Contents

ABOUT THE AUTHORS, XIII
ABOUT THE REVIEWERS, XIX
PREFACE, XXV

1 INTRODUCTION AND OVERVIEW, 1
Kelley J. Donham and Anders Thelin

1.1 Introduction to the Professional Specialty of Agricultural Medicine
(Agricultural Safety and Health), 1
1.2 Terminology and Definitions, 1
1.3 What is an Agricultural Health and Safety Professional?, 6
1.4 Training of Agricultural Health Practitioners and Agriculture Health and
Safety Specialists, 8
1.5 Demographics of the Agricultural Workforce, 17
1.6 The Evolution of Production Agricultural, Workforce, and Types of Farms, 18
1.7 Other Occupations Exposed to the Agricultural Environment, 21
1.8 General Health Status of the Agricultural Population, 21
1.9 Occupational Health Status of the Agricultural Workforce, 22
1.10 Occupational Injury and Illness Statistics, 23
1.11 Persistent and Emerging Megatrends in Agriculture:
Health—Safety Implications, 24
1.12 A Preview of Specific Occupational Health and Safety Risks and Conditions, 31
1.13 Summary, 35
References, 37

2 SPECIAL RISK POPULATIONS IN AGRICULTURAL COMMUNITIES, 43
Kelley J. Donham and Anders Thelin

2.1 Introduction, 43
2.2 Women in Agriculture, 44
2.3 Youths in Agriculture, 49
2.4 Elderly Farmers, 59
2.5 Migrant and Seasonal Farm Workers, 64
2.6 Old-order Anabaptists, 73
References, 84
3 AGRICULTURAL RESPIRATORY DISEASES, 95
Kelley J. Donham and Anders Thelin

3.1 Introduction and Overview, 95
3.2 Agricultural Structures and Respiratory Hazards, 98
3.3 Agricultural Dusts, 111
3.4 Confined Animal Feeding Operations and Respiratory Disease Hazards, 126
3.5 Oxides of Nitrogen (“Silo Gas”), 136
3.6 Applied Agricultural Chemicals, 140
3.7 Zoonotic Infections Causing Respiratory Disease, 142
3.8 General Preventive Measures for Agricultural Respiratory Illnesses, 143
References, 149

4 AGRICULTURAL SKIN DISEASES, 155
Kelley J. Donham and Anders Thelin

4.1 Introduction, 155
4.2 Contact Dermatitis, 156
4.3 Clinical Picture of Contact Dermatitis, 156
4.4 Epidemiology and Risk Factors of Contact Dermatitis, 156
4.5 Agents causing Contact Dermatitis in Agricultural Settings, 157
4.6 Infectious Dermatitis, 165
4.7 Arthropod-induced Dermatitis, 167
4.8 Sunlight-induced Dermatoses, 171
4.9 Skin Disorders Related to Heat, Cold, and Humidity, 176
References, 177

5 CANCER IN AGRICULTURAL POPULATIONS, 181
Kelley J. Donham

5.1 Introduction, 181
5.2 Summary, 198
References, 200

6 HEALTH EFFECTS OF AGRICULTURAL PESTICIDES, 205
Kelley J. Donham

6.1 Introduction, 205
6.2 Definition of Pesticides, 206
6.3 History and Risk Communication, 207
6.4 Pesticides: Classes, Subclasses, and Relative Toxicity, 208
6.5 How Farmers, Agricultural Workers, and Agriculture-associated Workers are Exposed to Pesticides, 209
6.6 The Risk of Pesticide Poisonings, 214
6.7 Insecticides: Usage, Acute Toxic Mechanisms, Diagnosis, and Treatment, 215
6.8 Herbicides: Usage, Acute Toxic Mechanisms, Diagnosis, and Treatment, 227
6.9 Fumigants: Usage, Acute Toxic Mechanisms and Treatment, 233
6.10 Chronic Health Effects of Insecticides, Herbicides, and Fumigants, 237
6.11 General Strategies for the Prevention of Pesticide Poisoning, 238
6.12 Summary, 243
References, 246

7 GENERAL ENVIRONMENTAL HAZARDS IN AGRICULTURE COMMUNITIES, 251
Kelley J. Donham and Anders Thelin
7.1 Introduction, 251
7.2 Water Quality, 252
7.3 Substance Sources and Health Effects of Water Pollution from Agricultural Operations, 255
7.4 Prevention of the Adverse Health Effects of Water Pollution, 265
7.5 Air Quality in Rural Agricultural Environments, 269
7.6 Solid Waste Concerns in Rural Agricultural Areas, 276
7.7 Animal Feeding Operations, 278
7.8 Global Climate Change: Effects on Agricultural Production and the Environment, 282
References, 284

8 MUSCULOSKELETAL DISORDERS, 293
Anders Thelin and Kelley J. Donham
8.1 Introduction, 293
8.2 Chronic Pain Conditions, 294
8.3 Injuries of the Neck, 297
8.4 Injuries of the Spine, 299
8.5 Injuries of the Shoulder, 304
8.6 Injuries of the Elbow, Wrist and Hand, 307
8.7 Injuries of the Hip, 311
8.8 Injuries of the Knee, Ankle, and Foot, 313
8.9 General Disorders, Infections, and Reactive Arthritis, 315
8.10 Prevention of Musculoskeletal Disorders, 316
8.11 Summary, 316
References, 317

9 PHYSICAL FACTORS, 327
Anders Thelin and Kelley J. Donham
Noise and Hearing Loss, 327
9.1 Introduction, 327
9.2 Noise, Definitions, and Measurements, 328
9.3 How Noise Affects the Auditory System, 329
9.4 Symptoms and Disablement, 330
9.5 Tinnitus, 331
9.6 Hearing Loss due to Trauma or Toxins, 331
9.7 Audiometry, 331
9.8 Other Effects of Noise, 333
9.9 Prevention, 333

**Vibration and Injuries Related to Vibration, 336**
9.10 Introduction, 336
9.11 Hand–arm Vibration Syndrome, 336
9.12 Whole-body Vibration, 339
9.13 Disorders due to Heat and Cold, 339
9.14 Human Thermal Balance, 339
9.15 Disorders due to Heat, 341
9.16 Disorders Related to Cold, 343
9.17 Climate and Physical and Mental Capability, 344
9.18 Prevention of Injuries Related to Heat and Cold, 344
9.19 Summary, 345
References, 347

**10 PSYCHOSOCIAL CONDITIONS IN AGRICULTURE, 351**
*Anders Thelin and Kelley J. Donham*

10.1 Introduction and Background, 351
10.2 Stress and Stress-related Health Disorders, 353
10.3 Stress Physiology, 356
10.4 Chronic Stress-related Physiological Reactions, 359
10.5 Stress and Disease, 360
10.6 Measuring Stress, 362
10.7 Management and Prevention of Stress Reactions, 364
10.8 Alcohol-related Health Problems, 367
10.9 Suicides and Suicide Prevention, 369
10.10 Summary, 370
References, 370

**11 ACUTE INJURIES IN AGRICULTURE, 379**
*Kelley J. Donham, Aaron Yoder, and LaMar Graffit*

11.1 Introduction, 379
11.2 Agricultural Injury Statistics and Epidemiology, 379
11.3 Medical Considerations of Acute Agricultural Injuries, 385
11.4 First on the Scene/First Aid, 386
11.5 First Responders and Emergency Medical Treatment, Rescue/Extrication, and Transport, 388
11.6 Emergency Room, 391
11.7 Primary Care, 392
11.8 Secondary/Tertiary Care, 393
11.9 Rehabilitation, 393
11.10 Hazards and Injury Scenarios, 394
11.11 Summary, 408
References, 409
## 12 VETERINARY PHARMACEUTICALS: POTENTIAL OCCUPATIONAL AND COMMUNITY HEALTH HAZARDS, 413

*Kelley J. Donham*

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.1</td>
<td>Introduction, 413</td>
<td>413</td>
</tr>
<tr>
<td>12.2</td>
<td>Background and Overview, 413</td>
<td>413</td>
</tr>
<tr>
<td>12.3</td>
<td>Veterinary Biologicals, 415</td>
<td>415</td>
</tr>
<tr>
<td>12.4</td>
<td>Antibiotics, 418</td>
<td>418</td>
</tr>
<tr>
<td>12.5</td>
<td>Hormones used for Growth Promotion, 427</td>
<td>427</td>
</tr>
<tr>
<td>12.6</td>
<td>Other Growth Promotors, 429</td>
<td>429</td>
</tr>
<tr>
<td>12.7</td>
<td>Hormones used in Veterinary Obstetrics, 429</td>
<td>429</td>
</tr>
<tr>
<td>12.8</td>
<td>Other Human Health Considerations of Veterinary Pharmaceuticals, 430</td>
<td>430</td>
</tr>
<tr>
<td>12.9</td>
<td>Summary, 430</td>
<td>430</td>
</tr>
<tr>
<td></td>
<td>References, 432</td>
<td>432</td>
</tr>
</tbody>
</table>

## 13 ZOONOTIC DISEASES: OVERVIEW OF OCCUPATIONAL HAZARDS IN AGRICULTURE, 437

*Kelley J. Donham*

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.1</td>
<td>Introduction, 437</td>
<td>437</td>
</tr>
<tr>
<td>13.2</td>
<td>Significance of Zoonotic Disease, 438</td>
<td>438</td>
</tr>
<tr>
<td>13.3</td>
<td>Forces Affecting Trends and Patterns of Zoonoses, 438</td>
<td>438</td>
</tr>
<tr>
<td>13.4</td>
<td>Historical Trends in Zoonoses, 441</td>
<td>441</td>
</tr>
<tr>
<td>13.5</td>
<td>Future Trends in Zoonoses, 441</td>
<td>441</td>
</tr>
<tr>
<td>13.6</td>
<td>General Epidemiologic Considerations of Zoonoses, 442</td>
<td>442</td>
</tr>
<tr>
<td>13.7</td>
<td>Classification of Zoonotic Infections, 442</td>
<td>442</td>
</tr>
<tr>
<td>13.8</td>
<td>Prevention, 444</td>
<td>444</td>
</tr>
<tr>
<td>13.9</td>
<td>Summary, 444</td>
<td>444</td>
</tr>
<tr>
<td></td>
<td>References, 462</td>
<td>462</td>
</tr>
</tbody>
</table>

## 14 INTERNATIONAL AGRICULTURAL SAFETY AND HEALTH, 465

*Kelley J. Donham*

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.1</td>
<td>Introduction, 465</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td><strong>Section A  Agricultural Medicine in South America – The Mercosur 4: Argentina, Brazil, Paraguay, and Uruguay, 466</strong></td>
<td></td>
</tr>
<tr>
<td>14.1A</td>
<td>Introduction, 466</td>
<td>466</td>
</tr>
<tr>
<td>14.2A</td>
<td>Types of Production and Processes, 466</td>
<td>466</td>
</tr>
<tr>
<td>14.3A</td>
<td>Culture and Demographics, 470</td>
<td>470</td>
</tr>
<tr>
<td>14.4A</td>
<td>The Demography of those Engaged in Agricultural Production, 471</td>
<td>471</td>
</tr>
<tr>
<td>14.6A</td>
<td>Support Professionals in Agriculture, 475</td>
<td>475</td>
</tr>
<tr>
<td>14.7A</td>
<td>Injuries and Illnesses in Farming Populations: Uruguay, Paraguay, and Brazil, 475</td>
<td></td>
</tr>
<tr>
<td>14.8A</td>
<td>Resources and Organizations in the M4, 477</td>
<td>477</td>
</tr>
</tbody>
</table>
Section B  Agricultural Medicine in Australia and New Zealand, 487
Susan Brumby

14.1B  Introduction, 487
14.2B  Differences in Types of Agricultural Systems, 488
14.3B  Working Characteristics, 488
14.4B  Agricultural Injuries and Illnesses, 489
14.5B  Occupational Health and Safety Legislation, 489
14.6B  Skin Cancer, 491
14.7B  Agricultural Health and Safety Resources, 491
14.8B  Conclusion, 492
References, 493

Section C  Agricultural Medicine in: The European Community, 495
Christina Lunner Kolstrup and Peter Lundqvist

14.1C  Introduction, 495
14.2C  Diversification of Agricultural Production in Europe, 495
14.3C  Differences in Types of Commodity Production and Processes Relative to North America, 496
14.4C  Differences in the Culture of the Workers, 497
14.5C  Differences in Agricultural Injury and Illness Statistics, 498
14.6C  Differences in Health and Safety Regulations, 499
14.7C  Differences in Resources for Agricultural Medicine, 500
14.8C  Special/unique Agricultural Illness or Injury Conditions, 500
References, 501

15  PREVENTION OF ILLNESS AND INJURY IN AGRICULTURE, 503
Kelley J. Donham

15.1  Introduction, 503
15.2  Barriers to Prevention Intervention, 504
15.3  A Hierarchy of Prevention Modalities, 507
15.4  Specialized Health and Safety Disciplines, 519
15.5  Multimodal Interventions, 525
15.6  Respiratory Disease Prevention in Swine Confinement Workers, 526
15.7  Sustainable Farm Families in Australia, 528
15.8  Farm-based Wellness Program, 528
15.9  Developing Comprehensive Prevention Programs, 528
15.10  Iowa Model of Integrated Multimodal Prevention Interventions, 528
15.11  Education to Facilitate Behavior Change, 529
15.12  Removal of Farm Health and Safety Hazards, 530
15.13  Development of Total Worker Health, 530
15.14  Summary, 530
Appendix A, 532
References, 545

INDEX, 551