Mona Shum, MSc, CIH

Principal, Industrial Hygienist

Professional summary

Ms. Shum is a certified industrial hygienist with 25 years of experience in exposure assessment, chemical review, and environmental public health. As an industrial hygienist, she has experience working in refineries, oil and gas plants, underground and open pit mines, research and development facilities, chemical and manufacturing facilities, and commercial buildings. She has investigated exposure to particles, volatile organic compounds, aldehydes, heavy metals, noise and ionizing radiation and non-ionizing radiation including extremely low frequency (ELF) and radiofrequency (RF). She has reconstructed asbestos, beryllium, EMF, lead and benzene exposures to various types of workers by examining the existing literature, identifying the possible exposure for tasks performed in each occupation, and then determining the likely exposure in the timeframe of interest.

Ms. Shum has managed and conducted several hundred microbial indoor air quality investigations involving commercial and residential buildings, schools, and recreational facilities. Ms. Shum has been designated as an expert witness in several litigation cases, with most cases reaching settlement before deposition or trial testimony was necessary. However, she has been deposed multiple times and has trial testimony experience in cases involving mould and legionella exposures.

Ms. Shum also has extensive teaching experience having taught courses at various universities and at workshops at large conferences such as the American Industrial Hygiene Conference and Exposition. She is currently an Adjunct Professor at the University of British Columbia.

For five years, Ms. Shum managed the National Collaborating Centre for Environmental Health, which conducted reviews of the current state of knowledge on environmental hazards and public health. In this position, she managed several large projects including one related to building capacity among environmental public health professionals around health impact assessment.

Ms. Shum has worked extensively with the film and television industry, most notably by conducting research on atmospheric fog and assisting productions with their COVID-19 safety protocols.

Ms. Shum is also the recipient of the 2020 Elizabeth McDonald Award presented by the AIHA BC Yukon Chapter for her contributions to the field of industrial hygiene.

Employment history

- University of British Columbia. School of Population and Public Health, Adjunct Professor, Vancouver, BC, 2016 to present.
- Aura Health and Safety Corporation, Principal Industrial Hygienist, Burnaby BC, 2016 to present.
- AMEC Environment & Infrastructure, Occupational Hygiene and Safety Team Lead, Burnaby, BC, 2013 to 2016.
- National Collaborating Centre for Environmental Health at the British Columbia Centre for Disease Control, Manager, Vancouver, BC, 2008 to 2013
- Exponent, Inc., Managing Scientist (previously Scientist and Senior Scientist), Menlo Park, CA, 1998 to 2008
- Shell Canada Ltd., Industrial Hygienist, Fort Saskatchewan, AB, 1997 to1998

Core Skills

- Exposure assessment
- Chemical reviews
- Microbial indoor air quality
- Expert witness support
- Stakeholder engagement
- Project management

Education

- MSc, Occupational Hygiene, University of British Columbia, BC, 1997
- BSc (Honours), Microbiology and Immunology, McGill University, QC, 1994

Professional qualifications

- Certified Industrial Hygienist, American Board of Industrial Hygiene, #8437CP, 2002
- EPA AHERA Building Inspector #178282

Memberships/affiliations

- Indoor Quality Association Vancouver Chapter Director, 2016-18
- American Industrial Hygiene Association BC Yukon Local Section, Past -President, 2014-15
- American Board of Industrial Hygiene, member, 2002-present
- American Industrial Hygiene Association, National member, 1998-present
- AIHA Non-ionizing Radiation Committee, Chair (2020), member 2006-2009, 2013-present

Location

- Burnaby, BC

Languages

- English
- French (basic)
- Cantonese

Continued...

Representative projects

Indoor Air Quality and Microbial IAQ Investigations

Indoor Air Quality Investigation, Property Developer, AB

Ms. Shum led an investigation of indoor air quality in a new building in which employees were reporting adverse health effects in one area of the building versus another. Material review and headspace chamber testing was conducted of new materials and comparison of headspace contaminants was made with the airborne contaminant profile. In addition, a microbial investigation and assessment of ventilation was conducted.

Indoor Air Quality Investigation, Alberta Workers' Compensation Board, AB

Ms. Shum conducted an investigation of indoor air quality in a project involving workers' compensation cases who had been experiencing allergic and other adverse reactions in their indoor office environment. She led an investigation that included worker interviews, visual inspection, review of materials and products, microbial and chemical sampling, and an assessment of the ventilation and pressure differentials in the building.

Microbial Investigation, Housing Authority, BC

Ms. Shum was the senior technical hygienist on a project involving a residential home owned by a housing authority where the ceiling had collapsed due to a defective roof scupper. She directed the project which involved conducting a microbial indoor air quality assessment, recommending remediation protocols, and overseeing clearance of the home.

Microbial and Asbestos Exposure Investigation, First Nations Community, BC

Ms. Shum was the senior reviewer on a project involving a commercial building owned by a First Nations community. Occupants were concerned that microbial growth and asbestos-containing materials identified in the crawlspace were impacting the indoor air quality in the occupied space. A team of industrial hygienists and hazardous materials technicians conducted an investigation which involved a visual inspection, air and bulk sampling for total, and viable fungi, bacteria and asbestos. The team identified that the occupied space was not affected by the contaminants in the crawlspace, but that the crawlspace should be remediated. The project also involved developing an enclosed space entry procedure intended for remediation contractors to follow

Mould Investigation, Secondary School, California

Ms. Shum managed a contentious project where teachers were concerned about the indoor air quality of their school and were claiming multiple health effects as a result. She coordinated an investigation involving geological, building envelope, and fungal evaluations by various experts. She managed to alleviate teachers' and parents' concerns by presenting her findings at both a school board meeting and a concerned teachers' meeting.

Legionella Investigations, Various Buildings, USA

Ms. Shum investigated several instances of legionella contamination in plumbing systems. She has 1) conducted water and biofilm sampling, 2) developed and overseen a laboratory protocol for reproducing biofilm and legionella growth in showerheads and whirlpool tubs, and 3) reviewed historical exposure data to determine feasibility of whether cases of Legionnaires' Disease were related to the same serotype of *Legionella pneumophila* even though the cases were separated by several years. She has testified on the last issue.

Coordination of a Mould Expert Panel, California

Ms. Shum coordinated an expert panel of physicians, mycologists, and other scientists to review the current state of the science regarding mould exposure and health effects. She handpicked literature that was reviewed by each panel member prior to the meeting, summarized literature, prioritized topics to be covered at the meeting, and ensured that a tight schedule was followed. In addition, she summarized findings of the expert panel in a report to the client.

Hazardous Materials Management Programs

Asbestos Survey Generations Project, BC Hydro, British Columbia

Ms. Shum is currently developing methodologies for BC Hydro's asbestos inventory of generating stations (i.e., dams and powerhouses) to be used for asbestos surveys, laboratory analysis, and labelling. She is conducting stakeholder engagement sessions to determine how best to modify methodologies already developed for substations.

Continued...

Asbestos Survey Substations Project, BC Hydro, British Columbia

Ms. Shum has developed methodologies and procedures for BC Hydro's asbestos inventory of substations across British Columbia and these have provided the basis for BC Hydro's company-wide Asbestos Management Program. These methodologies address inspector surveying, labelling, and laboratory analysis. With her guidance, BC Hydro has developed an inspector tablet app and online database that allows for easy surveying and access to the inventory. Currently, she is quality checking the inventory, conducting site audits as necessary, and developing long-term strategies for maintaining and updating the database after the initial inventory is complete.

Building-Related Hazardous Exposure Management Program, Vancouver International Airport, British Columbia

Ms. Shum leads a team of industrial hygienists at the Vancouver International Airport in providing assistance with their Building-Related Hazardous Exposure Management Program (BRHEMP). Currently, she consults with Vancouver International Airport health and safety team members in development of the BRHEMP process and procedures, as well as provides guidance to Aura project managers who manage day-to-day building-related hazardous materials assessments and abatement oversight.

Chemical Review and Exposure Assessments

Theatrical Haze Exposure Assessment, Film Industry, Canada

Ms. Shum leads a project involving exposure assessments of theatrical fog and haze at multiple sites where film crew workers and actors are working with atmospheric mist present. The findings are utilized to evaluate compliance as well as determine expected levels during similar future work. In addition, she is the Principal Investigator of a cross-sectional epidemiologic study on health effects and theatrical haze exposure funded through an Innovation at Work research grant from WorkSafeBC.

Emergency Industrial Hygiene Services during a Chemical Fire, Canada

Ms. Shum led a team of industrial hygienists to respond to a chemical fire, which involved advising the client regarding immediate potential exposure and decontamination issues, building and guiding a sampling strategy to ensure the safety of workers returning to site, and conducting risk communication activities. The sampling strategy required development of innovative methods to quickly assess the situation and clear the work area for re-entry by workers.

New Material Review, R&D Semiconductor Industry, CA, USA

Ms. Shum was an off-site new material reviewer for a research and development branch of a semiconductor facility. She reviewed the toxicology of chemicals, the frequency and amount of product to be used, and handling procedures to determine whether a product was acceptable from a potential health hazard perspective. She ensured that Toxic Substances Control Act (TSCA), Drug Enforcement Agency (DEA), and other international regulations were met before chemicals were brought on-site or incorporated into new products for consumer consumption. She provided a summary document to end users of the new product that outlined the toxicology, regulatory elements, and special handling procedures. She also developed guidelines for waste handling and storage, which required determining the types of by-products produced through various chemical processes and assessing the compatibilities of these raw and by-product wastes for onsite storage.

Chemical Review, Health and Safety Audits, Shell Canada Ltd., Canada

As an industrial hygienist at the Scotford Refinery and oil and gas plants across Canada, Ms. Shum conducted health and safety audits, industrial hygiene investigations, reviewed toxicology of new chemicals entering the site, and conducted health risk assessments based on review of processes, usage, and exposure data. She was also the radiation safety officer on site, responsible for monitoring of radioisotopes and compliance to federal regulations.

Benzene Exposure Assessment, Shell Canada Ltd., Canada

Ms. Shum was an integral part of an investigation of benzene exposure to gasoline truck drivers in Canada. She completed time-motion studies on truck drivers and assessed personal exposure at several terminals across Canada. She collected data for a job-exposure matrix of petrochemical workers using available exposure data and time-motion information to form exposure groups.

Mercury Exposure Assessment, Semiconductor Industry, California

Ms. Shum was involved in responding to an accidental release of mercury in a semiconductor facility, where she conducted sampling, recommended remediation procedures, and ensured that the incident was contained. After

the spill was remediated, she determined that the indoor air was acceptable to workers. Also, by taking samples from the air filters in the room in which the mercury spill occurred, she was able to determine that the mercury vapours were contained in the room and did not infiltrate the rest of the of the ventilation system which would have been extremely detrimental to the semiconductors that were being manufactured, thus potentially saving the client millions of dollars' worth of product.

Trihalomethane Exposure Assessment, Paper-Plate Manufacturing, California

Ms. Shum evaluated potential exposure from trihalomethanes emanating from water used for various industrial processes in a paper-plate manufacturing plant. She helped determine that trihalomethane exposures in the plant were minimal.

Cyanoacrylate Exposure Assessment and Health Effects Study, Glue Manufacturing Facility, Puerto Rico

Ms. Shum conducted cyanoacrylate exposure monitoring at a glue-manufacturing facility while epidemiologists conducted spirometric measurements and review of medical records to determine whether workers experienced a higher rate of asthma. (See publication in Amer Ind Hygiene Jour. 2001; 62:70–79).

Mining Dust - Assessment of Irritant effects, Trona Mine, Wyoming

Ms. Shum investigated eye and nasal irritant effects due to dust exposure from the mining of trona ore in order to determine the feasibility of compliance with a newly proposed American Conference of Governmental Hygienists (ACGIH) threshold limit value (TLV) for trona dust. Irritation was assessed before the start of the week-long shift, at the end of the day, and at end of the week.

Exposure Reconstruction

Acid Mist Exposures, Copper and Zinc Refinery, Quebec and Utah

Ms. Shum investigated potential acid mist exposures by reviewing historical hygiene records in copper and zinc refining industries in an epidemiological feasibility study of upper respiratory cancers. She helped determine that the feasibility of conducting a retrospective epidemiological study was low due to uneven historical recordkeeping.

Beryllium Exposures, Beryllium Extraction and Refining, USA

Ms. Shum has compiled and analyzed historical beryllium exposure data from extraction and refining facilities in support of occupational health studies concerning chronic beryllium disease. One such example of this exposure reconstruction work is highlighted in Appl Occupat Environ Hygiene. 2001; 16(5):579-592.

Proposition 65 Exposure Reconstruction Cases, California

Ms. Shum has been involved in several Proposition 65 cases involving potential lead exposure from household products including electrical cords and drinking bottles. She helped recreate exposures by working with volunteers who handled products and conducted wipe sampling of surfaces and hands.

Exhaust Exposures, Boiler Exhaust System, California

Ms. Shum managed a project involving an exposure reconstruction of a worker near a boiler exhaust system. She recreated the conditions of the incident and measured the contaminants of interest. As a result of this work, the case settled in favor of the client for one-tenth of the original lawsuit amount.

Autobody Dust Exposures, Autobody Repair Shop, California

Ms. Shum reconstructed dust exposure to an auto body repair worker. She was involved in designing the sampling protocol, sampling, and conducting a job task analysis to identify activities that contributed most to dust exposure.

Consumer Product Exposures, California

Ms. Shum has assessed potential human health risk from the use of consumer products. She completed a number of investigations that involved reviewing the potential for contaminants to either leach or off gas from consumer electronics and other household products under normal and abnormal conditions. She determined the potential impact on human health as a result of a release of these contaminants and advised her clients of mitigation strategies.

Naturally Occurring Radioactive Materials (NORM), Metals, Dust exposure - Superfund Site, California

Ms. Shum reviewed and analyzed soil, ambient air, and personal sampling data to determine whether surrounding buildings were at increased risk during remediation of the site. She determined that risk was minimal.

Continued...

Product Testing

Efficacy of Anti-microbial Plastic, California and Nevada

Ms. Shum managed a project involving experimental research investigating various anti-microbial chemicals that were impregnated in specific bath and plumbing plastic products. The original concern stemmed from Legionella growth in hospital showerheads and an investigation determined that handheld showerheads were more prone to Legionella growth likely due to ease of biofilm growth in the heads. She investigated efficacy of antimicrobial compounds to reduce biofilm and bacterial growth by developing and managing a number of research studies at a university laboratory. In addition, she worked with material engineers to research plastics that were innately more resistant to biofilm growth. As a result, the client was able to focus on products that warranted further investment of resources. As part of this project, she worked with the client in producing protocols for testing, choosing the types of materials to be tested, liaising with biocide manufacturers and laboratories, and assisting the client in prioritizing the products for which the most research was required.

Efficacy of Air Purifiers, California and Nevada

She managed several projects involving experiments in which aerosols containing microorganisms were released into a chamber and tests with and without an air purifier activated were conducted. The results of these experiments were used for marketing purposes in supporting claims of efficacy. In conducting these experiments, Ms. Shum liaised with laboratory and US Environmental Protection Agency (EPA) personnel, managed technical staff that conducted the testing, and provided technical data in a form that could be readily understandable to a consumer.

By-product Exposure Reconstruction from Failed Household Products, California

As part of failure investigations of electronics and other household products, Ms. Shum has worked with engineers to recreate failures of products and the subsequent exposure to byproducts that could potentially produce adverse health effects. As a result of her work, she has helped determine that many exposures would be short-lived and unlikely to cause long-term health effects, thus helping the client avert costly personal injury litigation.

By-product Exposure Reconstruction from Failed Household Products, California

Ms. Shum managed a project in which she investigated the mechanism by which fungal growth occurred within a particular type of household furnishing. She worked with other experts to discover innovative ways to approach the problem. She conducted both material testing and larger-scale testing that simulated real-world conditions. As a result of her research, she discovered that there were no inherent properties of the furnishing that supported fungal growth; the fungal growth had resulted from external sources of nutrients and moisture.

Human Health Risk Assessment

Determination of Attributable Risk of Radiation Dose and Lifestyle Factors on Cancer and Other Health Outcomes, Micronesia

As part of a human health risk assessment of a Micronesian population, Ms. Shum compiled and reviewed historical radiation exposure data and calculated radiation dose of the population. This information was used in conjunction with information on smoking rates, life expectancy, dietary habits, and lifestyle/behavioural factors to determine the attributable risk of these factors on chronic disease incidence, particularly cancer outcomes. It was determined that the major chronic diseases of concern at the time were unlikely associated with prior radiation exposures.

Perchlorate in Drinking Water and Antenatal Thyroid Function, California

As part of an epidemiological study, Ms. Shum analyzed exposure data on perchlorate in drinking water and calculated dose to pregnant women and their offspring. This information was utilized to determine whether or not there was a dose-response relationship between perchlorate in the county drinking water and hypothyroidism in children born to women in the area.

Risk Assessment of Methyl Tertiary Butyl Ether (MTBE), California

Ms. Shum assisted in conducting a risk assessment MTBE, as an alternative fuel additive. She calculated potential dose based on assumptions of exposure and determined health risks from ingestion of drinking water contaminated with MTBE. She helped determine that the levels of MTBE that would be found in drinking water would not pose a health risk, but that it would be an aesthetic problem for much of the population (i.e., it would have an objectionable taste and odour).

Continued...

Electromagnetic Radiation

Determining Factors that Affect Radiofrequency Exposure from Mobile Phones, California

For eight years, Ms. Shum managed a project involving the evaluation of the factors that affect mobile phone exposure. The project consisted of three major study areas:

- Software-modified phone (SMP) study. SMPs (mobile phones with the ability to record power control settings) were distributed to volunteers who used them in lieu of their regular mobile phones for a set duration. This study identified factors of usage that contributed to higher radiofrequency (RF) exposure. Results are available in Radiation Research 2007;168(2):253-61.
- Recall Study. A questionnaire was distributed to volunteers of a workforce that possessed billing records going back three years. Recall of mobile phone usage was assessed against billing records using a number of statistical methods. Results are available in Bioelectromagnetics. 2011;32(1):37-48.
- Phantom-head Field Study. This sub-study was one of the first of its kind in North America and involved collection of field data that until this study had only been collected in controlled laboratory conditions. The sub-study assessed how much factors such as user activity, driving, mobile phone technology, geography and phone type contribute to variation in power levels. Different types of mobile phones on phantom heads filled with dielectric fluid simulating the human brain, were placed in a vehicle and were driven around three different routes over the course of many months in the San Francisco Bay Area. Results are available in J Expo Sci Environ Epidemiol. 2011;21(4):343-54.

In the course of this project, Ms. Shum coordinated an international expert panel to review protocols and to offer suggestions for improvement of the study. Ms. Shum worked with multiple experts and coordinated a multi-tiered project, which required constant supervision to ensure that schedule and budgetary constraints were met. With such a long-term project, she needed to re-evaluate initial objectives and adjust priorities to ensure that original objectives were addressed.

EMF Exposure in Garment Industry, Garment-making Facility, New York

Ms. Shum was involved in a feasibility study that investigated the potential for using a garment worker population to evaluate breast cancer incidence among women exposed to electromagnetic radiation. This study involved working closely with union leaders to elicit assistance from a population that is oftentimes unwilling to participate in health studies. Results are available in Bioelectromagnetics. 2003;24(5):316-26.

Occupational and Environmental Health Policy

Feasibility of Reducing Portland Cement Occupational Exposure Limit in Alberta

Ms. Shum was the Principal Investigator of this project with the objective of determining whether or not it was feasible to reduce the current Portland Cement occupational exposure limit from 10 mg/m^3 total particulate to 1 mg/m^3 respirable particulate. As respirable dust exposure in facilities using Portland cement often consists of mixed exposures, a marker of Portland cement was sought so that exposure results could be tied to Portland cement and not other dusts.

Feasibility Study on Improving Chinese Legal System and Policy on Occupational Safety and Health, China

Ms. Shum was involved in a project involving a review of policy options for the Chinese government which was considering the issues involved with integrating “health” and “safety” into a single regulatory regime. The main objective of the project was to provide support in the preparation of a comparative analysis of the Chinese and Canadian legal systems governing OHS, so that the Chinese government could determine policy options that were applicable to and could be implemented in China.

Health Impact Assessment Policy Review, Canada

As part of an initiative to increase capacity among environmental public health practitioners and policymakers in the area of health impact assessment, Ms. Shum managed a project that involved 1) bringing key experts across Canada together in a workshop to discuss how health impacts could be added to environmental impact assessments, 2) reviewed how all Canadian provinces and territories were addressing health impact assessment in environmental projects, and 3) developed a working group to discuss how provinces and territories could develop commonalities in approaches to health impact assessment (in the context of environmental projects). As a side-benefit of this project, some provinces have developed strategies around how their governments are approaching health impact assessment (eg., shale gas/fracking in New Brunswick).

Continued...

Film and Television

Atmospheric Fog Calibration Factors, IATSE 891, Burnaby, BC

Ms. Shum directed a project involving UBC Masters students and Aura industrial hygienists in developing calibration factors for commonly used atmospheric fogs and hazes in the BC film industry. These calibration factors allow for the use of direct-reading instruments to measure fogs and hazes in real-time, giving productions the ability to react quickly to ensure levels are below guideline or occupational exposure limits.

Atmospheric Fog and Health Effects, WorkSafeBC Innovation at Work Grant, 2018

Ms. Shum was principal investigator of a study investigating the health effects of atmospheric fog/hazes in the film and television industry. This cross-sectional study involved monitoring the fog levels on sets with and without fog/haze and distributing a health questionnaire to determine self-reported irritation effects. Initial results showed that exposed workers were more likely to report irritation-type symptoms than non-exposed workers.

Miscellaneous Projects

Ergonomic Assessments, Shell Canada Ltd., Canada

Ms. Shum was responsible for conducting ergonomic assessments of office workstations as well as advising on job tasks performed in the Scotford refinery and oil and gas plants across Canada. She developed strategies for conducting work safely and made recommendations for workstation layout changes, for equipment purchase, and for changing how tasks were performed.

Job Task Analysis, Chicken Processing Plants, USA

Ms. Shum was part of a team that conducted job task analysis requiring recording and documentation of personal protective equipment donning and doffing activities of workers at a various chicken processing plants across the United States. This project required Ms. Shum to be meticulous in her observation of employee activities and in her documentation of those activities.

Risk-based Decision Model, California Public Utilities Commission (CPUC), California

Ms. Shum assisted the CPUC in a large-scale evaluation of the relative public health and safety risks of more than 9,000 businesses seeking an exemption from rotating power outages in California. She assisted in development and implementation of a web-based application and a risk-based decision model to generate a numerical risk score using qualitative modifying factors for each applicant. As a result, she helped develop a prioritized list of applicants that should receive rotating power outage exemptions based on health and safety requirements.

Continued...

Publications

1. Cherry N, Broznitsky N, Fedun M, Kinniburgh D, Shum M, Tiu Sylvia, Zadunayski T, Zhang X. Exposures to Polycyclic Aromatic Hydrocarbons and Their Mitigation in Wildland Firefighters in Two Canadian Provinces. Annals of Work Exposures and Health, wxac085, Dec 2022, XX,1-12. Available from: https://doi.org/10.1093/annweh/wxac085.
2. Shum M, Cooper J. Non-Ionizing Radiation: Extremely Low Frequency in Cohrssen, B, editor. Patty's Industrial Hygiene, Seventh Edition. Hoboken, NJ: John Wiley & Sons, Inc., 2021 April. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1002/0471435139.hyg102.pub2
3. Loss M, Katchen M, Arvelo I, Arnold P, Shum M. COVID-19 Implication by Physical Interaction of Artificial Fog on Respiratory Aerosols. Advances in Clinical Toxicology, 2021 6(2). Available from: https://medwinpublishers.com/ACT/covid-19-implication-by-physical-interaction-of-artificial-fog-on-respiratory-aerosols.pdf
4. Johnson R, Shum M. Generation Gap: 5G Cellular Technology and Worker Protection. Synergist; 2021 February.
5. Clements L, Shum M. NCCEH Mould Investigation Toolkit. Vancouver, BC: National Collaborating Centre for Environmental Health; 2015 February. Available from: http://www.ncceh.ca/documents/guide/ncceh-mould-investigation-toolkit
6. Fong D, Gaulin C, Lê M-L, Shum M. Effectiveness of alternative antimicrobial agents for disinfection of hard surfaces. Vancouver, BC: National Collaborating Centre for Environmental Health; 2014 August. Available from: http://www.ncceh.ca/sites/default/files/Alternative_Antimicrobial_Agents_Aug_2014.pdf
7. Palaty C, Shum M (revised 2014). Mould Assessment Recommendations Evidence Review. Vancouver, BC: National Collaborating Centre for Environmental Health; 2014 March. Available from: http://www.ncceh.ca/documents/guide/mould-assessment-recommendations-revised
8. Palaty C, Shum M (revised 2014). Mould Remediation Recommendations Evidence Review. Vancouver, BC: National Collaborating Centre for Environmental Health; 2014 March. Available from: http://www.ncceh.ca/documents/guide/mould-remediation-recommendations-revised
9. Curran, JH, Curran HD, Shum M, Davies HW. Reducing cardiovascular health impacts from traffic-related noise and air pollution: intervention strategies. Environmental Health Review, 2013. 56(2):31-38.
10. Kosatsky T, Zitouni A, Shum M, Ward HD, Gallagher RP, Anselmo F, et al. Radiofrequency toolkit. Vancouver, BC: BC Centre for Disease Control and National Collaborating Centre for Environmental Health; 2013 May. Available from: http://www.bccdc.ca/healthenv/ElectromagFields/RadioFrequency/default.htm.
11. Kuehn, S, Kelsh, M, Kuster N, Sheppard A, Shum M. Analysis of Mobile Phone Design Features Affecting Radiofrequency Power Absorbed in a Human Head Phantom. Bioelectromagnetics, 2013 Mar 26. doi: 10.1002/bem.21784.
12. Shum M, Atkinson D, Kaposy C (case discussion by T Schreker). First Nations Drinking Water Policies. In Canadian Institutes of Health Research – Institute of Population and Public Health. Population and Public Health Ethics: Cases from Research, Policy, and Practice. Toronto, ON: University of Toronto Joint Centre for Bioethics; 2012.
13. Atkinson D, Shum M, Kaposy C, Greenwood M (case discussion by N King). Health Inequities in First Nations Communities and Canada's Response to the H1N1 Influenza Pandemic. In Canadian Institutes of Health Research – Institute of Population and Public Health. Population and Public Health Ethics: Cases from Research, Policy, and Practice. Toronto, ON: University of Toronto Joint Centre for Bioethics; 2012.
14. Shum M, Comack E, Stuart DT, Ayre R, Perron S, Beaudet S, Kosatsky T. Bed Bugs and Public Health: New Approaches for an Old Scourge. CJPH. 2012; 103(6). Available from: http://journal.cpha.ca/index.php/cjph/article/view/3426
15. Fong D, Bos C, Stuart T, Perron S, Kosatsky T, Shum M. Prevention, identification, and treatment options for the management of bed bug infestations. EH Review. 2012; 55(4):89-102. Available from: http://pubs.ciphi.ca/doi/abs/10.5864/d2012-013

16. Van Balen E, Shum M, Ward H. Reducing residential indoor exposure to pesticides: a toolkit for practitioners. Vancouver, BC: National Collaborating Centre for Environmental Health; 2011 October. Available from: http://www.ncceh.ca/en/practice_policy/ncceh_reviews/residential_pesticides_toolkit
17. Shum M, Kelsh MA, Sheppard AR, Zhao K. An evaluation of self-reported mobile phone use compared to billing records among a group of engineers and scientists. Bioelectromagnetics. 2011;32(1):37-48. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20857456.
18. Gaulin C, Lê M-L, Shum M, Fong D. Disinfectants/sanitizers on hard food-contact surfaces. Vancouver, BC: National Collaborating Centre for Environmental Health; 2011 August. Available from: http://www.ncceh.ca/en/practice_policy/ncceh_reviews/food_contact_sanitizers
19. Kelsh MA, Shum M, Sheppard AR, McNeely M, Kuster N, Lau E, et al. Measured radiofrequency exposure during various mobile-phone use scenarios. J Expo Sci Environ Epidemiol. 2011;21(4):343-54. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20551994.
20. Williams P, Bos C, Shum M. Does eating organic food reduce pesticide exposures and health risks? Vancouver, BC: National Collaborating Centre for Environmental Health; 2010 May. Available from: http://www.ncceh.ca/practice_policy/ncceh_reviews/organic_diet.
21. Palaty C, Shum M. Health effects from mould exposure in indoor environments. Vancouver, BC: National Collaborating Centre for Environmental Health; 2009 August. Revised 2012 Available from: http://www.ncceh.ca/en/practice_policy/ncceh_reviews/mould_and_health_effects.
22. Mowat FS, Shum M, Kelsh MA. Exposure assessment. In: Baslaugh SE, editor. Encyclopedia of epidemiology. Thousand Oaks, CA: Sage Publications; 2007.
23. Erdreich LS, Van Kerkhove MD, Scrafford CG, Barraj L, McNeely M, Shum M, et al. Factors that influence the radiofrequency power output of GSM mobile phones. Radiat Res. 2007;168(2):253-61.
24. Shum M, Dahlen E. Legionnaires' disease contracted in multi-unit high rise structures – a comparative assessment of the cause of contamination and disease. [Abstracts for the 10th International Conference on Indoor Air Quality and Climate]. Indoor Air. 2005;15(Supplement 11):70.
25. Dahlen E, Shum M, Van Kerkhove MD. Legionnaires' disease contracted in multi-unit high rise structures – a comparative assessment of the cause of contamination and disease. [Abstracts for the 10th International Conference on Indoor Air Quality and Climate]. Indoor Air. 2005;15(Supplement 11):134.
26. Van Kerkhove MD, Erdreich LS, Shum M, McNeely M, Chan N, Barraj L, et al. Variability of radiofrequency power output of GSM mobile phones. Epidemiology (Cambridge, Mass). 2004;15(4):S115.
27. Kelsh MA, Bracken TD, Sahl JD, Shum M, Ebi KL. Occupational magnetic field exposures of garment workers: results of personal and survey measurements. Bioelectromagnetics. 2003;24(5):316-26.
28. Shum M. An overview of the health effects due to mold exposure. Proceedings, 9th International Conference on Indoor Air Quality and Climate. June 30–July 5; Monterey, CA, 2002.
29. Paustenbach DP, Burke ML, Shum M, Kalmes R. Airborne concentrations of ethyl and methyl cyanoacrylates in the workplace. Am Ind Hyg Assoc J. 2001;62:70-9.
30. Deubner D, Kelsh M, Shum M, Maier L, Kent M, Lau E. Beryllium sensitization, chronic beryllium disease, and exposures at a beryllium mining and extraction facility. Appl Occupat Environ Hygiene. 2001;16(5):579-92.

Presentations

1. Shum M, Cooper N, Fung A, McBride S. Hot and Smoky: A New Normal. American Industrial Hygiene Conference and Exposition (AIHce), Phoenix, AZ, May 23, 2023 (Session I3).
2. Shum M, Broznitsky N, Toic T, Kimble L, Durrad T. Hazards and Exposure Risks of British Columbia Wildfire Firefighters. AIHce, Nashville, TN, May 24, 2022 (Session H3).
3. Shum M, Loss M, Shah A. Mystery on 34th Street. American Industrial Hygiene Association BC Yukon Section, October 21, 2020.
4. Shum M, Smith W, Antonucci M. Artificial Fog in the Film Industry. California Council of Industrial Hygienists Conference, San Francisco, CA, December 5, 2019.

Continued...

5. Shum M, Toic T, Loss M. Medical Devices: Case Studies of EMF Exposure Assessments. AIHce, Minneapolis, MN, May 22, 2019 (Session M6).
6. Shum M, Loss M, Toic T, Cooper J. Mistbusters: Artificial Fog in the Film Industry. American Industrial Hygiene Association Annual Conference and AGM, Burnaby, BC, March 15, 2019.
7. Shum M. Lights, Camera, Fog! A Study of Theatrical Fog Use. AIHce, Philadelphia, PA, May 21, 2018 (Session D1).
8. Shum M., Nicol AM. 100+ Years of Radiation Risk Communication. AIHce, Seattle, WA, June 6, 2017 (Round Tables G13 and H13).
9. Shum M. Is Natural Better? A review of food contact sanitizers. BC Food Protection Association Food Safety Workshop, Burnaby, BC, November 7, 2016 (Oral Presentation).
10. Shum M. Risk Communication Around Electric and Magnetic Fields. University of British Columbia School of Population and Public Health Occupational and Environmental Health Seminar Series, Vancouver, BC, September 16, 2016 (Oral Presentation).
11. Shum M. Radiofrequency – Do you Hear Me Now? AIHce, Baltimore, MD, May 25, 2016 (Round Table RT234)
12. Shum M. Emergency Industrial Hygiene Response to a Chemical Fire. AIHce, Salt Lake City, UT, June 2, 2015 (Podium Session PO118).
13. Shum M. Radiofrequency exposures at work: What we know and don't know. AIHce, Salt Lake City, UT, June 1, 2015 (Podium Session PO108).
14. Shum M. Mould Remediation Evidence for What Works. OEH Seminars. UBC School of Population and Public Health, November 24, 2014. Available from: https://www.youtube.com/watch?v=oNs22PW8ftQ&list=PL0h0001n9v-i6hw5Nff_U6oEXIxcRy11-&index=10
15. Shum M. A comparison of different methods and guidelines for evaluating heat stress. AIHce, San Antonio, TX, June 3, 2014 (Round Table Presentation RT216).
16. Shum M. Occupational Radiofrequency Exposures. Canadian Radiation Protection Association. Vancouver, BC, May 28, 2014 (Plenary Presentation).
17. Shum M, Zitouni A, Ward H, Kosatsky K. Putting radiofrequency exposure into context. AIHce, Montreal, QC, May 22, 2013 (Oral Presentation).
18. Shum M. Built Environment: a multisectoral health issue. Canadian Institute of Public Health Inspectors (CIPHI)/Canadian Public Health Association (CPHA) – Nova Scotia/PEI, Fredericton, NB, October 25, 2012 (Plenary Presentation).
19. Shum M, Fong D, Kosatsky T, Stuart T, Comack E, Eyre R, Perron S, Beaudet S. Bed bugs: what to do about unwanted houseguests. AIHce, Indianapolis, IN, June 20, 2012 (Oral Presentation).
20. Shum M, Fong D, Gaulin C, Mê-Linh Lê. Efficacy of green cleaning products for reducing microbial loads on household surfaces. AIHce, Portland, OR, May 19, 2011 (Oral Presentation).
21. Shum M. Built environment and health. Canadian Institute of Public Health Inspectors (CIPHI) – Newfoundland & Labrador, St. John's, NL, Dec 8, 2010 (Oral Presentation).
22. Shum M, Palaty C. Mould and health effects, exposure assessment and remediation. CIPHI – Newfoundland & Labrador, St. John's, NL, Dec 8, 2010 (Oral Presentation).
23. Shum M, Barn P, Ross R. Radiation and radon from granite countertops – Environmental exposure. AIHce, Denver, CO, May 25, 2010 (Oral Presentation).
24. Shum M, Sheppard AR, Kelsh MA, Kuster N. Factors that affect RF exposure from mobile phones. Semiamhoo Occupational and Environmental Health Conference, Semiamhoo, WA, January 9, 2010 (Oral Presentation).
25. Shum M, Sheppard AR, Kelsh MA. Cell phone technology – Is the research representative of today's exposures? AIHce, Toronto, ON, June 2, 2009 (Round Table Presentation).
26. Shum M, Bos C. Intervention strategies to reduce residential pesticide exposures. AIHce, Toronto, ON, June 2, 2009 (Oral Presentation).

Continued...

27. Erdreich LS, Van Kerkhove, MD, Scrafford CG, Barraj L, McNeely M, Shum M, Sheppard AR, Kelsh MA. Factors that influence RF power output of GSM mobile phones. AIHce, Philadelphia, PA, June 4, 2007 (Oral Presentation).
28. Shum, M, Kelsh M, Sulser C, McNeely M, Kuster N, Fröhlich J, Sheppard AR. Evaluation of mobile phone exposure variation. AIHce Chicago, IL, May 13-19, 2006 (Oral Presentation).
29. Shum M, Kelsh M, Lau E, Sheppard AR, McNeely M, Kuster N. Correlation of power control setting to RF power levels from software modified phones. Bioelectromagnetics 28th Annual Meeting in Cancun, Mexico, June 11-15, 2006 (Poster Presentation).
30. Kelsh M, Shum M, Fordyce T, Sheppard AR. Evaluation of power output of software modified mobile phones as a function of time of day. Bioelectromagnetics 28th Annual Meeting in Cancun, Mexico, June 11-15, 2006 (Poster presentation).
31. Shum M, Kelsh M, McNeely M, Sheppard AR, Kuster N, Lau E. Evaluation of mobile phone handset exposures using a portable phantom system. Bioelectromagnetics 28th Annual Meeting in Cancun, Mexico, June 11-15, 2006 (Poster presentation).
32. Shum M, Dahlen E. Legionnaires' disease contracted in multi-unit high rise structures – a comparative assessment of the cause of contamination and disease. Indoor Air 2005. Beijing, China, September 4-9, 2005 (Oral Presentation).
33. Dahlen E, Shum M, Van Kerkhove MD. Control of Legionella in distribution systems. Indoor Air 2005. Beijing, China, September 4-9, 2005 (Oral Presentation).
34. Weingart M, Kelsh MA, Shum M, Sheppard AR, Kuster N. Statistical analysis of the influences of technology, antenna, mobile phone shape and position on SAR measurements from FCC compliance testing data. BioEM, University College, Dublin, Ireland, June 19–24, 2005.
35. Shum M, Kelsh MA, Zhao K, Erdreich LS. A comparison of recall of mobile phone use with billing record data. BioEM, University College, Dublin, Ireland, June 19–24, 2005.
36. Kelsh MA, Sulser C, Shum M, McNeely M, Kuster N, Froehlich J, Sheppard A. Evaluation of mobile phone handset exposures using software modified phones and field phantom systems. BioEM, University College, Dublin, Ireland, June 19–24, 2005.
37. Erdreich LS, Van Kerkhove MD, Scrafford C, Shum M, Kelsh MA. Assessing the relative impact of factors that influence RF exposure for mobile phones. BioEM, University College, Dublin, Ireland, June 19–24, 2005.
38. Dahlen E, Shum M. Control of Legionella growth in distribution systems. AIHCE, Anaheim, CA, May 21-26, 2005.
39. Shum, M, Sheppard A, Kelsh M, Kuster N, Fröhlich J, McNeely M, Chan N. Pilot study to determine environmental factors that influence RF Exposure from mobile phones. Bioelectromagnetics Society 26th Annual Meeting, Washington, DC, June 23, 2004 (Oral Presentation).
40. Shum M, Kelsh M, Sheppard A, Chan N, Kuster N, Fröhlich J, Erdreich L, Van Kerkhove McNeely M. Improved assessment of cell phone exposure for epidemiologic studies. AIHce 2004, Atlanta, GA, May 12, 2004 (Oral Presentation).
41. Shum M. Mold Madness. Understanding the current interest in mold litigation: from an industrial hygienist's perspective. American Bar Association Section of Litigation 2004 Annual Conference, Scottsdale, AZ, May 7, 2004 (Round Table Presentation).
42. Fedoruk MJ, Shum M, Kerger B. ACGIH and the ACGIH Bioaerosols Committee. Mold remediation: medical toxicological considerations. Mold Remediation: The National QUEST for Uniformity Symposium, Orlando, FL, November 3, 2003.
43. Dahlen E. Shum M. Mold remediation and the reality of the cost—early involvement can save your client time and money. Proceedings, 3rd American Society of Civil Engineers (ASCE) Forensic Congress, San Diego, CA, October 19–21, 2003.
44. Shum M, Kelsh MA, Bracken TD, Sahl JD, Ebi K. Magnetic-field exposures of garment workers: results of personal and survey measurements and a pilot interview study. ISEA/ISEE Vancouver, BC, August 10, 2002 (Poster Presentation).

45. Shum M. An overview of the health effects due to mold exposure. Indoor Air 2002. Monterey, CA, July 3, 2002 (Oral Presentation).
46. Shum M, Kelsh MA, Bracken TD, Sahl JD, Ebi K. Magnetic-field exposures of garment workers: Results of personal and survey measurements and a pilot interview study. AIHce, San Diego, CA, June 3, 2002 (Oral Presentation).
47. Shum M, Dekermenjian M. Investigation of black material on walls and household contents in two residences. AIHce, San Diego, CA, June 3, 2002 (Oral Presentation).
48. Shum M. An overview of the health effects due to mold exposure. AIHce, San Diego, CA, June 2002 (Poster Presentation).
49. Shum M, Kelsh MA, Bracken TD, Chapman PS, Ebie K. Magnetic-field exposures of garment workers: Results of personal and survey measurements and a pilot interview study. Northern California Epidemiology Network, Berkeley, CA, February 5, 2001 (Poster Presentation).

Teaching Experience

1. University of British Columbia. School of Population and Public Health. SPPH 566 Occupational Hygiene Practice, Vancouver, BC. 2016-current.
2. AIHce. Tracing Air in Buildings PDC 410. Salt Lake City, UT, May 31, 2015.
3. AIHce. Fundamentals of Non Ionizing Radiation PDC 416. Radiofrequency. San Antonio, TX. June 1, 2014.
4. AIHce. Tracing Air in Buildings PDC 112. San Antonio, TX, May 31, 2014.
5. University of British Columbia. School of Population and Public Health Continuing Education. Industrial Hygiene Primer Series (5 one-day modules), Vancouver, BC. Oct 2013 – April 2014.
6. University of British Columbia. Occupational and Industrial Risk (SPPH 581I –Morbidity and Mortality in Developing Countries), Vancouver, BC. Guest lectures 2012-2016.
7. University of British Columbia. Thermal Stressors and Community Exposure sections of the Comprehensive Industrial Hygiene Review course, Vancouver, BC, April 24, 2009; April 13, 2011; September 19, 2012 (ABIH 5.0 CM course).
8. Simon Fraser University. Evidence-informed decision making in environmental health. Guest Lectures (HSCI 304: Perspectives on environmental health) November 26, 2009; April 7, 2010; Dec 2, 2010; April 7, 2011; Dec 2, 2011; April 5, 2012.
9. Shum M, Ciliska D. Evidence informed decision making in environmental health. British Columbia Environmental and Occupational Health Research Network (BCEOHRN) Spring Conference 2010, Victoria, BC, March 30, 2010.
10. AEMTEK Workshop Learn from the Experts. Reducing mold risk during building construction and maintenance. June 22, 2006 (ABIH 2.0 CM course).
11. University of California, Berkeley Extension. Indoor air quality and HVAC. Guest Lectures (Mold and Asbestos) January 26, 2006; February 9, 2006, and February 1, 2007.
12. University of California, Los Angeles. Indoor air quality and industrial hygiene in epidemiology. Guest Lectures (Epidemiology 263, Exposure Assessment for Occupational and Environmental Epidemiology) February 19, 2003; February 26, 2004; January 24, 2006.
13. Shum M., Dahlen E. Professional development course (PDC) 607 Navigating the costs of mold remediation. AIHce 2004, Atlanta, GA, May 8, 2004.
14. San Francisco State University. Industrial hygiene as it pertains to environmental engineering. Guest Lecture (ENGR434: Introduction to Environmental Engineering) March 27, 2003.

Select Technical Reports

1. Goodman, M, Shum M. Effect of the use of antimicrobials in food-producing animals on pathogen load: Systematic review of the published literature. Prepared for the Center for Veterinary Medicine, US Food and Drug Administration, 2000.

Continued...

2. Goodman, M, Shum M. Epidemiology, microbiology, and antibiotic resistance of *Enterococcus faecium*: Implications for risk assessment of streptogramin resistance attributable to the use of streptogramins in animals. Prepared for the Center for Veterinary Medicine, US Food and Drug Administration, 2000.
3. Shum M. Assessment of exposure to graphite dust, methanol, refractory ceramic fibre, and noise in a fuel-cell research and development facility. Submitted to the University of British Columbia Faculty of Graduate Studies Department of Occupational Hygiene, 1997.
4. Shum M. The role of ubiquitin-amyloid precursor protein (Ub-APP) in the formation of amyloid plaques in the brains of patients with Alzheimer's Disease. Honours Thesis submitted to McGill University Department of Microbiology and Immunology, 1994.