human Capital Management

NIOSH Human Capital Management Office

Excellence in Administration: GS-11 to 13

Cathy Calvert, National Personal Protective Technology Laboratory

Imelda Wong, Division of Science Integration

Jeremy Brannen, National Personal Protective Technology Laboratory

Excellence in Administration: GS-9 and below

Suzanne Alison, Pittsburgh Mining Research Division

Service Excellence Award Winners

Excellence in Administration

Diane Papes
Management and Program Analyst
Division of Science Integration (DSI)

Ms.Papes merits the Excellence in Administration award for her exceptional role in procurement guidance and service across the Institute.

Ms. Papes works continuously to keep up-to-date on challenging issues such as the frequently changing laws, policies, and regulatory procedures within the agency. Ms. Papes created an administrative share drive for the new DSI division to maintain all admin and budget tools. She analyzed new regulations and created internal tools, guidance, and trainings to ensure compliance. She developed Standard Operating Procedures (SOPs), reference guides, training programs, and procurement checklists to streamline the complex processes. Ms. Papes created a One-Stop-Shop Quick Reference Guide to walk project officers through the requirements and provide streamlined steps and links directly to where the language, standards, or clearance pages were located.

Ms. Papes' contributions assist project officers and administrative staff with navigating through the frequently changing policies and procedures. This saves money in preventing contract errors, reduces redundant work and fraud, and makes better use of federal funds. It also allows researchers to move efficiently through the processes and have more time for their work. DLOs from across the institute utilize these reference guides and in-house trainings which saves personnel time and resources in creating these guides individually.

She routinely fields questions from Program Analysts and employees in other DLOs. Without hesitation, she responds to inquiries and provides advice, assistance, and guidance both within and outside of her immediate organization.

Excellence in Human Capital Management

Human Capital Management Office

Top to bottom (l to r):. Row 1: Amanda Dunnick, Margaret Banton, Jennifer Siford-Myers, Constance Franklin; Row 2: John Christ, Kellie Pierson, Ashley Sutton, Kent Slakey; and Row 3: Lewis Underwood, Jennifer Rentz, Lauren Patterson, Lindsay Muniz.

The NIOSH Human Capital Management Office has excelled in supporting its customers, who are dispersed across the U.S. The human capital (HC) programs developed by this team are engaging our workforce in ways which allow all of our employees to feel supported and part of the larger CDC community.

The team developed the HC Life Cycle that focused on four areas: Strategic HC Planning, Talent Management, Talent Development, and Talent Effectiveness.

Under Strategic HC planning, the team made major improvements to its Workforce Analysis and Planning Dashboard , significantly improving the quality and flexibility of workforce data and analysis; collaborated to develop a dynamic and interactive Competency Assessment Tool and Program; and developed the NIOSH Employee Viewpoint Survey (EVS) dashboard that led to an 82% response rate for NIOSH on the 2019 EVS – an increase of 18% from the previous year.

Under Talent Management, the team developed the NIOSH Recruiting Process Manager, a customized, MS-Excel based application that standardizes, automates, and streamlines data entry, analysis, and reporting for key milestones in the hiring process. This tool filled a critical gap in available workforce data and reporting by providing analysis of cycle times, key performance indicators, and bottlenecks. The team also completed research vs. non-research position reconciliation and established a position plan for all NIOSH locations.

Under Talent Development, the team offered a series of over 16 webinars for managers and new researchers equaling 992 hours of training; relaunched the Rising Stars program for GS-11 employees and below; and enhanced the NIOSH Long Term Training program by offering doctorate level opportunities to three employees.

Under Talent Effectiveness, the team increased employee engagement by adding five new administrative and management awards to the NIOSH Science Awards, which now recognize staff across all job series; developed a NIOSH Opioid Awareness and Naloxone training; expanded wellness activities such as the NIOSH Get Up and Move Day; and improved the labor/management partnership by renegotiating the Morgantown Collective Bargaining Agreement .

Excellence in Leadership: GS 11-13

Imelda Wong
Senior Service Fellow
Division of Science Integration (DSI)

When Dr. Wong became a co-leader of the NIOSH Working Hours and Fatigue Interest Group she recognized the need to create a centralized effort to guide and connect researchers to address this topic effectively and efficiently. To do this she independently developed and lead several activities including establishing the NIOSH Director's Seminar Series on Working Hours and Fatigue which included five presentations from leading experts in sleep/fatigue research, fatigue risk management, and fatigue-incident investigations. These seminars averaged 160 viewers from around the world attending the live streaming presentations. Dr. Wong also developed internal "Learning Briefs" as an introduction to different research methodologies and technologies to assist researchers and programs across NIOSH. The Briefs will continue as a platform for researchers to share learning notes as they progress on their various studies.

Dr. Wong also secured funding to co-host a mini symposium on Working Hours and Fatigue with Washington State University for new investigators to network and learn from one of the top sleep labs in the U.S. The NIOSH Working Hours, Sleep and Fatigue Forum was NIOSH's first national meeting on this topic using an industry-specific approach and was conceptualized, organized, and co-hosted by Dr. Wong. Over 90 participants attended. Seven industry sessions were held, including one on vulnerable populations, to discuss research gaps and needs, effective fatigue mitigation strategies, challenges in managing fatigue in the workplace, and future directions for research. The American Journal of Medicine published manuscripts developed from this Forum in a special issue. NIOSH groups with previously limited work in this area have indicated that results from the Forum will serve as a blueprint for future research projects. NIOSH has emerged as an international leader in this topic, as other international agencies have asked for guidance to host similar forums.

During Dr. Wong's brief career at NIOSH, she has made many significant contributions. She won a small NORA to study fatigued driving among oil and gas workers. She has shared study protocols and technology information with internal and external partners to facilitate comparison of results across several organizations. She has created opportunities for new investigators, developed new avenues for research and collaboration, and has raised the profile of NIOSH as a leader in the areas of working hours and fatigue.

Excellence in Leadership: GS 9 and below

Suzanne Alison
Program Operations Assistant
Pittsburgh Mining Research Division (PMRD)

Ms. Alison was challenged to plan and implement an interagency collaboration event known as the Defense Advanced Research Project Agency (DARPA) Subterranean Challenge. Ms. Alison handled all the logistics. She planned for this effort by estimating the costs of hosting an event, securing a location and time suitable for the participants, sending out 'save the date' mailings, contacting potential speakers, customizing program content, assembling mailing lists, sending out invitations, processing security clearances for international visitors, providing attendees with driving directions and expectations for the meeting, purchasing supplies and materials, processing work order requests, arranging room set-up and tear down, and assigning specific tasks to the group. Ms. Allison's excellent organizational skills, professionalism, and careful attention to detail were critical to the overall success of this effort. Without sound logistics it is difficult for the less tangible and more important aspects of this event to happen such as having participants learn something new or letting participants feel supported and making connections with people who can help them.

Ms. Allison is a self-sufficient employee that can be relied upon to accomplish important tasks efficiently and with a high degree of professionalism. She plays a significant role as a leader because of her experience and knowledge of the procedures and guidelines established throughout the organization. Through the DARPA event, the mining program will gain access to the latest technologies and information in robotics, mine escape and rescue, refuge chambers, proximity systems, and coal dust products.

Ms. Alison is first and foremost a communicator. She has successfully used her communication and organizational skills and ability to work with people to improve the relationships between the science and technical personnel and management. She has established programs and activities that dramatically improved the workplace efficiency and improved on productivity and trust with external stakeholders. She has made a significant impact for PMRD and her branch has come to depend on her for the overall leadership and management. Her contributions to the organization are the embodiment of excellence in leadership.

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.

Award categories recognize distinguished career scientists, early career scientists, and scientific support staff.

Director's Intramural Award for Extraordinary Science Finalists

Finalists are listed alphabetically.

Lew Wade Distinguished Career Scientist

Robert D. Daniels
Alan Echt
M. Abbas Virji

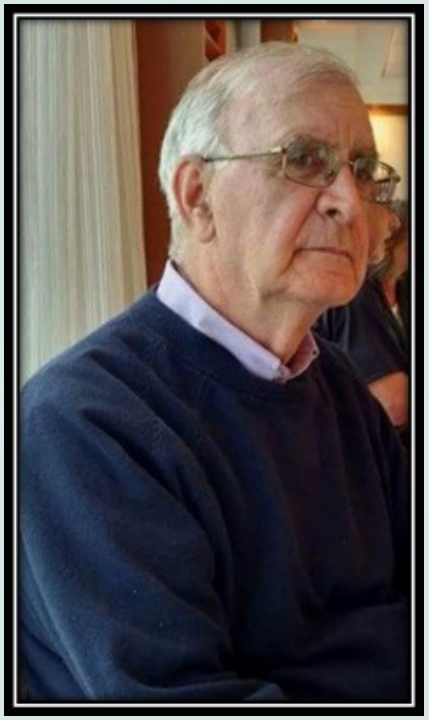
Early Career Scientist

Brie Hawley Blackley
Gary Roth
Carlos Siordia

Scientific Support

John Lechliter
Jeffrey Powell

Director's Intramural Award for Extraordinary Science: Lew Wade Distinguished Career Scientist



This award recognizes a permanent employee or fellow who has made extraordinary scientific contributions in his or her field of work. It is named after Dr. Lewis (Lew) Wade whose scientific contributions to miners, former radiation workers, and 9/11 survivors exemplify the definition of distinguished.

Dr. Wade joined NIOSH as the Associate Director of the Office of Mine Safety and Health Research in 2000 following a 25-year tenure with the federal Bureau of Mines and 5-year tenure with the U.S. Geological Survey. Among his many contributions to mining safety and health were the introduction of longwall mining technology into the Illinois Coal Basin, and the design, construction, and use of both a state-of-the-art mining test facility at the Lake Lynn Laboratory and of the Mine Roof Simulator, a multi-million pound load frame that can apply vertical and horizontal forces.

Dr. Wade became a NIOSH Senior Science Advisor in 2004 and provided advice and guidance to NIOSH as it worked to create a new program established by the Energy Employees Occupational Illness Compensation Program Act (EEOICPA). Dr. Wade became the designated federal official for the Advisory Board on Radiation and Worker Health and the technical project officer for the contract that provided support to the Board. This NIOSH program under EEOICPA has now completed more than 50,000 radiation dose reconstructions and added more than 120 classes of employees to the Special Exposure Cohort.

With the passage of the James Zadroga 9/11 Health and Compensation Act of 2010, Dr. Wade served as the Senior Advisor to guide, develop, and implement NIOSH's new responsibilities as the administrative body for the World Trade Center Health Program. Again, Dr. Wade provided leadership and advice to ensure that rescue and recovery workers, residents, students, and others suffering the health consequences related to the 9/11 attacks have access to the medical monitoring and treatment they need, and to advance the scientific understanding of the health consequences of 9/11 exposures.

Dr. Wade's dedication to the scientific foundations of worker safety and health exemplifies a career of distinction.

Director's Intramural Award for Extraordinary Science: Lew Wade Distinguished Career Scientist Winner

Robert D. Daniels

Dr. Robert D. Daniels is an epidemiologist and certified health physicist in the NIOSH Division of Science Integration (DSI). Dr. Daniels joined NIOSH in 2001 as a research health physicist in the former NIOSH Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS). In 2015, he became the Deputy Chief of the DSI Risk Evaluation Branch.

Dr. Daniels has made extensive and extraordinary scientific contributions in the fields of health physics, occupational epidemiology, and risk assessment over his career. While with DSHEFS, his research focused on radiation exposure among shipyard workers, in chemical laboratory workers at nuclear plants, and uranium miners. He is a founding member of the World Health Organization international consortium of experts to study nuclear workers in France, the United Kingdom, and the United States and participates the International Nuclear Workers' Study.

Dr. Daniels led a large-scale epidemiologic study examining potential links between firefighting and cancer. This research initiated changes within the fire service to manage cancer risks through behavior modification and exposure reduction. The findings have supported presumptive laws for worker compensation and recent federal legislation establishing a firefighter cancer registry. He participates in the World Trade Center Health Program Science Team and is coinvestigator on a project examining cancers in emergency responders. In the area of risk assessment, Dr. Daniels conducted a study using meta-analytically synthesized existing epidemiologic data on the dose-response relationship between adult asthma and occupational exposure to toluene diisocyanate (TDI). Using the results, he derived candidate occupational exposure levels for TDI that will be used as the basis for NIOSH authoritative recommendations.

Dr. Daniels is frequently requested to speak to scientific groups and organizations. His NIOSH publication history spans nearly two decades, comprising more than 40 peer-reviewed articles and over 1,100 citations, and demonstrating his influence beyond NIOSH's walls. He is a consummate scientist who is determined to improve all aspects of scientific investigation. His dedication to advancing worker safety and health by conducting research studies and occupational risk assessments of the highest quality and integrity have had a major impact on reducing worker exposure to hazardous materials.

Director's Intramural Award for Extraordinary Science: Early Career Scientist

Brie Hawley Blackley

Dr. Brie Hawley Blackley is a research industrial hygienist in the NIOSH Respiratory Health Division. Dr. Blackley began her NIOSH career in 2014 as an associate service fellow before assuming her current position in 2016. Dr. Blackley has established herself as a highly skilled and dedicated researcher and project officer. She has a unique background in industrial hygiene and cell and molecular biology that allows her to bridge between research in exposure assessment and occupational health outcomes. Coursework in epidemiology has furthered her ability to design novel and impactful exposure and health surveys.

The breadth of research conducted by Dr. Blackley is impressive for an early career scientist. Most of her work has focused on assessing exposures and potential health outcomes among workers in healthcare, metals manufacturing, and coffee roasting and packaging facilities. In response to Health Hazard Evaluation (HHE) requests citing concerns about exposure to a new disinfectant combining hydrogen peroxide, acetic acid, and peracetic acid, she designed exposure assessments and health surveys for hospitals in two states. Her study design and analyses were novel approaches to understanding occupational exposure and acute effects in workers. Dr. Blackley has taken an active role in investigating exposure risk factors and health outcomes among metal manufacturing workers. This includes assessing field performance of a single sample for measuring respirable and inhalable indium dust and identifying work tasks associated with particle exposure. She has also led seven HHEs at coffee roasting and packaging facilities with concerns about alpha-diketones exposure and respiratory health outcomes.

Since joining NIOSH, Dr. Blackley has presented her research at several conferences and published in the CDC Morbidity and Mortality Weekly Report, the Annals of Work Exposures and Health, the Journal of Occupational and Environmental Hygiene, the American Journal of Respiratory and Critical Care Medicine, and Frontiers of Public Health. She recently received funding to investigate gases, vapors, and dust contributing to occupational lung disease in dental personnel. She is the lead industrial hygienist on a new study to investigate exposures and respiratory health outcomes in exterior support firefighters.

Dr. Blackley brings a high level of motivation, enthusiasm, and dedication to her work and has demonstrated important contributions to exposure assessment and occupational health research through her research and service activities.

Director's Intramural Award for Extraordinary Science: Scientific Support

Jeffrey Powell

Mr. Jeffrey Powell is a biologist in the NIOSH National Personal Protective Technology Laboratory (NPPTL). He began his NIOSH career in 2010 as an associate service fellow before assuming his current position in 2019. Mr. Powell has provided superior technical and scientific support to eight research projects involving human subjects and at least two projects involving the NPPTL sweating thermal manikin.

Mr. Powell routinely participates in experiment design and data analysis and is responsible for equipment calibration and maintenance in the physiology lab. He recruits and schedules human participants in research studies. Mr. Powell has participated in numerous physiological tests including graded exercise stress tests to determine subject's cardiovascular fitness level and has experience in conducting respirator fit testing.

His contributions to these complex research studies require extensive attention to detail. He has consistently demonstrated a high degree of creativity in the designs of research studies to minimize the number of experiments conducted when human volunteers are involved. This is particularly important when challenging participants to walk on a treadmill or ride a stationary bicycle while wearing different types of personal protective equipment (PPE), sometimes in hot and humid conditions. Further, in 2014 Mr. Powell supported the testing of PPE and powered air-purifying respirators used by healthcare workers treating patients suffering from Ebola Hemorrhagic Fever in West Africa. Mr. Powell is a co-investigator on studies involving total heat loss and the effects of PPE on the physiological and biomechanical responses of first responders. Researchers seek out Mr. Powell as a collaborator. He has recently made significant contributions to studies by serving as task leader for a new project focusing on the wearability and use of respiratory protective devices, developing contracts for human subject testing, and contributing to human subjects research protocols. He has assumed responsibility for all laboratory purchases and manages credit card purchases. He identifies instrumentation needs and reviews and maintains the appropriate laboratory supply needs.

Further, Mr. Powell has played an important role in the success of numerous research studies leading to co-authorship on multiple publications and presentations. He is the author or co-author of 22 published or submitted peer-reviewed manuscripts and 27 conference posters and presentations.

Distinguished Career Scientist Update

Anna Shvedova

Dr. Shvedova continued to strengthen her laboratory's research program in the field of molecular, cellular, tissue, and organismal mechanisms of toxicity of several types of occupational materials. Specifically, she used the discretionary funds from the 2018 DIA to support research focused on toxic effects of several types of materials, including nanomaterials, as well as asbestiform and non-asbestiform elongated mineral particles. In the field of nanotoxicology, a comparative study of lung and blood transcriptomes in mice exposed to multi-walled carbon nanotubes has been successfully completed, with final results presented in a paper recently published (TAAP, 2020).

A current research project addresses a strategic research goal, to "develop a broader understanding of the important determinants of toxicity for asbestos fibers and other elongated mineral fibers." Presented at the Educational Session of American Industrial Hygiene Conference (AIHce, 2019, Minneapolis, MN), the research aims at elucidating the pathogenicity mechanisms of asbestos and cleavage fragments.

Another project presented at the Annual SOT meeting (March 2020, Anaheim, CA) looked at long-term exposure of human BEAS-2B and Met-5A cells to riebeckite/tremolite asbestos and their respective cleavage fragments. A separate series of experiments, with results in press in the journal Chemosphere (2020), explored morphological transformation of human lung epithelial cells due to continuous exposure to cellulose nanocrystals and asbestos.

During 2019, Dr. Shvedova's studies focused on in vitro and in vivo assessments of the mechanism(s) underlying the toxic effects of several groups of materials. The results are the basis for a series of publications that will spawn many new avenues for nanotoxicology and elongated mineral particle research. Several review articles also have been prepared on different methodological aspects of omics (e.g., lipidomics) related to quantitative characterization of lipid mediators and oxygenated phospholipids in regulated cell death programs.

DIA Early Career Scientist Winner Update

Matthew Wheeler

In 2019, Mr. Wheeler's research took two directions. The first related to dose-response estimation of toxicity data that arises from a single endpoint (e.g., lung tumors observed from inhalation experiments). This research led to collaborations with the U.S. Environmental Protection Agency (EPA) to enhance their Benchmark Dose software system to include model average dose response methods, which is a tool that he developed with Dr. A. John Bailer of Miami University.

Mr. Wheeler also worked with U.S. and international stakeholders to develop model-averaging and dose-response standards. Recently, the World Health Organization published an update to its dose-response guidelines; he served on that committee as the rapporteur. Further, his involvement in the group helped cement its recommendation for model averaging to become the international standard and has led to work with the European Food Safety Authority to begin talks of harmonizing dose-response assessment methodologies. To this end, Mr. Wheeler spent the award to go to the International Congress on Toxicology in July 2019, where he met with other dose-response experts and gave a training on harmonization research.

Mr. Wheeler's other research involved quantifying large data sets for chemical toxicity using high throughput chemical toxicity databases to understand the relationship between chemical structure and toxicity. He is currently developing models with scientists from the EPA and NTP that capture the complex correlation between chemical structure and gene and cell level responses. The goal is to understand possible toxicities associated with the 80,000 chemicals that workers are exposed to with little to no toxicological information.

This work resulted in various projects with graduate students, including Sarah Davidson from the University of Cincinnati, who is working to develop clustering algorithms for gene-level dose response data. Mr. Wheeler has also worked with Kelly Moran of Duke University to develop a unique chemical fingerprint relevant to dose-response activity.

Scientific Support Winner Update

Glenn Doyle

Mr. Doyle used funds from the 2017 Distinguished Career Scientist award to support the purchase of commercial software to analyze and inventory the vast collection of electronic files that NIOSH has on its Internet and Intranets sites. Specifically, the software packages were Web Link Validator (a website scanning package) and multiple copies of Beyond Compare (a file/code scanning package).

One of the challenges of websites assembled by hand over 2 decades is the large number of files, and the unintentional presence of old, unlinked, deprecated, or non-508 files. Using these two software tools and existing web usage statistic software, Mr. Doyle was able to identify "orphan" files. Orphan files are files that are unlinked and unintentionally present on a website but still viewable by website visitors. He was also able to identify collections of files, reports, or records that were interspersed throughout the website. Subsequently, the file collections can be isolated, documented, archived, or published in accordance with more contemporary data management practices.

In addition to identifying problematic files, Mr. Doyle was able to create comprehensive indexes of all web pages, PDFs, and more. The indexes included clickable URLs, so you could directly view the associated file. Another effect of the indexes of information was the formal classification of existing PDFs into dozens of subgroups, which assisted in the evaluation. He was able to identify hundreds of duplicate or unneeded older PDFs and remove them. He also located and removed unused JavaScript programs, reducing the Section 508 or other approval paperwork burden associated with those types of files.

NIOSH Nominations for the 2020 Charles C. Shepard Science Award

CDC/ATSDR established the Charles C. Shepard Science Award in 1986 in honor of Dr. 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 Awards recognize 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.

The following are the NIOSH nominations for the 2020 Charles C Shepard Science Award:

Scientific Publications

Assessment

Breloff SP, Dutta A, Dai F, Sinsel EW, Warren CM, Ning X, Wu JZ, (2019) Assessing work-related risk factors for musculoskeletal knee disorders in construction roofing tasks, Applied Ergonomics, 81 Article 102901, https://doi.org/10.1016/j.apergo.2019.102901.

Groenewold M, Brown L, Smith E, Sweeney MH, Pana-Cryan R, Schnorr T. Burden of occupational morbidity from selected causes in the United States overall and by NORA industry sector, 2012: A conservative estimate. Am J Ind Med. 2019;62:1117–1134. https://doi.org/10.1002/ajim.23048

Data Methods and Study Design

Johnson CY, Rocheleau CM, Grajewski B, Howards PP. Structure and Control of Healthy Worker Effects in Studies of Pregnancy Outcomes. Am J Epidemiol. 2019;188(3):562–569. doi:10.1093/aje/kwy277

Virji MA, Schuler CR, Cox-Ganser J, et al. Associations of Metrics of Peak Inhalation Exposure and Skin Exposure Indices With Beryllium Sensitization at a Beryllium Manufacturing Facility. Ann Work Expo Health. 2019;63(8):856–869. doi:10.1093/annweh/wxz064

Wheeler MW. Bayesian additive adaptive basis tensor product models for modeling high dimensional surfaces: an application to high-throughput toxicity testing. Biometrics. 2019;75(1):193–201. doi:10.1111/biom.12942

Laboratory Science

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Lifetime Scientific Achievement Award Nomination

Dr. Christopher C. Coffey

Dr. Coffey is recognized worldwide as a researcher in respiratory protection, a topic we have seen come into the spotlight with the current pandemic.His wealth of experience as a NIOSH researcher providing national and global leadership in preventing workplace illnesses and injuries began four decades ago in respirator certification and concluded with serving as the Associate Director for Science for the NIOSH National Personal Protective Technology Laboratory from 2011 to 2020.

Dr. Coffey's research improved the state of worker protection and helped lead to the establishment of a classification scheme for particulate air-purifying respirators that was established by NIOSH in 1995 and incorporated into federal regulation. His groundbreaking laboratory and workplace studies on respirator performance served to reduce exposures to inhalation hazards, with an emphasis on filtering facepiece respirators.

Dr. Coffey has been the lead researcher on the fit and filtration of these devices and is recognized worldwide for his research translation in influential respiratory protection policies, standards and guidelines. The results from his research have been used to establish federal regulations for respirator performance and use, national and international standards, test practices, and respirator policies and guidelines.

While his research has been outstanding and far reaching, Dr. Coffey has demonstrated exemplary leadership in identifying research needs and conducting research programs. His intelligent, disciplined, and committed leadership is seen in the creative and innovative approaches in NPPTL's research portfolio.

His research has led to numerous respirator technological contributions spanning design, performance requirements, performance testing, workplace testing and use. He has been recognized by his peers, including receiving the prestigious AIHA John M. White Award on three occasions.

Dr. Coffey recently retired from NIOSH after 41 years of service to the Institute. Through his work, Dr. Coffey has demonstrated exceptional commitment to the field of occupational safety and health.