

# Rachel Zisook, MS, CIH

## Current Position

Senior Supervising  
Health Scientist

## Discipline Areas

- > Exposure Assessment
- > Industrial Hygiene
- > Human Health Risk Assessment
- > Environmental Data Analysis

## Years' Experience

10 Years

## Joined Cardno

2015

## Education

- > MS, Geography and Environmental Engineering, Johns Hopkins University (2011)
- > BS with Honors, Biological Sciences, University of California Davis (2007)

## Summary of Experience

Ms. Rachel Zisook is a Senior Supervising Health Scientist in the San Francisco, CA office. She is a board certified industrial hygienist with ten years of varied professional experience in exposure assessment, industrial hygiene, human health risk assessment, and environmental data analysis. At Cardno ChemRisk, Ms. Zisook is the Business Development Lead for the Occupational and Environmental Health and Safety (OEHS) Service Area. Her practice focuses on assessing risk to workers, consumers, and communities resulting from exposure to a variety of chemical, physical, and biological hazards. Ms. Zisook earned an M.S. in Geography and Environmental Engineering from the Johns Hopkins Whiting School of Engineering, and holds a B.S. in Biological Sciences from the University of California, Davis.

## Significant Projects

### Industrial Hygiene and Occupational Health Risk Assessment

Managed the development of a standard operating procedure (SOP) and training presentation for conducting incident investigations of potential allergic responses resulting from pharmaceutical handling operations for a major pharmacy provider.

Directed and managed the preparation of an OSHA-compliant (29 CFR 1910.1026) hexavalent chromium (VI) SOP for an offshore liquid natural gas shipping terminal.

Managed numerous projects for a major distribution company to characterize potential worker exposure to various occupational hazards, including noise, particulate matter, VOCs, chloride and phosphate, constituents of fires, mold, and asphalt. Work included exposure data collection, literature reviews, exposure modeling, and data analysis.

Project examples include:

- > Analysis of indoor air quality data (temperature, humidity, and mold sampling results) and remediation actions following water intrusion at an office location. Developed recommendations for additional remediation actions, sampling investigations, and occupant risk communication.
- > Literature review of contaminants of potential concern (COPCs) associated with volatilization of asphalt, and preparation of a high-level sampling strategy for measuring COPCs in temporary tent structures.
- > Time trend and statistical analysis of a large real-time monitoring dataset collected for multiple constituents at various facilities during wildfire season.
- > Development of a spreadsheet tool to quickly estimate generation rates of liquid ingredients of products during accidental spills for use in air modeling; work included the collection of random air speed at warehouse facilities to fine-tune spreadsheet inputs.

Managed projects to assess potential inhalation and dermal hazards associated with multiple products used at automotive manufacturing facilities. Work included performing a review of OELs and screening-level toxicological assessments of major constituents.

Managed project to synthesize literature regarding welding fume particle emission rates associated with spot welding for an automotive manufacturing facility.

Provided industrial hygiene support during turnaround at a petroleum refinery. Collected personal air samples on contractors for asbestos, metals, respirable crystalline silica, and nickel carbonyl, during abatement, welding, refractory removal, and catalyst unloading operations, respectively. Performed monitoring for noise during power washing activities. Conducted ventilation assessments and real-time respirable dust monitoring associated with refractory removal work in a permit-required confined space.

Participated in multiple simulation studies to characterize exposures to metals, VOCs, and inorganic acids from lithium-ion battery thermal runaway events to inform a screening level human health risk assessment and selection of fire extinguishing techniques.

Developed industrial hygiene risk ranking tool for an automotive manufacturing facility. Inputs included toxicological data for constituents of adhesives, paints, and other products, in addition to worker exposure parameters. Conducted baseline assessment to characterize potential for exposure. Conducted interviews and observed workers performing tasks to obtain information on duration and frequency of routine operations and specific work tasks.

Developed a framework for identifying COPCs associated with 3D printing operations at an industrial facility. Measured emissions during operations of four 3D printer types (material extrusion, material jetting, powder bed fusion, and vat polymerization) using liquid photopolymer resin, acrylonitrile butadiene styrene (ABS) thermoplastic, and nylon powder bulk materials.

Conducted an exposure simulation study to characterize short-term exposures to airborne sodium chlorite solution. Study was performed to reconstruct potential exposures during a spill of a product containing sodium chlorite.

Managed litigation cases involving asbestos exposure from filter paper, drywall accessory products, insulation, automotive friction products and gaskets, and premises (e.g., refineries). Reviewed asbestos literature and case materials for use in the preparation of expert testimony and reports. Work has included conducting state-of-the-art reviews of industrial hygiene practices, quantitative exposure reconstruction, evaluation of regulatory requirements, and development of an air sampling strategy to measure ambient airborne concentrations of asbestos.

Provided EHS written policy review and redevelopment assistance for a Bay Area medical center. Developed hazardous waste management policy in compliance with USEPA and CalEPA, local ordinances, and standards set by the Joint Commission under the Environment of Care.

Conducted industrial hygiene sampling for potential exposures at a fiberglass manufacturing facility. Reviewed scientific literature to inform the design of a sampling protocol and assess occupational exposure limits and recommendations.

## COVID-19

Participated in a multi-disciplinary team of consultants and employees of a large distribution company to inform decisions regarding A) future buildout plans for heating, ventilation, and air conditioning (HVAC), and B) modifications to current and already planned HVAC configurations, considering system limitations. Led a team to analyze the available research on the airborne transmission of SARS-CoV-2 and identify the potential factors that may contribute to this mode of transmission.

Directed and managed project to synthesize literature regarding the efficacy of face coverings for a large distribution company.

Conducted a gap analysis of EHS COVID-19 plans and policies for a construction company's office and fabrication facilities. Work included advising on strategies for cleaning and disinfection, leadership and reporting, case management, worker hygiene and behavior, and ventilation.

Conducted a gap analysis of EHS COVID-19 plans and policies for a technology company conducting a study involving wearable devices. Evaluated EHS procedures considering both employee and participant health and safety, including behavior and movement, cleaning and disinfection, personal protective equipment (PPE), communication, and the operations carried out at the study location.

Managed multiple projects to assess the potential risk associated with exposure to antimicrobial agents, including hand sanitizer, disinfectants, and UV radiation. Constituents included ethanol, quaternary ammonium compounds, hydrogen peroxide, and UV-C light and its potential byproducts (nitrogen dioxide and ozone). For chemical agents, work ranged from screening-level assessments to derivation of occupational exposure limits (OELs). Specific to UV-C, work included field data collection and a literature review of its potential effects on produce.

Conducted a review of proposed changes to work operations for an optical products company. Provided recommendations for specific exposure controls, in consideration of work operations; regulatory requirements; resource constraints; and available guidance from the Occupational Safety and Health Administration (OSHA) and the Centers for Disease Control and Prevention (CDC).

## Consumer Product Health Risk Assessment and Product Stewardship

Directed and managed project to develop a high-level summary of the state of the science, frequently cited papers, and data gaps regarding glyphosate (RoundUp®). Research included a review of U.S. and international regulatory positions, and toxicology, exposure, and epidemiology studies of glyphosate, with an emphasis on consumer use. The results of this review were used to assist the client, a major distribution company, with developing policies regarding product stewardship.

Developed novel, health risk prioritization method specific to consumer products for a major distribution company. Work involved developing an algorithm incorporating hazard and exposure data to assign risk scores.

Assessed the likelihood for consumer exposure to mercury contained in skin lightening products.

Conducted exposure assessment of pine wood- and corn-based pet litter. Measured airborne particulate matter concentrations during simulated use of the product, employing real-time and active sampling methods for inhalable particulate and total suspended particulates.

Designed and conducted a simulation study to characterize potential exposure to terpenes, VOCs, and particles associated with airborne dispersion of tea tree essential oil utilizing two essential oil diffuser types in a household setting.

Managed litigation project regarding claims of exposure to lead-based paint. Work included a comprehensive literature review of exposure sources in various environmental media and exposure pathway analysis.

Provided expert support to a litigation matter involving claims of exposure to lead-based paint. Work included managing quality control of data entry from personal record sources; analysis of personal record data to identify trends and potential sources of elevated childhood blood lead levels; and review of lead abatement practices in homes.

#### Community Health Risk Assessment

Reviewed exposure literature and data for chemical constituents of wildfire smoke following acute exposure of residents to large wildfires. Managed statistical and geospatial data analyses.

Conducted literature reviews and performed data analyses for a human health risk assessment of residential exposure to airborne contaminants associated with a refinery fire. Work included conducting a literature review of emission factors associated with refinery fires and the burning of petroleum products; estimating airborne concentrations of COPCs; evaluating residential sources of exposure to COPCs associated with indoor and outdoor emission sources; and reviewing toxicology data associated with regulatory thresholds.

Provided technical support to a client involved in a lawsuit regarding land application of municipal biosolids. Prepared a database of federal and state regulatory screening levels and reviewed environmental data for various contaminants of potential concern (CPOCs) including: metals, PPCPs, PFCs, insecticides, phosphate ester flame retardants, polybrominated biphenyls, and other emerging COPCs. Conducted analyses of large datasets of soil, water, and biosolids sampling results, and developed an Access database of sampling data. Reviewed and analyzed biosolids land application loading rates and calculated site lifetime projections. Performed a review of the literature regarding health risks associated with the uptake of PFCs into crops via land applied biosolids.

Evaluated airborne exposure to contaminants during building cleanup work following an environmental disaster. Managed the development of an environmental sampling database and plaintiff-specific exposure profiles; prepared a review of scientific opinions; designed and developed a database for environmental datasets.

Evaluated odors and health impacts associated with a lake cleanup project. Analyzed real-time air measurements, potential toxicological comparisons, and spatiotemporal data of neighborhood odor complaints.

Analyzed and maintained an Access-based database system of multi-organizational sampling data for a toxic tort case involving exposures to airborne contaminants. Prepared data summaries and technical memoranda regarding air monitoring and exposure assessment. Conducted a review of literature regarding asbestos sampling methods and fiber resuspension.

Evaluated paint as a source of lead contamination in residential soil at a Superfund site. Reviewed and summarized literature on the prevalence of lead-based paint in homes and the associations between lead-based paint and soil lead levels. Managed technical analyses and visual representation of U.S. Census data.

Conducted a comparative analysis of the toxicity and effectiveness of dispersant and surface washing agent products intended for use on a nuisance sheen of refined product for an industrial client. Obtained product information from manufacturers and distributors and co-authored a technical memorandum.

Reviewed data and conducted research for a marine fish contamination risk assessment.

#### Environmental Data Analysis and Regulatory Compliance

Provided technical support to a client involved in an oil spill. Work included analysis of literature on impacts on air and water quality and human health; technical review of presentations and reports; management of attendance and review of presentations at relevant conferences; and the development of a database containing over 2,900 scientific conference materials for internal and client use. Identified, interviewed, and evaluated qualifications of potential testifying and consulting experts.

Contributed to an expert report for a cost recovery/cost allocation litigation case involving a former manufactured gas plant (MGP) site. Reviewed literature on historic MGP operations; site-specific investigation and remediation activities; data from environmental samples; and historic aerial images to determine likely sources of non-aqueous phase liquid (NAPL) groundwater contamination.

Provided technical support for a cost allocation case involving a large urban river system. Conducted a review of historic facility documents and developed responses to an allocator questionnaire regarding the historical use, discharge, fate, and transport of potential contaminants of concern, including PCBs, VOCs, PAHs, and chlorinated solvents.

Assisted a nationwide cable television, broadband, and telephone service company with a review of state and local requirements associated with the Clean Air Act. Prepared jurisdiction-specific summaries of applicable regulatory requirements for emergency generators in nine states based on a review of emergency generator specifications, regulatory requirements, and discussions with local government agencies.

Provided technical support to a client involved in a lawsuit related to oil and gas pipelines. Researched, prepared, and delivered a technical client presentation on pipeline and navigation canal dredging methods. Conducted research on erosion mechanisms; historic Army Corps projects; water impoundments; and pipeline redundancy, flow, and pressure specifications. Developed figures showing pipeline and well configurations in several areas.

## Certifications

- > Certified Industrial Hygienist (CIH), Comprehensive Practice (CP# 11224), American Board of Industrial Hygiene (ABIH), 2017

## Professional Honors/Awards

- > Co-recipient of the American Industrial Hygiene Association's President's Award for contributions to the Back to Work Safely Task Force, 2021
- > Co-recipient of the American Industrial Hygiene Association's Social Responsibility Award for contributions to the Back to Work Safely Task Force, 2021
- > Selected for the American Industrial Hygiene Association's Future Leaders Institute Program, 2018

## Professional Memberships

- > American Industrial Hygiene Association (AIHA)
  - President-Elect, AIHA Northern California Section (AIHA-NCS)
  - COVID-19 Re-Open America Guidelines Task Force (2020-present)
  - Member of AIHA Risk Committee (2018 – present)
  - Director, Public Relations & Marketing, Continuing Education (AIHA-NCS) (2018 – 2020)

## Publications

- > Zisook, R.E., A. Monnot, J. Parker, S. Gaffney, S. Dotson, and K. Unice. 2020. Assessing and managing the risks of COVID-19 in the workplace: Applying industrial hygiene (IH)/occupational and environmental health and safety (OEHS) frameworks. *Tox Ind Health*. Advance online publication, Oct. 21, 2020. doi: 10.1177/0748233720967522.
- > Dotson, G. S., J. T. Lotter, R. E. Zisook, S. H. Gaffney, A. Maier, and J. Colvin. 2020. Setting occupational exposure limits for antimicrobial agents: A case study based on a quaternary ammonium compound-based disinfectant. *Toxicol Ind Health* 36(9): 619-633.
- > Zisook, R.E., B.D. Simmons, M. Vater, A. Perez, E.P. Donovan, D.J. Paustenbach and W.D. Cyr. (2020). Emissions associated with operations of four different additive manufacturing or 3D printing technologies. *J Occup Environ Hyg* 17(10): 464-479.
- > Jacobs, N. and R. Zisook. 2020. Managing Perceptions of Risk in the Technology Industry: Part 2 of an Interview with Industry Leaders. *The Synergist*. March.
- > Zisook R. and N. Jacobs. 2019. A Holistic Approach to Risk, Part 3: Interviews with Leaders in the Technology Industry. *The Synergist*. December.



## Presentations

- > Abelmann, A., W. Cyrs, M. A. Maier, R. E. Zisook. 2021. Beyond Banding: Estimating Health-Based Limits for Data Poor Chemicals. Virtual Professional Development Course at American Industrial Hygiene Conference & Exposition (AIHce).
- > Lotter, J. T., G. S. Dotson, R. E. Zisook, S. H. Gaffney, A. Maier, and J. Colvin. 2021. Setting Occupational Exposure Limits for Antimicrobial Agents: A Case Study Based on a Quaternary Ammonium Compound-Based Disinfectant. Presented at the Society of Toxicology Annual Meeting. Virtual. March.
- > Hamaji, C.M., K.M. Towle, R.E. Zisook, C. A. Park, S. Dotson, and S. H. Gaffney. 2021. A Risk Assessment of Inorganic Mercury Renal Toxicity from Application of Skin Lightening Products from Multiple Countries. Presented at the Society of Toxicology Annual Meeting. Virtual. March.
- > Abelmann, A., W. Cyrs, M. A. Maier, R. E. Zisook. 2020. Beyond Banding: Estimating Health-Based Limits for Data Poor Chemicals. Virtual Professional Development Course at American Industrial Hygiene Conference & Exposition (AIHce).
- > Zisook, R. and A. Monnot. 2019. Assessing Health Risks Associated with Specialty Chemical Handling in the Semiconductor Industry: Employing Occupational Exposure Banding Strategies. Presented at the SESH International High Technology ESH Symposium & Exposition, Scottsdale, Arizona, April 30.
- > Garnick, L., A. Monnot, A. Mushnick, R. Zisook, and P. Scott. 2019. An Evaluation of State and Federal PFOA Drinking Water Guidelines. Poster presentation at the Society of Toxicology Annual Meeting, March 11, Baltimore, MA. Abstract No. 1193/Poster Board P218.
- > Perez, A.L., C. Poteete, F. Louie, L. Garnick, A. Monnot, R. Zisook, and P.K. Scott. 2017. State of the science and meta-analysis of crop uptake of per- and polyfluoroalkyl substances (PFAS) (Abstract ID 10129). Presented at the 37th International Symposium on Halogenated Persistent Organic Pollutants (POPs) - DIOXIN 2017 Symposium, Vancouver Canada, August 21.
- > Monnot, A., E. Miller, L. Garnick, E. Beckett, A. Perez, P.K. Scott, and R. Zisook. 2017. An Evaluation of Federal and State Perfluorooctanoic acid (PFOA) Drinking Water Standards in the US (Abstract ID 10146). Presented at the 37th International Symposium on Halogenated Persistent Organic Pollutants (POPs) - DIOXIN 2017 Symposium, Vancouver Canada, August 24.
- > Scott, P.K., A. Perez, R. Zisook, and A. Monnot. 2017. A Probabilistic Evaluation of the 2016 U.S. EPA Health Advisory for Perfluorooctanoic Acid (Abstract ID 10145). Presented at the 37th International Symposium on Halogenated Persistent Organic Pollutants (POPs) - DIOXIN 2017 Symposium, Vancouver Canada, August 22.
- > Zisook, R., M. Vater, W.D. Cyrs, and S.H. Gaffney. 2017. Real Time Detection Systems for Measuring Emissions from 3D Printing. Abstract #360. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce) June 4-7, Seattle, WA.
- > Zisook, R. and B. Simmons 2016. Characterization of Emissions from 3-Dimensional Printing Operations: A Literature Review and Sampling Framework for Future

Evaluations. Poster Presentation. American Industrial Hygiene Conference & Exposition (AIHce) May 21-26, Baltimore, MD.