

Jennifer Bare

Current Position

Health Scientist II

Discipline Areas

- > Exposure Modeling
- > Human Health Risk Assessment
- > Regulatory Support
- > Fate and Transport Analysis
- > Data Management

Years' Experience

7

Joined Cardno

2013

Education

- > BS, Environmental Engineering, The Ohio State University, 2013

Summary of Experience

Ms. Jennifer Bare is a Health Scientist with over seven years of consulting experience in human and environmental health risk assessment. She currently serves as the Computational Sciences Practice Area Lead with Cardno ChemRisk. Her primary areas of training and expertise are exposure modeling and reconstruction, fate and transport analysis, human health risk assessment, and data management. She has designed and executed chemical exposure models for workers, communities and consumers exposed to a range of volatile chemicals, metals and particulates. She has particular expertise in managing projects involving outdoor air dispersion modeling and indoor air modeling, as well as projects concerning regulatory risk assessments under Proposition 65 and TSCA. She has also provided support to expert witnesses in projects involving asbestos, talc, BTEX compounds, ethylene oxide, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, and other noxious chemicals. She is skilled in many exposure models and computational software such as AERMOD, AERSCREEN, AIHA IHMod, ECETOC TRA, R, BMDS, and ProUCL. Ms. Bare completed her Bachelors of Science in Environmental Engineering from The Ohio State University and earned her Engineer Intern certification (f/k/a EIT) from the State of Ohio.

Significant Projects

Computational Modeling

Performed screening air dispersion modeling of a prioritized chemical using USEPA's AERSCREEN in preparation of a USEPA TSCA risk evaluation. Included an analysis to background concentrations and human health benchmarks.

Provided methodological support for a Health Risk Assessment (HRA) for a Specific Plan per Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA) guidelines. Support included evaluating the HRA methodologies for assessing health risks from construction and operational activities.

Led and developed several Proposition 65 assessments that evaluated potential community exposures to chemicals emitted from operational activities. Site-specific information was collected and synthesized for air dispersion modeling using USEPA's screening model AERSCREEN. Exposures were thereby estimated for nearby community receptors of concern. Refinements to the model and model assumptions were made as necessary. Several chemicals assessed did not have State-defined Safe Harbor Levels (SHL) for the basis of comparison. SHLs were derived, or acceptable exposure levels were estimated or identified, for the risk assessments.

Managed a project in which an air dispersion model was used to estimate the location at which odors resulting from multiple turbines at a military facility were not detectable in the surrounding community. Chemicals emitted from turbines were determined using fuel data and corresponding odor thresholds were compiled from various USEPA sources.

Estimated community exposure to asbestos at residences located miles away from a facility that historically manufactured asbestos-containing products. The model assessed fugitive, area, and point sources of asbestos emissions from two different locations associated with the manufacturer. The cumulative exposure to asbestos was found to be below background levels in the area.

Used USEPA's refined air dispersion model, AERMOD, to estimate occupational and community exposure to asbestos from a facility that historically manufactured asbestos-containing materials. The model accounted for variable emission rates from multiple area and point sources of asbestos. Airborne asbestos concentrations were predicted for thousands of potential receptor locations.

Performed air dispersion modeling with AERMOD to estimate potential exposures to volatile organic compounds (VOCs); nitrogen oxides (NO_x); and benzene, toluene, ethylbenzene, and xylenes (BTEX) from a natural gas compression facility. This involved an extensive review of site-specific emissions data and regulatory reports. The modeling was utilized in expert reports pertaining to exposure reconstruction and human health.

Aided in air model screening of multiple chemicals for various sources using SCREEN3. Contributed to refined CALPUFF air dispersion modeling of four of the chemicals using chemical degradation properties.

Assisted in the analysis of column leaching and sediment incubator study data to evaluate the environmental fate of chemicals formulated in tire and road wear particles (TRWPs) as part of the Tire Industry Project. Tasks included data interpretation of these studies to evaluate sample repeatability, quantify mass of chemical leached, and analyze environmental fate and transport of TRWP chemicals. This study evaluated chemicals with varying physical properties, as well as the effect of weathering on TRWP chemical content.

Developed a model to perform a lifetime asbestos exposure assessment and create a threshold ranking distribution based on several inputs. The model utilizes a simple Monte Carlo simulation to assess the uncertainty in exposure intensity throughout a workers' career.

Exposure and Risk Assessment

Led a Proposition 65 risk assessment involving exposures to metals in various home HVAC products as part of a product line compliance measure. The assessment included coordinating analytical testing and performing a screening level exposure assessment.

Provided comments on a TSCA Draft Scope Document for a prioritized chemical undergoing a risk evaluation. Comments specifically involved the USEPA's approach and scope for the occupational exposure assessment (inhalation and dermal pathways).

Reviewed and provided comments on a report that used Monte Carlo analyses to assess exposure and risk to airborne contaminants. Critiques included the appropriateness of using this probabilistic tool and the implementation of the actual analysis.

Provided comments on a TSCA Draft Risk Evaluation for a prioritized chemical. Comments specifically addressed USEPA's approach and implementation of the occupational exposure assessment (inhalation and dermal pathways). Recommendations for future assessments were also provided.

Critically reviewed a Proposition 65 analysis of talc in a line of consumer products. The review included a strategic assessment of the methodology and assumptions used.

Reviewed and synthesized data from literature relating to medium chain chlorinated paraffins (MCCPs) for REACH. Measured concentrations of MCCPs in various environmental media such as sediment, soil, and biota were summarized and critically evaluated.

Managed a Proposition 65 risk assessment that evaluated VOCs in adhesives and metals in shelving equipment. Exposures were qualitatively and quantitatively assessed for compliance with Proposition 65 for the exposed population.

Estimated exposures to irritants resulting from accidental scenarios in warehouse settings. For several scenarios, used near-field far-field modeling to recreate exposures and predict at what time exposures were less than identified health benchmarks.

Managed a Proposition 65 risk assessment involving exposure to lead and cadmium in tarps. The exposure model included several use scenarios resulting in dermal and hand to mouth exposure potentials.

Estimated a consumer's potential exposure and risk to MBT from shoes using Proposition 65 guidance. Pathways of exposure included direct dermal contact and hand-to-mouth contact. Daily exposures averaged over a lifetime were compared to a derived NSRL for MBT.

Evaluated the environmental liability allocation of a former battery manufacturing facility using historical data and information. This included an assessment of prior allocation methods of the site.

Managed several Proposition 65 risk assessments involving a series of metals and volatile chemicals in confidential lines of products. Exposure pathways included inhalation, dermal and hand to mouth ingestion. In addition, NRSLs and MADLs were derived for chemicals that did not have a State-defined NSRL. Risk assessments were developed in Microsoft Excel with a user-friendly interface with product type, consumer use and chemical selection options.

Estimated a consumer's potential exposure and risk to DEHP from shoes following Proposition 65 and REACH guidance. Proposition 65 routes of exposure included dermal contact and hand-to-mouth contact. The REACH ECETOC TRA consumer products model includes a default exposure scenario for rubber articles such as shoes. Exposure concentrations were compared to relevant regulatory human health benchmarks to estimate risk. No unsafe risk from DEHP in the shoes was found.

Estimated a child's potential exposure to chemicals in inks and adhesives through incidental oral contact. Conservative exposure scenarios included ingestion and saliva migration. The calculated average daily intake of chemicals was found to be negligible.

Managed a project evaluating the methodologies used to assess risks associated with a former manufactured gas plant site in Australia. The evaluation was subsequently used in mediation to determine the extent of remediation required to reduce potential human and environmental health risks from the site. Specific areas of interest included the exposure scenarios and assumptions used in the assessment.

Evaluated historical effluent discharged from a former battery manufacturing facility. The assessment included a review of claims regarding the toxicology of and potential environmental exposures to the effluent.

Aided in a human health risk assessment of various metals located in pond water and sediment. The conceptual site model included ingestion and dermal exposure to metals during recreational fishing and wading as well as from accidental immersion. For comparison, risk calculations were also performed for background levels of select metals. Overall, there was no increased risk associated with the exposure scenarios to pond water and sediment.

Helped sample and compare arsenic concentrations in Californian wines to various human health criteria. This comparison included wine- and water-specific international and domestic arsenic health standards. Differences in wine and water consumption rates were evaluated and factored into the comparison.

Assisted in a human health risk assessment evaluating potential inhalation exposures to chemicals of concerns during the remediation of a former manufactured gas plant (MGP) site. Performed air dispersion modeling to compare potential risks associated with remediation to fence line concentration objectives calculated to protect nearby receptors.

Evaluated the exposure associated with the ingestion of vegetable-based carbon black used as a colorant in lollipops. Work included researching the current international and domestic regulations pertaining to vegetable-based carbon black in food and the toxicity associated with its ingestion. Exposures were estimated for the US population (children) and were compared to estimated total dietary exposures to vegetable carbon black. It was concluded that there was no increased risk associated with ingestion of the carbon black in the lollipops due to the lack of PAHs and low exposure potential.

Assisted in evaluating potential risk from PCBs in drinking water during multiple phases of remediation. The assessment evaluated other sources of risk including disinfection by-products (DBPs) and radium.

Completed an exposure assessment for long-chain chlorinated paraffins (LCCPs) manufactured in the United States. Air, water, landfill, and incineration emission factors were reviewed and compiled for use in the ECETOC Targeted Risk Assessment (TRA) model, which is intended for performance of screening assessments performed in accordance with the guidance for REACH.

Performed a quality assurance review of extended safety data sheets (eSDSs) of four phosphates (DDPP, DPDP, 2-EHDPP, TDP). This task included verifying the accuracy of predicted environmental concentrations and risk characterization ratios reported in the annex for multiple environmental and human health exposure scenarios.

Statistical Analysis

Cleaned a large database that included PCB sampling data from a variety of environmental media. Built summary statistics formulations for use in current and future litigation matters.

Built a database that handled and cleaned large datasets of liquid and aerosol ENDS product testing results. In addition, created a framework for performing descriptive summary statistics of the results for use in human health risk assessments.

Assisted in statistical analysis of groundwater data near a coal ash facility to evaluate site compliance. Chemicals of concern included arsenic, boron, iron, manganese, selenium, thallium, and total dissolved solids. Analysis included various methods outlined in the USEPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance. Specifically, ProUCL and R were used to test for outliers and to determine background concentrations, data distributions and LCLs/UCLs.

Aided in a review and formulation of comments on OSHA's justification as to why current sampling and analytical methods for measuring respirable crystalline silica (RCS) can accurately measure exposures at the proposed occupational permissible exposure limit (PEL) of 50 $\mu\text{g}/\text{m}^3$ and at a corresponding action level of 25 $\mu\text{g}/\text{m}^3$. This included an assessment of OSHA's comments in the Notice for Proposed Rulemaking for an Occupational Exposure to Crystalline Silica standard and Preliminary Economic Analysis,

statistical analysis of available data in R, and a literature review of sampling and analytical methods for RCS.

Litigation Support

Manage cases involving occupational and non-occupational asbestos and talc exposures from talcum powder, drywall accessory products, coatings and paint products. This involves organizing and reviewing case-specific information, performing exposure reconstructions, and preparing for expert reports and testimony.

Research and review literature relating to occupational and non-occupational benzene exposure for use in exposure reconstructions and expert reports. Assessments have included benzene exposure from gasoline, cleaning solvents, diesel fuel and exhaust, and pesticides.

Critically review approaches used to characterize human and environmental health risk including methodology frameworks, air dispersion models, and inhalation exposure models.

Certifications

- > Engineer Intern (EI) – Ohio, 2013

Professional Honors/Awards

- > Recipient of American Industrial Hygiene Conference & Expo (AIHce)
 - > Second Place “Best of Session” Poster Award. Session 404. 2016 – *Time Trends in Formaldehyde Emissions from Laminate Flooring Products After Installation*

Membership to Professional Societies

- > Society for Risk Analysis (SRA)
- > International Society of Exposure Science (ISES)

Publications

Peer-Reviewed Publications

- > Drechsel, DA, CA Barlow, JL Bare, NF Jacobs, and JL Henshaw. 2017. Historical evolution of regulatory standards for occupational exposures to industrial talc. *Reg Tox Pharm.* 91: 251-267.
- > Pierce, JS, A Abelmann, JT Lotter, PS Ruestow, KM Unice, EM Beckett, HA Fritz, JL Bare, and BL Finley. 2016. An assessment of formaldehyde emissions from laminate flooring manufactured in China. *Reg Tox Pharm.* 81:20-32.
- > Paustenbach, DJ, AL Insley, JR Maskrey, JL Bare, KM Unice, VB Conrad, L Iordanidis, DW Reynolds, KD DiNatale, and AD Monnot. 2016. Analysis of total arsenic content in California wines and comparison to various health risk criteria. *Am J Enol Viticult.* 67(2):179-187.
- > Unice, KM, JL Bare, ML Kreider and JM Panko. 2015. Experimental methodology for assessing the environmental fate of organic chemicals in polymer matrices using column leaching studies and OECD 308 water/sediment systems: Application to tire and road wear particles. *Sci Total Env.* 533, 476–487.

Magazine Publications

- > Scott, PK, MM Abramson, JL Bare, and CA Barlow. 2019. Air dispersion modeling for historical community exposure reconstruction: An evaluation of the approach and its uncertainties. EM-Mag Env Mgrs. January 2019.

Presentations

Podium Presentations

- > Bare, JL, RM Novick, JR Maskrey, KM Unice. 2019. Screening air dispersion modeling approach: Prop 65 community exposure assessments for industrial emitters. Platform Presentation at Air and Waste Management Association's (AWMA) Annual Conference and Exhibition: Conference Proceedings. June 25-28, 2019. Quebec City, Quebec.
- > Abramson, MM, JL Bare, CA Barlow, PK Scott. 2018. Evaluation of the Uncertainties Associated with the Use of Air Dispersion Modeling to Estimate Historical Community Exposure from Manufacturers of Asbestos-Containing Products. Platform Presentation at Air and Waste Management Association's (AWMA) Annual Conference and Exhibition: Conference Proceedings. June 25-28, 2018. Hartford, CT.
- > Lotter, J, KM Unice, PS Ruestow, A Abelmann, HA Fritz, E Beckett, JL Bare and JS Pierce. 2016. Formaldehyde Emissions from Small Chamber Testing of Laminate Flooring and Comparison to Exposure Modeling. Podium Presentation at American Industrial Hygiene Conference & Exposition (AIHce). May 21-26, 2016. Baltimore, MD.

Poster Presentations

- > Bare JL, JR Maskrey, LA Hallett, CM Hamaji, KM Unice. 2019. Qualitative review of recent USEPA TSCA occupational inhalation exposure assessments: Recommendations for future assessments. Abstract P.122. Poster Presentation at Society for Risk Analysis (SRA) Annual Meeting. December 8-11, 2019. Arlington, VA.
- > McMenamy, C, N Jacobs, JL Bare and JJ Keenan. 2018. Potential Exposure to Hydrogen Fluoride from a Thermal Runaway Event in an Airplane Cockpit. Abstract #653. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce). May 20-23, 2018. Philadelphia, PA.
- > Bare JL, MM Abramson, JR Maskrey, CM Manning, JJ Keenan. 2018. Proposition 65 Risk Assessment Model Framework for Chemically-Complex Consumer Products. Abstract #3525. Poster Presentation at Society of Toxicology (SOT) Annual Meeting. March 11-15, 2018. San Antonio, TX.
- > Bare, JL, MM Abramson, CA Barlow, PK Scott. 2017. Use of Air Dispersion Modeling to Estimate Historical Community Exposure from Manufacturers of Asbestos-Containing Products. Abstract P.96. Poster Presentation at Society for Risk Analysis (SRA) Annual Meeting. December 10-14, 2017. Arlington, VA.
- > Jacobs, N, JL Bare, C McMenamy and JJ Keenan. 2017. Potential Chemical Exposures Following Thermal Runaway in a Lithium Ion Battery. Abstract #614. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce). June 4-7, 2017. Seattle, WA.

- > Hollins, DM, PK Scott, JL Bare, CA Barlow, M Nembhard, JR Maskrey and DJ Paustenbach. 2017. Estimating Asbestos Emissions from Former Industrial Sites and Estimating Resulting Airborne Concentrations in the Surrounding Community: A Review of Methodologies. Abstract #3248. Poster Presentation at Society of Toxicology (SOT) Annual Meeting. March 12-16, 2017. Baltimore, MD.
- > Keenan, JJ, JL Bare, C McMenemy, A Chapman and E Miller. 2017. Screening-Level Risk Assessment of Hydrogen Fluoride Exposure Resulting From a Thermal Runaway Event on an Aircraft. Abstract #2829. Poster Presentation at Society of Toxicology (SOT) Annual Meeting. March 12-16, 2017. Baltimore, MD.
- > Fritz, HA, J Lotter, A Abelmann, PS Ruestow, E Beckett, KM Unice, JL Bare and JS Pierce. 2016. Evaluation of Diurnal Variations in Formaldehyde Concentrations Following Installation of Laminate Flooring Using Real-Time Sampling. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce). May 21-26, 2016. Baltimore, MD.
- > Pierce, JS, A Abelmann, P Ruestow, J Lotter, E Beckett, HA Fritz, JL Bare and KM Unice. 2016. Assessment of indoor formaldehyde concentrations following the installation and removal of laminate flooring. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce). May 21-26, 2016. Baltimore, MD.
- > Ruestow PS, KM Unice, J Lotter, A Abelmann, HA Fritz, E Beckett, JL Bare and JS Pierce. 2016. Time Trends in Formaldehyde Emissions from Laminate Flooring Products after Installation. Poster Presentation at American Industrial Hygiene Conference & Exposition (AIHce). May 21-26, 2016. Baltimore, MD.
- > Pierce, JS, A Abelmann, PS Ruestow, J Lotter, E Beckett, HA Fritz, JL Bare and KM Unice. 2016. Assessment of indoor formaldehyde concentrations following the installation and removal of laminate flooring. Abstract #1689. Poster Presentation at Society of Toxicology (SOT) Annual Meeting. March 13-17, 2016. New Orleans, Louisiana.
- > Unice, KM, JL Bare, ML Kreider and JM Panko. 2015. Evaluation of leachate from tire and road wear particles (TRWP) upflow percolation column tests. Poster Presentation at Society of Environmental Toxicology and Chemistry (SETAC) North America 36th Annual Meeting. November 1-5, 2015. Salt Lake City, Utah.