Preface

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The scientific underpinnings of human health and ecological risk assessments have grown increasingly complex as our understanding of the mechanisms of interactions of chemicals with humans and the environment has improved. This increased complexity continues to challenge the regulatory community's ability to incorporate state-of-the-science information into risk assessment policy in a timely and comprehensible manner. In this special issue on risk, the diversity of scientific and policy issues underlying risk assessment and management is highlighted. The contributors cover a wide range of expertise from different fields of study (such as chemistry, ecology, toxicology, mathematics and law) in a series of papers on current research focusing on a broad spectrum of risk-related topics.

The first paper, by Bartell, LaKind, Moore and Anderson, presents the scientific views of the participants at the working conference *The Bioaccumulation of Hydrophobic Organic Chemicals by Aquatic Organisms*. The extent to which aquatic organisms accumulate HOCs (a class of chemicals that includes dioxins and PCBs) impacts not only the viability of the organisms themselves, but also organisms higher in the food chain (including humans). Therefore, the derivation of water and sediment quality criteria for the protection of human health and the environment is predicated on our ability to predict the accumulation of HOCs by aquatic organisms. The goals of the workshop and associated paper are to describe the state-of-the-science of the bioaccumulation of HOCs and to lay the foundations for future research.

The next three papers, by VanHorn, Hampton, Morris and Kester, describe a phased approach to conducting ecological risk assessments. They provide a description of an innovative approach to assessing potential impacts on an ecosystem by using functional groups demonstrating biological similarity, based on taxonomic divisions, trophic category and potential for contaminant exposure, rather than using the traditional method of evaluating single species indicators (threatened and endangered species and critical habitats are evaluated individually). An additional methodology introduced by the authors is the use of ecologically based screening levels, or chemical concentrations in the environment that are not expected to cause adverse effects on specific organisms after long-term exposure. By focusing on the contaminants of greatest concern and the ecological receptors most likely to be adversely affected, use of these methods is expected to streamline the ecological risk assessment process for complex contaminated sites.

McKenna reviews the current scientific understanding of the toxicology of chemicals whose dose–response behaviour is non-traditional, and are better described by the concept of hormesis. In addition, recently proposed models designed to accommodate these types of toxicological response are examined. Finally, the phenomenon of hormesis is placed in a regulatory context by describing how these types of response could illustrate the concept of carcinogenesis as a non-threshold process.

Next, Abramson describes the US government's proposed legislative risk assessment and management reforms and their potential impact on the US Environmental Protection

Agency and other federal agencies. Some of the more significant measures introduced by the proposed legislation include the requirement for systematic peer review of all risk assessments, presentation of a reasonable range of scientific uncertainties, comparison of risks with risks familiar to the general public, and preparation of cost–benefit analyses for major rules. Abramson also comments on the potentially beneficial and detrimental aspects of these proposals in the risk assessment and management process.

Jacobs focuses on occupational exposure to lead during residential renovation work and structural steel demolition. The data presented describe high levels of exposure to lead during these activities, but also indicate that methods exist for performing lead remediation projects without excessive exposure to lead (in particular, proper surface preparation and use of high-efficiency exhaust ventilation systems). Jacobs provides recommendations on attainable permissible exposure limits for lead.

Finally, Allen examines the use of a statistical method (order statistics) for describing distributions of data (for example, point estimates for chemical concentration data in soils) whose underlying distributions are neither normal nor log-normal. Although estimation of exposure point concentrations is fundamental to the quantification of risk, there is a paucity of guidance on how to address datasets without making assumptions about the underlying distribution.