Exposures, Controls and Respiratory Health in Coffee Workers

Coffee processing is common throughout the world. Workers in this industry are exposed to complex mixtures of gases, dusts, and vapors including carbon monoxide, carbon dioxide, coffee dust, allergens, alpha-diketones, and other volatile organic compounds. Adverse respiratory health outcomes such as respiratory symptoms, decreased pulmonary function, asthma, and obliterative bronchiolitis can occur among exposed workers. The National Institute for Occupational Safety and Health (NIOSH) conducted health hazard evaluations at 17 small- to medium-sized coffee processing facilities. Objectives were to understand the burden of respiratory abnormalities, exposure to alpha-diketones from flavorings and natural sources, risk of adverse respiratory health effects related to exposures, and options for exposure mitigation. Full-shift, task-based, and instantaneous air samples for diacetyl and 2,3-pentanedione were collected and engineering controls were evaluated. Medical surveys included questionnaire, spirometry, impulse oscillometry, and biomarkers of respiratory health. Exposures above the NIOSH recommended exposure limits were measured for many production and non-production jobs and tasks. Participants (n=384) reported irritation and respiratory symptoms, and 5% of workers had abnormal spirometry with one worker diagnosed with obliterative bronchiolitis. This comprehensive research aimed at understanding the burden and risk of adverse respiratory health outcomes among coffee processing workers and identifying effective strategies to mitigate exposures.

A Strategy for Field Evaluations of Exposures and Health Outcomes at Small to Mid-Sized Coffee Processing Facilities (presentation 1), and Multi-pollutant models of mixed chemical exposures and respiratory health outcomes in workers at coffee roasting an
Mohammed Virji (CDC/NIOSH, USA)

Exposures and emissions in coffee roasting facilities and cafés: diacetyl, 2,3-pentanedione, and other volatile organic compounds
Ryan LeBouf (CDC/NIOSH, USA)

Determinants of personal and area full-shift exposures to diacetyl, 2,3-pentanedione, and 2,3-hexanedione during coffee production
Alyson Fortner (CDC/NIOSH, USA)

Determinants of task-based exposures to alpha-diketones and other VOCs in coffee roasting and packaging facilities
Brie Blackley (CDC/NIOSH, USA)

Relationship of respiratory outcomes with tasks in workers at coffee roasting and packaging facilities
Ethan Fechter-Leggett (CDC/NIOSH, USA)

Perspectives on the Impacts of this Study on Risk Assessment of Alpha Diketones
Jean Cox-Ganser (CDC/NIOSH, USA)

Burden of respiratory abnormalities and relationship with tasks in workers at coffee roasting and packaging facilities
Reid Harvey (CDC/NIOSH, USA)

Efficacy of engineering controls in mitigating diacetyl and 2,3-pentanedione emissions
Marcia Stanton (CDC/NIOSH, USA)

MODERATOR

Mohammed Virji

Dr. M. Abbas Virji is a research industrial hygienist with the Respiratory Health Division at NIOSH in Morgantown. His research interests and experience include developing biologically relevant exposure metrics for epidemiologic studies; tools to calculate lung dose using pharmacokinetic models; historical exposure reconstruction; statistical methods for real-time exposures to identify exposure determinants; and evaluating mixed exposure-response relationships using multipollutant models. He is currently working on developing dose metrics for the epidemiology of beryllium sensitization and indium lung disease, reducing exposure to cleaning and disinfecting chemicals to prevent asthma symptoms while maintaining infection control in hospital settings, and exploring the health effects of exposure to alpha diketones during coffee processing.

SPEAKERS

Ryan LeBouf

Dr. Ryan LeBouf is a Supervisory Research Industrial Hygienist with the Respiratory Health Division at the National Institute for Occupational Safety and Health in Morgantown, WV. He completed his doctorate in Environmental Science and Engineering from Clarkson University in 2008. He holds an MSE in Mechanical Engineering focusing on Nuclear and Radiation Engineering from the University of Texas at Austin (2001). He received a BS in Industrial Hygiene Environmental Toxicology from Clarkson University in 1999. His current research is concentrated on VOC monitoring and analysis, emissions from electronic nicotine delivery systems, and exposures during cured in-place pipe installations.

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SPEAKERS

Alyson Fortner

Dr. Alyson Fortner is a research industrial hygienist in the Respiratory Health Division at the National Institute for Occupational Safety and Health in Morgantown, WV. She holds a doctorate (PhD) in Occupational and Environmental Health Sciences from West Virginia University, an MPH with a focus in Occupational and Environmental Health Sciences from West Virginia University, and a BS in Biology with a minor in Chemistry from California University of Pennsylvania. Her current research includes assessing exposures to alpha diketones in coffee production, exposures to VOCs and respirable silica in artificial stone fabrication, and exposure to welding fumes.

Brie Blackley

Dr. Brie Hawley Blackley is a Research Industrial Hygienist in the Respiratory Health Division of NIOSH, the National Institute for Occupational Safety and Health. She holds a doctorate (PhD) in Cell and Molecular Biology from Colorado State University, a MS in Environmental Health, with a specialization in Industrial Hygiene, from Colorado State University, and a BS in Animal Science from the University of Delaware. She actively serves as a Project Officer in the Health Hazard Evaluation at NIOSH and draws from a background in aerosol science and toxicology. Her current research includes assessing exposures and health outcomes in healthcare workers exposed to peroxygen compounds, exposures to alpha diketones in coffee production, and engineering controls and exposures to respirable dust, silica, metals, and VOCs in dental settings.

Ethan Fechter-Leggett

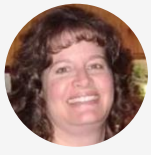
Dr. Ethan Fechter-Leggett is a Lead Research Epidemiologist with the Respiratory Health Division at the National Institute for Occupational Safety and Health (NIOSH) in Morgantown, West Virginia, United States. Dr. Fechter-Leggett joined CDC in 2013 as Epidemic Intelligence Service Officer in environmental health before joining NIOSH in 2015. He holds a Doctor of Veterinary Medicine (DVM) from Tufts University, a Master of Preventive Veterinary Medicine (MPVM) from the University of California, Davis, and a Bachelor of Science in Animal Science from the University of Vermont. His main research projects at NIOSH are on interstitial lung diseases in dental personnel, respiratory hazards and health effects in coffee processing workers, and chronic beryllium disease.

Jean Cox-Ganser

Jean Cox-Ganser, Ph.D. is a Senior Research Epidemiologist and since 2018 is the Associate Director for Science in the Respiratory Health Division (RHD) of the National Institute for Occupational Safety and Health. From 2004 to 2018, she served as supervisor of the Research Team in the RHD-Field Studies Branch. She is author or co-author on over 90 peer-reviewed publications, book chapters and reports. Her body of scientific work includes research in the areas of indoor environmental quality and associated respiratory health outcomes, respiratory health effects in relation to flavorings, metal working fluid-related respiratory disease, soy asthma, use and impact of respirators on mold-related health complaints among those recovering from Katrina, sarcoidosis in relation to indoor environmental exposures, wildland firefighter respiratory health, silica, and World Trade Center spirometry. Dr. Cox-Ganser has been a principal investigator for research studies on the respiratory health effects of dampness and mold in office buildings and schools, as well as for research studies on the health effects of exposure to flavorings. Dr. Cox-Ganser has a leadership role in the analysis and reporting out of RHD investigations on respiratory health in coffee processing. In 2016 and 2017 Dr. Cox-Ganser was a member of a National Academies committee for a document on the microbiome of the built environment in relation to human health. In 2020 and 2021 she was the NIOSH liaison to the Advisory Committee on Immunization Practices COVID-19 Vaccines Work Group. In February and March 2021, she served as the Associate Director for Science to the Worker Safety and Health Team in the CDC COVID-19 response.

Reid Harvey

Dr. Harvey is an Epidemiologist with the Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH) in Morgantown, West Virginia. Dr. Harvey has been heavily involved with CDC's COVID-19 response, but his typical role with NIOSH's Respiratory Health Division involves investigating outbreaks of work-related lung disease in the United States. Prior to joining NIOSH, Dr. Harvey was an Epidemic Intelligence Service (EIS) Officer with CDC's Division of Foodborne, Waterborne, and Environmental Diseases in Atlanta, Georgia during 2013–2015. During 2011–2012, Dr. Harvey was a Congressional Fellow for the American Veterinarian Medical Association in the Office of Senator Kirsten Gillibrand where he worked on the Farm Bill and other agricultural- and health-related policy. Dr. Harvey completed his DVM (2010), MPH (2009), and BA Hispanic Studies (2006) at the University of Tennessee.



Marcia Stanton

Marcia Stanton is a Health Scientist in the Respiratory Health Division at the National Institute for Occupational Safety and Health in Morgantown, WV. She received a BS in Social Work from West Virginia University in 1990. She actively serves as a Project Officer in the Health Hazard Evaluation Program at NIOSH. Her current research interests include evaluation of engineering controls to control grinding emissions in coffee roasting and packaging facilities, assessing exposures and exploring health effects among workers in coffee production, and evaluating exposures to cleaning and disinfecting chemicals in healthcare workers.