



## Book reviews

### **Assessing Oral Bioavailability of Metals in Soil**

Nark E. Kelley, Susan E. Brauning, Rosalind A. Schoof, Michael V. Ruby, Battelle Press, Columbus, OH, 2002, US\$ 65.00, 136 pp., ISBN 1-57477-123-X

Bioavailability is the extent to which a chemical can be adsorbed by a living organism and reach the systemic circulation system. By measuring bioavailability and incorporating its magnitude into risk assessments of contaminated areas, the scope and magnitude of some contaminated site cleanups have been reduced. For example, at a smelter site in Bartlesville, OK, bioavailability studies allowed increases in the soil cleanup levels (e.g. the lead cleanup level was increased from 500 to 925 mg/kg) resulting in decreased remediation costs from US\$ 80–100 millions to approximately US\$ 40 millions. The authors cite nine other case studies using bioavailability adjustments; contaminants cited are mercury, arsenic, and lead.

The foreword to this book aptly elucidates the text's coverage. This book has been developed as a resource for anyone involved in remediating hazardous waste sites. The book brings together the most current information on bioavailability of metals in soils, and synthesizes this information into a practical handbook that explains concepts, identifies methods and data for assessing bioavailability, and illustrates how bioavailability adjustments can be incorporated into risk assessments to generate risk-based cleanup values that are more site-specific than those based on default assumptions. Although the guide focuses on oral bioavailability of metals to human receptors, many of the basic principles described herein also can be applied to assess the bioavailability of organic compounds and to assess bioavailability to ecological receptors.

Situations are identified that are appropriate for conducting a bioavailability study. In addition, the basic steps involved in conducting a bioavailability study are outlined and important factors that affect the acceptability of the results are discussed. A summary of metal-specific bioavailability data is provided for six metals that are common contaminants at hazardous waste sites—arsenic, cadmium, chromium, lead, mercury, and nickel. For each metal, the book discusses specific considerations relevant to the design on in vitro and in vivo studies to estimate bioavailability. Standard operating procedures are provided for two generally accepted in vitro test methods that measure the fraction of a metal solubilized under simulated gastrointestinal tract conditions. In addition, 'template' protocols are provided for in vivo study designs that have been employed to assess the oral bioavailability of arsenic and lead. With input from appropriate experts, these protocols can be tailored to the specific needs of a particular site. The protocols also provide a framework for professionals interested in designing and performing in vivo studies for other metals discussed in this

book. Laboratories and individuals experienced in conducting bioavailability studies of the type discussed in the book also are identified.

The book has the following eight chapters:

1. Overview
2. Designing/Conducting a Bioavailability Study
3. Arsenic
4. Cadmium
5. Chromium
6. Lead
7. Mercury
8. Nickel

Each chapter follows the same format: Predominant forms in the soil, Toxicity assessment, Summary of relative bioavailability data, In vitro study design recommendations, In vivo study design recommendations and References. There are two appendices describing methods for the determination of the bioavailability of lead and arsenic.

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Gary F. Bennett

### **Human and Ecological Risk Assessment: Theory and Practice**

Dennis J. Paustenbach (Ed.), Wiley, New York, NY, 2002, US\$ 150.00, 1586 pp., ISBN 0-471-14747-8

To begin my review, I quote from the foreword written by William K. Riley, former administrator of the US EPA:

When Dr. Paustenbach's previous text was published in 1989, it filled an important void in the environmental sciences. Before that time, risk assessments were usually conducted by regulatory agencies or those within the regulated community (and their consultants) and were of varying quality. Most of these assessments lacked transparency, that is, few persons knew exactly how the calculations were performed and the basis for the exposure factors and other assumptions. Further, only a few assessments had been published in peer-reviewed journals before 1990 and this tended to inhibit the maturation of the scientific aspects of risk assessment. Thus, his textbook of case studies became a foundation against which others could assess the thoroughness of their work.

This new text comes at a time when the field has passed through its infancy and is now a generally well-respected approach for objectively evaluating environmental issues. Many well-known and respected authors have contributed to this text and have described methods that they have used to evaluate complex environmental questions. Appropriately, an emphasis has been placed on presenting analyses that address topics ranging from risks due to contaminated groundwater, occupational hazards, radionuclide emissions to the community, consumer products, and a variety of risks to wildlife. The overall