
CONTENTS

Figures, Tables, and Exhibits xi

Preface xvii

About the Editors xxi

About the Contributors xxiii

1 Introduction to Risk Assessment in Public Health 1

Mark Robson and Fred Ellerbusch

Where to Begin? • What Is Risk? • Acceptable Risk • Risk Assessment Is Not New • New Risks Arising from Common Public Health Practices • Risk in Context

2 The Risk Assessment–Risk Management Paradigm 11

Gilbert S. Omenn

Definition of Risk • Historical Perspectives • *The Red Book* • The Objectives of Risk Assessment: Statutes and Programs • Biological End Points • A Framework for Regulatory Decision Making • Adding Context for Risk Assessments • Special Challenges for Risk Assessment of Chemicals • Emerging Contributions from Eco-Genetics • Risk Management–Risk Communication Approaches

- 3 Risk Assessment and Regulatory Decision Making in Environmental Health 31**
Felicia Wu and William H. Farland
What Is Risk Assessment? • Brief History of Risk Assessment in U.S. Environmental Regulation • Risk Considerations in Environmental Decision Making • Going from Risk Assessment to Risk Management and Risk Communication • Three Examples of Risk Assessment
- 4 Toxicological Basis for Risk Assessment 55**
Tee L. Guidotti and Marina S. Moses
Toxicology • Biomonitoring • Chemical Safety
- 5 The Application of Physiologically Based Pharmacokinetic (PBPK) Modeling to Risk Assessment 85**
Raymond S. H. Yang and Yasong Lu
The Need for PBPK Modeling in Risk Assessment • What Is Physiologically Based Pharmacokinetics? • How Does a PBPK Model Work? • Data Requirements for PBPK Modeling • Datasets Used for Model Building and Model Validation • Available Software Comparison • Explanation of an Example of Computer Code for a PBPK Model in Berkeley Madonna • Numerical Integration • Sensitivity and Uncertainty • PBPK Models for Chemical Interactions (Interactive PBPK Models) in Chemical Mixtures • Application of PBPK Modeling in Dichloromethane Risk Assessment and Its Recent Development in Bayesian Population Approach
- 6 Probabilistic Models for Characterizing Aggregate and Cumulative Risk 121**
John L. Adgate and Gurumurthy Ramachandran
Basic Risk Assessment Equations for Cancer and Noncancer Assessments • Pesticide Exposure Assessment • Aggregate Exposure: Combining All Relevant Routes • OP Pesticide Cumulative Assessment • Bayesian Statistical Framework
- 7 Molecular Tools for Risk Assessment 155**
William A. Toscano and Chisato Mori
Gene Expression Analysis and Chemical Exposure in Humans: Detection of High-Risk Groups • A Technological Approach to Risk Assessment Using Toxicogenomics, Exposure Level, and Susceptibility
- 8 Comparative Risk Assessment 173**
Michele Morrone
Defining Comparative Risk • *Unfinished Business* • Comparative Risk and Politics • The Comparative Risk Process • The Impact of Comparative Risk on Policy Making • Conclusion

9 Risk in the Workplace: Where Analysis Began and Problems Remain Unsolved 187

Adam M. Finkel and P. Barry Ryan

Background • Overview of Occupational Risk Assessment Methodology and Policy • Control of Hazards • The Evolution of Industrial Hygiene and the Role of New Professionals • Emerging Hazards

10 Radiological Risk Assessment 239

Ronald O. Rahn and Arthur C. Upton

Hazard Identification • Dose-Response Evaluation • Human Exposure and Epidemiology Assessment • Risk Characterization and Regulatory Aspects • Abbreviations, Acronyms, and Key Terms

11 Microbial Risk Assessment 285

Rebecca T. Parkin

Background • Frameworks • Modeling Approaches • Risk Management

12 Children's Risk Assessment 315

Natalie C. G. Freeman

Children Are Not Little Adults • Risk Assessment Paradigms as They Apply to Children • Special Case: Lead Exposure • Special Case: Pesticide Exposure

13 Biological Monitoring of Exposure to Environmental Chemicals Throughout the Life Stages: Requirements and Issues to Consider for Birth Cohort Studies 345

Dana B. Barr, Richard Y. Wang, and Larry L. Needham

General Behavior of a Chemical in the Body • Behavior of Specific Chemical Classes in the Body • Assessing Exposure Throughout the Life Cycle • Biological Matrices for Exposure Assessment • Collecting Samples from Infants and Children • Methodology • Conclusions

14 Overview of Environmental Public Health Laws and Their Relation to Risk 383

Russellyn S. Carruth and Bernard D. Goldstein

Overview of the U.S. Governmental Structure • Sources of American Law, Including Environmental Law • Clean Air Act • Safe Drinking Water Act • Clean Water Act • Food, Drug, and Cosmetic Act • Occupational Safety and Health Act • Mine Safety and Health Act • National Environmental Policy Act • Toxic Substances Control Act • Resource Conservation and Recovery Act • Comprehensive Environmental Response Compensation and Liability Act • Recommendations for Further Reading

15 Why Risk Assessment Is Not Enough to Protect Health: Rationale for a Precautionary Approach to Science and Policy 423

Joel A. Tickner

Limitations of Risk Assessment and Risk-Based Policy • Limiting Preventive Actions • Problems When Risk Assessment Is Applied in Policy • Responding to Risk Assessment Critiques • Introducing the Precautionary Principle • Roots of the Precautionary Principle • Definitions and Elements of the Precautionary Principle • Precaution and Science • Alternatives Assessment: A Prevention-Oriented Approach to Weighing Scientific Information • Developing Rapid Screening and Assessment Tools • Precautionary Assessment: A Decision-Making Tool for Preventive Decisions Under Uncertainty • Applying Alternatives Assessment in Practice: Cleaner Production and Goal Setting • Conclusions

16 Risk Communication 463

Susan L. Santos

The Relationship Between Risk Communication, Risk Assessment, and Risk Management Decision Making • Legal and Regulatory Considerations • What Is Risk Communication? • The Purpose(s) of Risk Communication • Principles of Effective Risk Communication • Understanding Risk Perception and the Importance of Establishing Trust and Credibility • Issues in Explaining Risk and Designing Messages

CASE STUDIES IN RISK ASSESSMENT

17 Improvement of Risk Assessments for Multicontaminant Sites in the Face of Critical Data Gaps 489

Yoram Cohen and Adrienne Katner

Santa Susana Field Laboratory • Methods • Results and Discussion

18 Intraspecies Differences in Acute Acrylonitrile Toxicity 511

Gwendolyn Ball, Clif McLellan, and Lori Bestervelt

19 Drinking Water Contamination by Perchlorates from Department of Defense Rocket Fuel Facilities 517

Terry Gratton and Norman Trieff

20 Multi-Pathway Risk Assessment for Children Living Near a Hazardous Waste Site 523

Serap Erdal

- 21 Child with Asthma Living in a Moisture-Damaged Home 531
Myrtis Sullivan
What Would You Do at This Point? • Case Progression • What Would You Do at This Point? • Case Discussion • Case Progression • Discussion
- 22 Endocrine Disruption Through Phthalates/Plasticizers 541
Christine Ziebold
- 23 Estimation of Health and Safety Risks from Exposure to Chlorine and Chloroform for Swimmers in Pools 547
Richard P. Hubner
Methods • Results • Discussion • Conclusions
- 24 U-Shaped Dose-Response Curve for Risk Assessment of Essential Trace Elements: Copper as a Case Study 555
Bonnie Ransom Stern
General Approach
- 25 Ecosystem Risk Assessment: The Neuse River Estuary, North Carolina 563
Craig A. Stow, Mark E. Borsuk, and Kenneth H. Reckhow
Decision Making Under Uncertainty • The Neuse River Estuary
• Model Development • Adaptive Management
- 26 The Ohio Comparative Risk Project 587
Michele Morrone
Issue List Development • Project Structure • Risk Assessment Methods • Public Involvement • Risk Ranking • State of the Environment Report • Policy Recommendations
- 27 Community-Based Risk Assessment: DDT Contamination in Triana, Alabama 597
Padma Tadi-Uppala
Background • Exposure
- Name Index 605
- Subject Index 611

