



Wednesday, April 30, 2008
Stream E – Human Health Risk Assessment /
Risk Communication Strategies

Topic Keynote

LOCATION: GRAND BALLROOM A

8:45 am - 9:30 am



Dr. Mark Richardson,
Risklogic Scientific Services Inc.

Mark Richardson obtained his Ph.D. in biology from the University of Ottawa in 1994. Currently, he manages and directs Risklogic Scientific Services Inc., a company specializing in environmental and regulatory risk assessment, environmental guidelines, data analysis and biostatistics. From September 2003 to March 2008, Mark headed Health Canada's Contaminated Sites Division, fulfilling Health Canada's roles and responsibilities as an Expert Support Department within the Federal Contaminated Sites Action Plan. This was his second life with Health Canada, having worked there between 1987 and 1995 on Canada's first National Contaminated Sites Remediation Program. He is author of *The Compendium of Canadian Exposure Factors for Risk Assessment*, now the most common source of receptor characteristics used in risk assessments in Canada. He has conducted a variety of high profile risk assessments including mercury exposure from dental amalgam; the 1998 mine tailings disaster at Aznacollar, Spain, considered by some to be the worst mine tailings disaster in European history; and the assessment of contaminant exposures and risks posed to Canadian Peace Keepers participating in Operation Harmony, as part of DND's Board of Inquiry on Croatia.



WEDNESDAY, APRIL 30, 2008

9:30 am - 9:55 am

Development of Indoor Air Guidance for Benzene

Ian Mitchell¹, Ross Wilson², David Williams¹, Deborah Schoen³¹Meridian Environmental Inc.²Wilson Scientific Consulting Inc.³Health Canada

Benzene is a common contaminant of concern at federal contaminated sites, particularly those with petroleum hydrocarbon contamination, and is often the “driver” for human health risk assessments due to its toxicity and mobility. The main exposure route for benzene is inhalation, and as a result there is often a desire to measure indoor air concentrations of benzene in order to better quantify human health risks. However, measurement of benzene concentrations in indoor air is complicated by typical background concentrations exceeding the risk-based concentrations often used as benchmarks.

In order to develop meaningful guidance for benzene in indoor air, both background concentrations of benzene and the toxicity of benzene were reviewed. The review of background concentrations included consideration of sources of benzene in indoor air, factors affecting indoor air concentrations, and trends in benzene concentrations. The toxicological review included an evaluation of approaches taken by various regulatory agencies and the basis for toxicity reference values for benzene. The results of the reviews were used to develop proposed indoor air guidance values for benzene for residential, commercial and industrial buildings. The application of the guidance values and the implications of concentrations exceeding the guidance values will also be discussed.

9:55 am - 10:20 am

Revised Health Canada Spreadsheet Tools for Risk Assessment at Federal Contaminated Sites

Ian Mitchell¹, David Williams¹, Lindsay Smith², Sanya Petrovic²¹Meridian Environmental Inc.²Health Canada

In order to further standardize the Preliminary Quantitative Risk Assessment (PQRA) process, minimize inconsistencies and facilitate peer review, a draft spreadsheet tool was developed for use by risk assessors conducting PQRA in 2004. Subsequent related tools were developed specific to petroleum hydrocarbons and the vapour intrusion pathway. The features of all of these tools have been incorporated to develop two spreadsheets that include the features of all of the previous versions, as well as a large chemical

database. One of these spreadsheets is a simplified version for PQRA, while the other allows more flexibility for site-specific risk assessments

Users of the spreadsheets can select exposure scenarios, receptors and chemicals of concern, and specify contaminant concentrations in several potential exposure media. Fate and transport models have also been incorporated into the spreadsheet in order to predict chemical concentrations in media for which measured data are absent or inadequate. Non-standard receptor characteristics and exposure scenarios, such as for native populations or for sites located in remote areas, can be selected or specified. The spreadsheets permit the estimation of non-cancer hazard indices and cancer risk estimates for each chemical of concern and receptor evaluated.

The presentation will outline the development, features, limitations and intended use of the spreadsheet tools.

10:50 am - 11:15 am

What is Keeping Your Toxicologist Up at Night? Exploring the Myth of the Ultra-Conservative TRV

Norm Healey, Health Canada

Human health risk assessments often characterize toxicological reference values (TRVs) as ultra or over-conservative. This discussion will review the general principles and process for deriving a TRV for threshold substances and explain the rationale and guidance for the application of adjustment (safety) factors. For several chemicals, including lead, mercury, cadmium, and aspartame, dose-response data will be reviewed in the context of existing TRVs to illustrate the margin of “safety” between the TRV and doses associated with evidence of adverse health effects. Additionally, emerging evidence will be reviewed to underscore the extent of uncertainties challenging our current understanding of toxicology: these uncertainties include interactive effects of concurrent exposure to other chemicals (paraquat and maneb) and stressors (Pb and stress), genetic polymorphisms (caffeine, heart attack and CYP1A2), early life environmental exposures contributing to latter life disease (Pb and Alzheimer’s disease), and transgenerational epigenetic effects (reproductive effects of vinclozolin and methoxychlor 5 generations after in utero exposure). The cumulative evidence from these case studies and associated data illustrate that, for some commonly occurring chemicals, the uncertainty inherent in the TRV should be more fairly characterized and given appropriate weighting in human health risk assessments.

All presentations will be delivered in English, unless noted otherwise.



WEDNESDAY, APRIL 30, 2008

11:15 am - 11:40 am

Human Health Cancer Risk Assessment for Less-than-lifetime Exposure at Contaminated Sites

Angela Li-Muller, Norm Healey, Margaret Yole, Sanya Petrovic
Health Canada, Contaminated Sites Division

The Contaminated Sites Division of Health Canada is currently reviewing the policy on dose averaging related to short term exposure in cancer risk assessment. This will impact on human health risk assessments conducted at federal contaminated sites.

A literature review was conducted to evaluate whether averaging short-term exposure over a lifetime would be adequate to estimate cancer risk using cancer slope factors derived from chronic animal studies which begin exposures as young adults. Both theoretical studies using mathematical models of carcinogenesis and empirical studies with exposure during discrete age windows suggest that less-than-lifetime exposures in early life stages are more susceptible in most cases. It was concluded that application of age-dependent adjustment factors to the cancer slope factor with exposure averaged over a lifetime can provide a generally conservative estimate of lifetime cancer risks. As an interim measure, the United States Environmental Protection Agency (U.S. EPA) approach has been adopted as a default for contaminated site risk assessments. When chemical-specific data is available for a susceptible lifestage, this data can be used directly to evaluate risks for the chemical and the lifestage on a case-by-case basis. The total lifetime cancer risk can be estimated by summing the cancer risks for all the lifestages.

11:40 am - 12:05 pm

The Advantages of Using Bioaccessibility Measurements in Site-Specific Risk Assessments

Megan Lord-Hoyle¹, Joanna Wragg², Iris Koch¹,
Loren D. Knopper³, Christopher A. Ollson³, Kenneth J. Reimer¹
¹Environmental Sciences Group, Royal Military College of
Canada

²British Geological Survey

³Jacques Whitford Limited

The presence of contaminants in the environment presents an inherent public concern regarding the risk posed to ecological and human receptors. Typically, concentrations of contaminants of potential concern (COPCs) in a specific medium (i.e., soil) are compared to environmental criteria (i.e., Canadian Council of Ministers of the Environment

[CCME] soil quality guidelines [SQG]); however, such comparisons may exaggerate the risk and may lead to costly and unnecessary cleanups. Of necessity, SQGs are derived using the most conservative exposure scenarios and the assumption that the total concentration of a given COPC is available to enter the systemic circulation of the receptor of interest (i.e., 100% bioavailable). It is more likely that significant portion of the COPC is tightly bound to the soil. Bioavailability tests (animal models) are expensive but lab-based bioaccessibility tests are being developed that estimate the fraction of a COPC that is soluble in the gastrointestinal tract. This presentation will describe the advantages, with case study examples, of the use of such tests in risk assessments and will cite recent work of BioAccessability Research Canada (BARC). It has also been found that bioavailability/bioaccessibility concepts are useful tools in effective risk communication and can enable a better appreciation of actual, as opposed to perceived, risk.

1:30 pm - 1:55 pm

Guidance on Human Health Risk Assessment at Federal Contaminated Sites when Exposures are Acute or Subchronic

Ross Wilson¹, Ian Mitchell², David Williams², Sanya Petrovic³,
Chris Rowat³

¹Wilson Scientific Consulting Inc.

²Meridian Environmental Inc.

³Health Canada

The primary focus of most risk assessment guidance is directed at the evaluation of chronic health risks, but there is also a need to address short-term risks from non-carcinogens at contaminated sites where people are not at a site for a long time. This can have impacts on remediation costs based on risk-based levels of chemicals at sites.

A critical error that can occur in a human health risk assessment of short-term exposures is not ensuring the short-term toxicity reference values (TRVs) are established for a time period that is at least as long as the exposure period for people at the site. It should also be recognized that there is no generic default adjustment factor for deriving acute or subchronic TRVs from chronic values. Additionally, risk assessors should ensure that exposures are amortized properly (i.e., spreading a one month exposure over a year may not be appropriate).

It is important to consider short-term risks on a case-by-case basis. Risks from acute soil ingestion are most likely to be a concern at: (1) sites with chemicals that are acutely potent (i.e., cyanide); or (2) sites where people are not present for very long.

All presentations will be delivered in English, unless noted otherwise.



WEDNESDAY, APRIL 30, 2008

1:55 pm - 2:20 pm

**Health Canada Guidance Manual for
Environmental Characterization:
New Directions for Site Assessment**Ian Hers¹, Jo-Ann Aldridge², Guy Patrick¹, Sanya Petrovic²,
Reidar Zapf-Gilje¹¹Golder Associates Ltd.²Health Canada

As an expert support department under the Federal Contaminated Sites Action Plan, Health Canada is required to provide detailed guidance for the assessment of human health risks posed by federal contaminated sites in Canada. Due to the rapidly evolving science around environmental site characterization, and the necessity to have a well-developed and sound conceptual model for contaminated sites prior to undertaking a risk assessment, Health Canada has developed a comprehensive new guidance, the *Health Canada Guidance Manual for Environmental Characterization in Support of Human Health Risk Assessment*.

This manual is intended to replace existing federal guidance on environmental site characterization and addresses those media most commonly driving human health risk assessment: soil, groundwater, indoor air quality and soil vapour. Biota have been addressed separately in Health Canada's *Supplemental Guidance on Human Health Risk Assessment for Country Foods*. The manual consists of three volumes: Technical Guidance; Checklists; and, Suggested Operating Procedures. The manual was subjected to a review process that included the Federal Contaminated Sites Management Working Group and provincial regulators.

The presentation provides an overview of the manual and how it may be effectively used, as well as specific examples highlighting new approaches or tools for environmental site characterization. One of the key themes of the guidance is site characterization design for obtaining representative data; the critical importance of linking design to the conceptual site model is demonstrated, and specific guidance on sampling locations, spacing and frequency for different media is provided.

2:50 pm - 3:15 pm

**Hazard Assessment and Derivation
of Risk-Based Remedial Targets
for Perfluorooctane Sulfonate**Tara Siemens Kennedy, MET, Lindsay Paterson, M.Sc.
SLR Consulting (Canada) Ltd.

SLR Consulting (Canada) Ltd. (SLR), formerly SEACOR Environmental Inc., was retained by Public Works and Government Services Canada (PWGSC) to conduct a hazard assessment of perfluorooctane sulfonate (PFOS) and to derive risk-based remedial targets for PFOS in soil and groundwater at two fire-fighting training areas at Williams Lake Airport, British Columbia (BC) (the Site). Concentrations of PFOS related to Aqueous Film Forming Foam, a fire suppression foam used at the Site during training exercises, were measured in soil and groundwater during routine environmental investigations. A problem formulation conducted for the Site identified human and ecological receptors of concern (ROC) and the pathways by which the ROC have the potential to be exposed to PFOS in soil and groundwater. Human ROC included commercial/industrial workers and off-site residents. Ecological ROC were plants, soil invertebrates and terrestrial wildlife. The hazard assessment comprised a review of the available toxicological data for PFOS. Studies deemed to be most relevant to human health and with the lowest "no observed adverse effect levels" (NOAEL) were selected as key studies. A detailed review of selected key studies was then conducted and, where appropriate, toxicity reference values (TRV) were derived based on the results of the studies. The most conservative of the derived TRVs was then used to estimate concentrations of PFOS in soil and groundwater at the Site that would be protective of human health exposures under a commercial/industrial land use scenario. In addition, ecotoxicological data was reviewed and, where possible, used to estimate risk-based remedial targets for the protection of ecological ROC. Final remedial targets for soil and groundwater were 1.3 mg PFOS/kg soil (dw) and 2.7 µg PFOS/L groundwater.

3:15 pm - 4:15 pm

Panel Discussion – Live and Unplugged