

The Complete Book of Pesticide Management

*Science, Regulation, Stewardship,
and Communication*



FRED WHITFORD

Environmental
PROTECTION

Magazine Series

CONTENTS

CONTRIBUTORS	xiii
PREFACE	xvii
INTRODUCTION	xxi
1. THE EVOLUTION OF PESTICIDE REGULATIONS: THE SHIFT FROM BENEFITS TO RISKS	1
<i>Fred Whitford, Jeff Wolt, Douglas Urban, and Monte Mayes</i>	
Early Federal Laws Focused Primarily on Benefits / 2	
Environmental Movement Changes Public Perception of Pesticides / 3	
Government Policies Shift toward Risk Reduction Strategies / 3	
Risk–Benefit Considerations / 4	
Study Requirements and Scientific Testing Guidelines / 4	
Pesticide Manufacturers and Good Laboratory Practices / 4	
EPA Moves toward a More Comprehensive Review of Risks / 5	
Policy Shifts to Reduced-Risk Pesticides / 6	
Aggregate and Cumulative Risks / 6	
Summary / 6	
2. HUMAN HEALTH RISK ASSESSMENT: EVALUATING POTENTIAL EFFECTS OF PESTICIDES ON HUMANS	8
<i>Fred Whitford, Joel Kronenberg, Curt Lunchick, Robert Tomerlin, Jeff Wolt, Jeffrey Driver, K. S. Rao, Gail Arce, Henry Spencer, Carl Winter, and James Klaunig</i>	
Initial Focus on Dietary Risks / 8	

Attention Shifts to Occupational Risks / 8
Public Scrutiny over Residential Risks / 8
The Multistep Risk Assessment Process / 9
General Principles of Toxicology / 10
General Testing Methodology / 24
Study Design for Toxicological Testing of Pesticides in
the United States / 36
Extrapolation from Animals to Humans / 52
Dietary Exposure Assessment / 54
Occupational Exposure Assessment / 70
Residential Exposure Assessment / 86
Risk Characterization / 99
Aggregate and Cumulative Risk Assessment / 113
Summary / 114

3. EPIDEMIOLOGY: VALIDATING HUMAN RISK ASSESSMENTS

116

Fred Whitford, John Acquavella, and Carol Burns

The Science of Epidemiology / 116
Principles of Epidemiology / 117
Sources of Information / 119
Epidemiology as an Observational Science / 122
Study Designs in Epidemiology / 123
Reporting Epidemiological Data / 127
Bias Complicates Study Results / 131
Placing Scientific Studies in Perspective / 133
Summary / 138

4. ECOLOGICAL RISK ASSESSMENTS: EVALUATING PESTICIDE RISKS TO NONTARGET SPECIES

140

*Fred Whitford, Monte Mayes, Douglas Urban, Jeff Wolt, Richard Bennett,
Ronald Turco, Margaret Jones, Brian K. Miller, and Larry Bledsoe*

Benefits of Wildlife / 140
Pesticide Impact Depends on Wildlife Ecology / 143
Pesticide Poisoning of Wildlife / 144
Ecological Risk Assessment Process / 147
Study Designs for Toxicological Testing of Pesticides in
the United States / 151
Exposure Characterization / 166
Risk Characterization / 183
Public Policy on Wildlife / 189
Summary / 194

- 5. WATER QUALITY RISK ASSESSMENT: PREDICTING COMPLEX INTERACTIONS BETWEEN PESTICIDES AND THE ENVIRONMENT** 196
Fred Whitford, Jeff Wolt, Jane Frankenberger, Michael Barrett, Henry Nelson, Ian van Wesenbeeck, Ronald Turco, and Sarah Brichford
- Cycling of Water in the Environment / 197
 The Introduction of Pesticides into the Water Cycle / 201
 Water Quality Assessment for Pesticide Registration / 205
 Public Policy on Water Quality / 223
 Summary / 229
- 6. PRODUCT DEVELOPMENT AND REGISTRATION: BLENDING SCIENTIFIC INFORMATION INTO PUBLIC POLICY DECISIONS** 231
Fred Whitford, Dan Barber, Amy Breedlove, and Jeff Wolt
- An Analysis of Risks / 231
 Manufacturer's Product Development and Commercialization Process / 233
 The EPA Decision-Making Process in Product Review and Registration / 246
 Summary / 253
 Appendix 6.1. List of Testing Requirements for EPA Registration / 254
- 7. PESTICIDE LABELS: THE CONVERGENCE OF SCIENCE, PUBLIC POLICY, AND USER RESPONSIBILITY** 258
Fred Whitford, Dan Barber, Amy Breedlove, David Scott, and C. Richard Edwards
- Pesticide Product Registration and the Regulatory Process / 258
 Types of Pesticide Labeling / 259
 Sources of Information for Crafting a Pesticide Label / 261
 Organization of the Pesticide Label / 263
 Public Policy / 276
 Summary / 278
- 8. LIABILITIES AND LAWSUITS: UNDERSTANDING REGULATIONS, INSPECTIONS, AND THE COURTS** 279
Fred Whitford, Michael Olexa, David Gunter, Lawrence Pinto, Joe Becovitz, John Ward, Gerald Harrison, Larry LeJeune, and Mark Thornburg
- Regulations in the Modern Business World / 279
 Regulations: Needless Paperwork or Valued Asset? / 281
 Laws and Regulations / 282
 Reading Regulations / 287
 Liability Focused on the Pesticide User / 289
 Inspection, Investigation, and Reporting / 290

Attorney–Client Protection / 293

Administrative Proceedings / 295

Civil Proceedings (Lawsuits) / 298

Criminal Proceedings / 300

Labels and Applicator Certification Set Standards of Conduct / 300

Seeking Professional Advice / 306

Summary / 309

9. ENVIRONMENTAL SITE ASSESSMENTS:

MANAGING THE FACILITY AGAINST CONTAMINATION

311

Fred Whitford, David Gunter, Brian R. Miller, and Joe Becovitz

Transfer of Property and Environmental Disclosure Documents / 311

The “Phases” of Environmental Site Assessments / 315

Important Components of Risk Management / 319

Conducting Environmental Site Assessments / 324

Incorporating Site Assessment Information into Business Practices / 337

Legal Implications Associated with Environmental Site Assessments / 346

Summary / 350

Appendix 9.1 Environmental Audit Check Sheets / 351

10. OCCUPATIONAL USE OF PESTICIDES: HANDLING PRODUCTS IN THE WORKPLACE

364

*Fred Whitford, Lawrence Pinto, Joe Becovitz, Andrew Martin, Brian R. Miller,
Bob Avenius, and Jonathan Neal*

Employer’s Commitment to Pesticide Safety / 364

Employees Must Take Safety Seriously / 365

Pesticide Safety Is a Shared Responsibility / 366

Pesticide Product Selection Considerations / 366

Purchasing Pesticides by Phone / 381

Following Label Directions / 382

Moving Products between the Facility and the Job Site / 384

Pesticide Storage Facilities / 398

Handling and Applying Pesticides in the Workplace / 407

Management Practices for Pesticide Disposal / 413

Symptoms of Pesticide Poisoning / 421

Answering Customer Questions / 428

Handling Complaints / 429

Summary / 432

Appendix 10.1 Pesticide Selection Based on
Formulation Characteristics / 434

Appendix 10.2 Vehicle and Trailer Inspection Checksheets / 444

11. PERSONAL PROTECTIVE EQUIPMENT: SELECTION, CARE, AND USE

450

Fred Whitford, Janis Stone, and Tracy MacMillian

Safety Linked to Toxicity and Exposure / 450

Personal Protective Equipment: Protecting Your Hands / 453

Personal Protective Equipment: Protecting Your Eyes / 456

Personal Protective Equipment: Protecting Your Lungs / 458

Personal Protective Equipment: Protecting Your Body / 464

Pesticide Labels Provide Valuable Safety Instructions / 468

Washing Regular Work Clothing / 471

Summary / 474

Appendix 11.1 Written Respirator Program for OSHA 29 CFR Part 1910.134 / 475

12. THE EMPLOYEE BULLETIN BOARD: WHERE EMPLOYERS COMMUNICATE POLICIES, PROCEDURES, AND PRACTICES TO EMPLOYEES

477

Fred Whitford, E. Mark Hanna, Jean Seawright Pileggi, Kevin Pass, Paul Sommerville, and Nicole Mason

Long-Lasting Benefits / 478

Designing an Effective Employee Bulletin Board / 480

Employee Bulletin Board Content / 482

Employee Relations Bulletin Board: Where Employees Communicate with the Employer and Other Employees / 488

Using the Employee Bulletin Board for Training / 491

Beware: Bulletin Boards Can Become a Liability / 491

Getting Additional Help / 492

Summary / 494

13. PLANNING FOR EMERGENCIES: PREVENTING AND REACTING TO EMERGENCIES IN THE WORKPLACE

495

Fred Whitford, David Gunter, Brian R. Miller, Allen Summers, Mike Titus, and Larry Hamby

Characteristics of Emergencies / 497

Preplanning for Emergencies / 500

Workplace Hazard Assessment (OSHA, 29 CFR Part 1910.132) / 501

Portable Fire Extinguishers (OSHA, 29 CFR Part 1910.157) / 504

First Aid Kits (OSHA, 29 CFR Part 1910.151) / 509

Bloodborne Pathogens (OSHA, 29 CFR Part 1910.1030) / 511

- Emergency Phone Numbers [OSHA, 29 CFR Part 1910.38(A)(2)(V) and Part 1910.165(B)(4)] / 513
- Hazardous Waste Operations and Emergency Response (OSHA, 29 CFR Part 1910.120) / 514
- Exit Signs (OSHA, 29 CFR Part 1910.35) / 517
- Electrical Panel Markings (OSHA, 29 CFR Part 1910.303) / 519
- Evacuation Map (OSHA, 29 CFR Part 1910.38) / 521
- Site Map (OSHA, 29 CFR Parts 1910.38 and 1910.120) / 523
- Emergency Response Plan (Federal Register, Vol. 61, No. 109, pp. 28642–28664) / 525
- Summary / 532
- Appendix 13.1 Certification of Hazard Assessment (OSHA, 29 CFR Part 1910.132) / 534
- Appendix 13.2 Check Sheets for Fire Extinguishers, Exit Signs, and First Aid Kits / 538
- Appendix 13.3 Let-It-Burn Policy / 540
- Appendix 13.4 Bloodborne Pathogen Policy / 541
- Appendix 13.5 Emergency Response Plan / 546

14. THE INSURANCE POLICY: PROTECTING YOURSELF AGAINST THE UNEXPECTED

576

Fred Whitford, Scott McGinness, Donna Marron, and Daniel Reardon

- Planning for Unforeseeable Risks / 576
- Insurance Coverage: Expecting the Unexpected / 578
- Coverage Alone Is Not Enough / 579
- The Insurance Policy Is a Legal Contract / 581
- Commercial Property Insurance / 587
- Commercial Crime Insurance / 589
- Commercial Vehicle Insurance / 591
- Inland Marine Floater / 595
- Comprehensive General Liability Insurance / 596
- Worker's Compensation Insurance / 600
- Pollution Insurance / 603
- Employment Practices Liability Insurance / 606
- Directors and Officers Liability Insurance / 607
- Errors and Omissions Liability Insurance / 607
- Hold Harmless Agreement / 607
- The Insurance Agent: A Valuable Advisor / 608
- Choosing the Right Insurance Policy / 612
- The Claim: Who Does What, When, and Where / 615
- Audits and Surveys: Payroll, Sales, and Safety / 619
- Risk Management / 620

Summary / 621

Appendix 14.1 An Insurance Policy Checksheet / 623

**15. EDUCATING THE COMMUNITY AND THE WORKFORCE ABOUT
HAZARDOUS CHEMICALS**

626

*Fred Whitford, David Gunter, Ken Rogers, Larry Olsen, Jeff Burbrink,
Jay Castleman, and Butch Ambler*

Chemicals in the Community / 626

Chemicals in the Workplace / 637

Summary / 652

Appendix 15.1 A Hazard Communication Program / 654

**16. EDUCATING YOUR CUSTOMER CLIENTELE: A HOLISTIC
APPROACH TO PEST MANAGEMENT**

656

*Fred Whitford, Gail Ruhl, Andrew Martin, Dan Weisenberger, Amy Brown,
Bill Field, Bobby Corrigan, B. Rosie Lerner, Lynn Ballentine, Zac Reicher,
Tim Gibb, Kelly Pearson, Roy Ballard, Dave Huth, Cliff Sadof, and Bob Wolf*

Pest Management Options for Reducing Pesticide Use at Home / 656

Pest Management at Home: Patience, Persistence, and Practice / 661

Lawn Pest Management / 662

Home Gardens / 666

Landscape Plants / 669

Pest Management in the Home / 672

Choosing an Over-the-Counter Product / 676

Pesticide Labels for the Homeowner / 676

Purchasing and Using Granular Spreaders / 679

Purchasing and Using Liquid Sprayers / 684

Owner's Manual and Instructions / 693

Wearing Personal Protective Equipment / 693

Reduce Pesticide Disposal through Smart Buying / 694

Preventing Accidental Poisonings in the Home / 695

Seeking Advice on Nonemergency Questions / 706

Choosing a Commercial Service / 706

Summary / 707

**17. RISK COMMUNICATION: INTERACTIONS
AND DIALOGUES WITH THE PUBLIC**

710

*Fred Whitford, Richard Feinberg, Robert Earl, Otto Doering,
Katherine Rowan, Thomas Neltner, and Amy Mysz*

The History of Public Debate on Pesticides / 711

The Public's View of Pesticides / 718

The Real Conflict: Pesticides Are Safe and Unsafe / 721

The Art and Science of Risk Communication / 725

The Role of the Internet / 746

Summary / 747

18. TODAY'S DISCUSSIONS, TOMORROW'S ISSUES **749**

*Fred Whitford, Richard Feinberg, Thomas Neltner, Jeff Wolt, Rick Tinsworth,
and Arthur-Jean Williams*

"What-If" Issues Challenge Existing Science / 749

Human Health Issues / 749

Wildlife and Environmental Issues / 755

Regulatory Issues / 759

Right-to-Know Issues / 762

Summary / 767

19. CONCLUSION **768**

INDEX **771**