Environmental Toxicology and Risk Assessment

Modeling and Risk Assessment

SIXTHV LUME

F. James Dwyer, Thomas R. Doane, and Mark L. Hinman, editors



\$TP 1317

Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment (Sixth Volume)

F. James Dwyer, Thomas R. Doane, and Mark L. Hinman, Editors

ASTM Publication Code Number (PCN): 04-013170-16



ASTM 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 Printed in the U.S.A. ISBN: 0-8031-2474-0

ASTM Publication Code Number (PCN): 04-013170-16

ISSN: 1071-720X

Copyright © 1997 AMERICAN SOCIETY FOR TESTING AND MATERIALS, West Conshohocken, PA. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of the publisher.

Photocopy Rights

Authorization to photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by the American Society for Testing and Materials (ASTM) provided that the appropriate fee is paid to the Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA 01923; Tel: 508-750-8400; online: http://www.copyright.com/.

Peer Review Policy

Each paper published in this volume was evaluated by two peer reviewers and at least one editor. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

To make technical information available as quickly as possible, the peer-reviewed papers in this publication were prepared "camera-ready" as submitted by the authors.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

Foreword

The Sixth Symposium on Environmental Toxicology and Risk Assessment was presented in Orlando, FL on 15–18 April, 1996. ASTM Committee E47 on Biological Effects and Environmental Fate sponsored the symposium, which was the 23rd symposium sponsored by the committee. The focus of the Sixth Symposium on Environmental Toxicology was on the use of modeling in developing risk assessments for a variety of situations, including human-health assessments, site-specific assessments, and ecosystem-level assessments. F. James Dwyer, Midwest Science Center, National Biological Service, chaired the symposium. Co-chairs were Thomas R. Doane, Battelle-San Antonio Operations, and Mark L. Hinman, Exxon Biomedical Sciences, Inc. Each of these men served as editors of the resulting publication.

Contents

Overview—F. James Dwyer, Thomas R. Doane, and Mark L. Hinman	1
Modeling Perspectives	
A Food Web Model of Mercury Transfer from Stream Sediment to Predators of Fish for Ecological Risk Based Clean-Up Goals—T. P. BURNS, C. T. HADDEN, B. W. CORNABY, AND S. V. MITZ	7
Graphical Determination of Metal Bioavailability to Soil Invertebrates Utilizing the Langmuir Sorption Model—S. G. DONKIN	28
Indicators of Chemical Stressor Levels Derived from Population Time Series: A Retrospective Modeling Approach—T. G. HALLAM AND E. T. FUNASAKI	44
Monte Carlo Simulation of Near-Source Dry Deposition—E. C. McDONALD-BULLER, R. B. GILBERT AND H. M. LILJESTRAND	56
Modeling the Effect of Toxicants on the Parameters of Dynamic Energy Budget Models—E. B. MULLER AND R. M. NISBET	71
Building Uncertainty Analysis into Environmental Risk Assessments of Chemicals Disposed Through Municipal Wastewater Treatment Plants—D. J. VERSTEEG, C. E. WHITE, AND C. E. COWAN	82
ECOLOGICAL RISK ASSESSMENT	
Environmental Monitoring at Two Department of Energy Sites—R. H. GRAY	101
Ecotoxicity of Nitroaromatics to Aquatic and Terrestrial Species at Army Superfund Sites—P. S. HOVATTER, S. S. TALMAGE, D. M. OPRESKO, AND R. H. ROSS	117
Ecological Risk Assessments of Priority Substances in Canada: Identification and Resolution of Difficult Issues—D. R. J. MOORE, R. L. BRETON, P. DOYLE, B. J. ELLIOTT, K. TAYLOR, AND W. M. WINDLE	130
Methods for Assessing Watershed-Scale Aquatic Risks for Multiple Stressors— B. R. PARKHURST, W. J. WARREN-HICKS, AND C. S. CREAGER	148

Screening Level Model for Vadose Zone and Ground Water Transport Evaluation—P. A. RZEPECKI AND M. D. EDLUND	164
The Influence of Floodplains on Mercury Availability—D. WALLSCHLÄGER AND RD. WILKEN	179
Ecological Risk Assessment Procedures for U. S. Army Sites —R. S. WENTSEL, M. SIMINI, R. T. CHECKAI, D. LUDWIG, AND T. W. LA POINT	197
Human Health Risk Assessment	
Predicting Dermal Absorption from Contact with Chemically Contaminated Soils—A. L. BUNGE AND J. M. PARKS	227
Indirect Exposure Screening Model for Evaluating Contaminant Intake from Air Emissions Via Ingestion of Milk and Beef: Risk-Based Air Concentrations— C. M. CHEW, R. M. LORENZANA, AND M. GARRY	245
Prediction of Risk-Based Screening Levels for Infiltration of Volatile Subsurface Contaminants into Buildings—I. HERS, R. ZAPF-GILJE, S. PETROVIC, M. MACFARLANE, AND R. MCLENEHAN	265
Science, Science Policy, and Risk-Based Management—L. P. MIDGLEY	286
Performance and Reliability of Intermedia Transfer Models Used in Human Exposure Assessment—A. B. SHELDON, H. E. DAWSON, AND R. L. SIEGRIST	301
BIOMARKERS	
Biomarker Selection for Restoration Monitoring of Fishery Resources— M. J. ANDERSON, M. G. BARRON, S. A. DIAMOND, J. LIPTON, AND J. T. ZELIKOFF	333
Macrophage Aggregates: Biomarker for Immune Function in Fishes?—v. S. BLAZER, J. W. FOURNIE, AND B. A. WEEKS-PERKINS	360
Development of Short-Term, Whole-Embryo Assays to Evaluate Detrimental Effects on Amphibian Limb Development and Metamorphosis Using Xenopus laevis—D. J. FORT AND E. L. STOVER	376
Preliminary Results Using the Early Embryo Teratogenesis Assay: A Comparison of Early Embryo Abnormalities with Late Embryo and Hatchling Teratogenic Changes—D. S. HENSHEL, D. W. SPARKS, C. A. A. MAYER, K. BENSON, C. FOX, Y. LAM, S. A. SOBIECH, AND R. WAGEY	391
Chick Embryo Limb Bud Cell Culture for Screening Environmental Contaminants— M. A. SMITH AND A. KANTI	402

TOXICOLOGY-AQUATIC, PLANT, SEDIMENT, AND SOIL

An Overview of Metals Permitting Alternatives. The Importance of Clean Chemistry Techniques for Trace Metal Sampling of Domestic Wastewater and Paper Mill Treated Effluents and Receiving Waters—R. E. FERGEN, J. P. COOKE, P. BOOTHE, AND F. BLOETSCHER	415
Significance of Experimental Design in Evaluating Ecological Hazards of Sediments/ Soils to Amphibian Species—D. J. FORT AND E. L. STOVER	427
Inhibition of Photosynthesis as an Endpoint for the Photoinduced Toxicity of Intact and Photomodified PAHs—xd. huang, t. s. babu, c. a. marwood, r. w. gensemer, k. r. solomon, and b. m. greenberg	443
Evaluation of the Genotoxicity of Bioaccumulatable Contaminants in Sediments Using Co-Solvent Mobilization—J. C. MEANS AND D. J. McMILLIN	456
Development of Suitable Test Methods for Evaluating the Toxicity of Contaminated Soils to a Battery of Plant Species Relevant to Soil Environments in Canada—G. L. STEPHENSON, K. R. SOLOMON, B. HALE, B. M. GREENBERG, AND R. P. SCROGGINS	474
A Field Screening Method Using Earthworms (Eisenia foetida andrei) to Evaluate Contaminated Soils—D. C. WILBORN, M. A. BOLLMAN, C. S. GILLETT, S. L. OTT, AND G. L. LINDER	490
Reference Toxicants for Toxicity Testing Using Caenorhabditis elegans in Aquatic Media—C. P. CRESSMAN III AND P. L. WILLIAMS	518
Age-Specific Sensitivity of Grass Shrimp (Palaemonetes pugio) Embryos to Sublethal Concentrations of Diflubenzuron—J. E. H. WILSON	533
The Relationship Between Chronic Values in Toxicity Tests with Ceriodaphnia dubia— J. A. ZUIDERVEEN AND W. J. BIRGE	551
Appendix I—Special Technical Publications (STPs) of ASTM Committee E47 on Biological Effects and Environmental Fate.	557
Author Index	559
Subject Index	561

ISBN 0-8031-2474-0

XOSY-TYOT :NZZI