



VOLUME ONE

ENCYCLOPEDIA OF TOXICOLOGY

SECOND EDITION

EDITED BY
FRANK W. OTTAWAY

ASSOCIATE EDITORS:
BRUCE S. BOYLAND
JOHN W. FOSTER
ROBERT D. GAC
FRANK J. FALCONE
ROBERT A. MARON
FRANK J. LUZZI
NATIONAL TOXICOLOGICAL CENTER
DAVID S. JONES
LEE S. HOFFMAN



CONTENTS

Volume 1

A

Aberrations of Chromosomes <i>see</i> Chromosome Aberrations	
Absorption <i>Jules Brodeur and Robert Tardif</i>	1
Acceptable Daily Intake (ADI) <i>Jaya Chilakapati and Harihara M Mehendale</i>	6
Accutane <i>Russell Barbare</i>	7
ACE Inhibitors <i>Henry A Spiller</i>	9
Acenaphthene <i>Sanjay Chanda and Harihara M Mehendale</i>	11
Acephate <i>Subramanya Karanth</i>	13
Acetaldehyde <i>John Sanseverino</i>	15
Acetamide <i>Gerald L Kennedy</i>	17
Acetaminophen <i>Kartik Shankar and Harihara M Mehendale</i>	18
Acetamiprid <i>David Wallace</i>	23
Acetic Acid <i>Sanjay Chanda</i>	25
Acetone <i>Lee R Shugart</i>	27
Acetonitrile <i>Heriberto Robles</i>	28
Acetylaminofluorene <i>Sanjay Chanda and Harihara M Mehendale</i>	31
Acetylcholine <i>Sanjay Chanda and Harihara M Mehendale</i>	33
Acetylcholinesterase <i>see</i> Cholinesterase Inhibition	
Acetylene <i>Ralph J Parod</i>	34
Acetylsalicylic Acid <i>Christopher P Holstege</i>	36
Acids <i>Sanjay Chanda</i>	38
Aconitium Species <i>Christine Stork and Jeanna Marraffa</i>	39
Acrolein <i>James M Garrison</i>	40
Acrylamide <i>Ralph J Parod</i>	42
Acrylates <i>see</i> Acrylic Acid; Ethyl Acrylate; Methyl Acrylate	
Acrylic Acid <i>Sanjay Chanda and Harihara M Mehendale</i>	45
Acrylonitrile <i>Raja S Mangipudy and Harihara M Mehendale</i>	46
Acute Toxicity <i>see</i> Toxicity, Acute	
Adiponitrile <i>Shashi Ramaiah and Harihara M Mehendale</i>	49
Aerosols <i>Raja S Mangipudy</i>	51
A-Esterases <i>Lester Grant Sultatos</i>	52
Aflatoxin <i>Raja S Mangipudy and Harihara M Mehendale</i>	54
Aggregate Exposures <i>Jeffrey H Driver</i>	55
Air Pollution <i>see</i> Pollution, Air	
Alachlor <i>Raja S Mangipudy and Harihara M Mehendale</i>	58
Alar <i>Raja S Mangipudy</i>	60
Albuterol <i>Samantha E Gad</i>	61
Alcoholic Beverages and Alcoholism <i>Kartik Shankar and Harihara M Mehendale</i>	62
Alcoholism <i>see</i> Alcoholic Beverages and Alcoholism	
Alcohols <i>see</i> Alcoholic Beverages and Alcoholism; Allyl Alcohol; Benzyl Alcohol; Ethanol	
Aldicarb <i>Paul R Harp</i>	64

Aldosterone	<i>see</i> Corticosteroids	
Aldrin	<i>Benny L Blaylock</i>	66
Algae	<i>Keiko Okamoto and Lora E Fleming</i>	68
Alkalies	<i>Sanjay Chanda and Harihara M Mehendale</i>	76
Alkyl Halides	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	77
Allergenicity Testing	<i>see</i> Toxicity Testing, Sensitization	
Allyl Alcohol	<i>Sharmilee P Sawant and Harihara M Mehendale</i>	80
Allyl Formate	<i>Sharmilee P Sawant and Harihara M Mehendale</i>	81
Aluminum	<i>Abbi Heilig</i>	82
Aluminum Phosphide	<i>Christopher H Day</i>	84
Amanitin, α -	<i>see</i> Mushrooms, Cyclopeptide	
Amdro	<i>Jamaluddin Shaikh</i>	87
Ames Test	<i>Robin C Gwy</i>	88
Aminobiphenyl, 4-	<i>Heriberto Robles</i>	92
Aminoglycosides	<i>Abraham Dalu</i>	93
Aminopyridine, 4-	<i>David Roane</i>	96
Amiodarone	<i>Elizabeth J Scharman</i>	98
Amtraz	<i>Jamaluddin Shaikh</i>	99
Amitroptyline	<i>see</i> Tricyclic Antidepressants	
Ammonia	<i>Ralph J Parod</i>	101
Ammonium Nitrate	<i>Prathibha S Rao</i>	103
Ammonium Perchlorate	<i>Joan Strawsen</i>	105
Amobarbital	<i>see</i> Barbiturates, Short-Acting	
Amphetamine	<i>Michael Wahl</i>	108
Amphibians	<i>Prathibha S Rao</i>	109
Amaranth	<i>see</i> Red Dye No. 2	
Amyl Nitrite	<i>Michael Wahl</i>	110
Anabolic Steroids	<i>Sharmilee P Sawant and Harihara M Mehendale</i>	111
Analytical Toxicology	<i>Shayne C Gad</i>	113
Ancient Warfare and Toxicology	<i>Adrienne Mayor</i>	117
Androgens	<i>Prathibha S Rao and Harihara M Mehendale</i>	121
Anesthetic Agents	<i>Jeffrey W Allen</i>	125
Aneuploidy	<i>David A Eastmond</i>	134
Angiotensin-Converting Enzyme Inhibitors	<i>see</i> ACE Inhibitors	
Aniline	<i>Shayne C Gad</i>	136
Animal Models	<i>Shayne C Gad</i>	138
Animal Testing Alternatives	<i>see</i> Toxicity Testing, Alternatives	
Animals, Poisonous and Venomous	<i>Teresa Dodd-Butera and Molly Broderick</i>	140
Antagonism	<i>see</i> Chemical Interactions	
Anthracene	<i>Prathibha S Rao</i>	144
Anthrax	<i>Kartik Shankar and Harihara M Mehendale</i>	145
Anticholinergics	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	146
Antimony	<i>Shayne C Gad</i>	148
Antimony Trioxide	<i>Shayne C Gad</i>	150
Anxiolytics	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	151
Apoptosis	<i>Sidhartha D Ray and Harihara M Mehendale</i>	153
Aquatic Ecotoxicology	<i>see</i> Ecotoxicology, Aquatic	
Aquatic Toxicity Testing	<i>see</i> Toxicity Testing, Aquatic	

Aramite	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	167
Arsenic	<i>Robert Kapp</i>	168
Arsenical Vomiting Agents	<i>Harry Salem, Bryan Ballantyne and Sidney A Katz</i>	171
Arsine	<i>Felix Ayala-Fierro</i>	173
Arts and Crafts Materials and Processes	<i>Angelique Dosh</i>	176
Arts and Toxicology	<i>see Toxicology in the Arts, Culture, and Imagination</i>	
Arum	<i>Susan M Stejskal</i>	178
Asbestos	<i>Xuannga Mabini</i>	179
Ascorbic Acid	<i>John Sanseverino</i>	182
Aspartame	<i>Robin C Guy</i>	184
Aspirin	<i>see Acetylsalicylic Acid</i>	
Astemizole	<i>Michael D Reed</i>	187
Atrazine	<i>Jing Liu</i>	188
Atropine	<i>Amanda Lofton</i>	190
Avermectins	<i>Katherine K Williamson</i>	192
Avian Ecotoxicology	<i>see Ecotoxicology, Avian</i>	
Azamethiphos	<i>Jason R Richardson</i>	195
Azathioprine	<i>Eric M Silberhorn</i>	196
Azinphos-Methyl	<i>Subramanya Karanth</i>	200
B		
<i>Bacillus cereus</i>	<i>Lee R Shugart</i>	203
<i>Bacillus thuringiensis</i>	<i>Eric M Silberhorn</i>	204
BAL (British Antilewisite)	<i>Sharmilee P Sawant and Harihara M Mehendale</i>	206
Baneberry	<i>Rebeca Gracia</i>	208
Barbiturates, Long-Acting	<i>Alexander B Baer and Christopher P Holstege</i>	209
Barbiturates, Short-Acting	<i>Alexander B Baer and Christopher P Holstege</i>	211
Barium	<i>Shayne C Gad</i>	213
Bases	<i>see Alkalies</i>	
Batrachotoxin	<i>John P Dumbacher</i>	215
Baycol	<i>Shayne C Gad</i>	217
BCNU (Bischloroethyl Nitrosourea)	<i>Madhusudan G Soni</i>	219
Bee	<i>see Hymenoptera</i>	
Behavioral Toxicity Testing	<i>see Toxicity Testing, Behavioral</i>	
Behavioral Toxicology	<i>Deborah A Cory-Slechta</i>	221
Belladonna Alkaloids	<i>Madhusudan G Soni</i>	244
Benchmark Dose	<i>Qiyu Jay Zhao</i>	246
Benomyl	<i>Jamaluddin Shaikh</i>	248
Benz[a]anthracene	<i>Madhusudan G Soni</i>	250
Benzene	<i>Stephen R Clough</i>	251
Benzene Hexachloride, Mixed Isomers	<i>Madhusudan G Soni</i>	253
Benzenedicarboxylic Acid, 1-2	<i>see Phthalate Ester Plasticizers</i>	
Benzidine	<i>C Vaman Rao</i>	255
Benzo(a)pyrene	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	257
Benzodiazepines	<i>Christopher P Holstege</i>	260
Benzyl Alcohol	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	262
Benzyl Benzoate	<i>Jamaluddin Shaikh</i>	264
Beryllium	<i>Shayne C Gad</i>	265

Beta Blockers	<i>Michael Wahl</i>	267
Bhopal	<i>Pallavi B Limaye and Harihara M Mehendale</i>	269
Biguanides	<i>C Vaman Rao</i>	271
Bio Warfare and Terrorism: Toxins and Other Mid-Spectrum Agents	<i>James M Madsen</i>	273
Biocides	<i>Amy Merricle</i>	279
Biocompatibility	<i>Samantha E Gad</i>	280
Bioinformatics	<i>Kartik Shankar and Harihara M Mehendale</i>	285
Biological Exposure Index	<i>Alan J Weinrich</i>	286
Biomarkers, Environmental	<i>Lee R Shugart</i>	287
Biomarkers, Human Health	<i>Rogene F Henderson</i>	290
Biomonitoring	<i>Chris Theodorakis</i>	294
Bioremediation	<i>Lee R Shugart</i>	297
Biotransformation	<i>Tanya C McCarthy and Christopher J Sinal</i>	299
Bis-Chloromethyl Ether <i>see</i> Chloromethyl Ether, Bis-		
Bismuth	<i>Shayne C Gad</i>	312
Bisphenol A	<i>Alan L Blankenship and Katie Coady</i>	314
Black Widow Spider <i>see</i> Spider, Black Widow		
Bleach	<i>Julie Weber</i>	317
Blister Agents/Vesicants	<i>Harry Salem and Frederick R Sidell</i>	319
Blood	<i>Gary R Krieger and Scott D Philips</i>	323
Blue-Green Algae <i>see</i> Algae		
Boric Acid	<i>Michael Wahl</i>	329
Boron	<i>William S Utley</i>	331
Botulinum Toxin	<i>Fermin Barrueto Jr.</i>	332
Bovine Spongiform Encephalopathy (Mad Cow Disease)	<i>Todd Canedy</i>	334
Brodifacoum	<i>Henry A Spiller</i>	335
Bromadiolone	<i>KS Rao</i>	338
Bromethalin	<i>Eric M Silberhorn</i>	340
Bromine	<i>Sanjay Chanda and Harihara M Mehendale</i>	342
Bromobenzene	<i>William S Utley</i>	344
Bromoform	<i>William S Utley</i>	345
Bromotrichloromethane	<i>Midhun C Korrapati and Harihara M Mehendale</i>	347
Brown Recluse Spider <i>see</i> Spider, Brown Recluse		
BSE <i>see</i> Bovine Spongiform Encephalopathy (Mad Cow Disease)		
Buckthorn	<i>Christopher P Holstege</i>	349
Busulfan	<i>Matthew Janes</i>	350
Butadiene, 1,3-	<i>Ralph J Parod</i>	353
Butane	<i>Michael A Kamrin</i>	355
Butter Yellow	<i>Kashyap N Thakore</i>	356
Butyl Ether	<i>Heriberto Robles</i>	358
Buryl Nitrite	<i>Kashyap N Thakore</i>	359
Burylamines	<i>Janice McKee</i>	360
Butylated Hydroxyanisole	<i>Kashyap N Thakore</i>	364
Butylated Hydroxytoluene	<i>Kashyap N Thakore</i>	365
Butyraldehyde, <i>n</i> -	<i>Sanjay Chanda and Harihara M Mehendale</i>	367
Butyric Acid	<i>James Deyo</i>	368
Butyronitrile	<i>Carey N Pope</i>	370
Butyrophenones	<i>Jaya Chilakapati and Harihara M Mehendale</i>	372
BZ	<i>Harry Salem</i>	373

C

Cadmium	<i>Shayne C Gad</i>	375
Caffeine	<i>Christopher P Holstege</i>	377
Calcium Channel Blockers	<i>Shayne C Gad</i>	379
Calomel	<i>Kashyap N Thakore</i>	381
Camphor	<i>Fermin Barrueto Jr.</i>	382
Cancer	<i>see</i> Carcinogenesis	
Cancer Chemotherapeutic Agents	<i>David S Fischer</i>	384
Cancer Potency Factor	<i>Anna M Fan</i>	401
Cannabinoids	<i>Jaya Chilakapati and Harihara M Mehendale</i>	405
Cannabis	<i>see</i> Cannabinoids	
Captafol	<i>Priya Raman</i>	407
Captan	<i>Xun Song</i>	409
Carbamate Pesticides	<i>Stephanie Padilla</i>	410
Carbamazepine	<i>Henry A Spiller</i>	413
Carbaryl	<i>Paul R Harp</i>	414
Carbofuran	<i>Xun Song</i>	417
Carbon Dioxide	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	419
Carbon Disulfide	<i>Christopher H Day</i>	420
Carbon Monoxide	<i>Christine Stork and Deborah Anguish</i>	423
Carbon Tetrabromide	<i>Kashyap N Thakore and Harihara M Mehendale</i>	425
Carbon Tetrachloride	<i>Thomas R Parker, Robert Howd and Hierberto Robles</i>	426
Carbonyl Sulfide	<i>Amy Merrice</i>	428
Carboxylesterases	<i>Ramesh C Gupta</i>	432
Carcinogen Classification Schemes	<i>Michael A Kamrin</i>	435
Carcinogen-DNA Adduct Formation and DNA Repair	<i>Ainsley Weston and Miriam C Poirier</i>	440
Carcinogenesis	<i>David E Malarkey and Robert R Maronpot</i>	445
Carcinogenicity Toxicity Testing	<i>see</i> Toxicity Testing, Carcinogenesis	
Cardiovascular System	<i>Arthur Penn and Gleeson Murphy</i>	467
Castor Bean	<i>Brenda Swanson-Bearman</i>	486
Catecholamines	<i>Zhengwei Cai</i>	487
CCA-Treated Wood	<i>C Charles Barton and Thomas T Newton</i>	489
Cell Cycle	<i>Vishal S Vaidya, Alice M Sheridan and Harihara M Mehendale</i>	490
Cell Proliferation	<i>Sanjay Chanda and Harihara M Mehendale</i>	495
Centipedes	<i>Elizabeth J Scharman</i>	499
Cephalosporins	<i>Shayne C Gad</i>	500
Cerium	<i>Shayne C Gad</i>	502
Cesium	<i>Shayne C Gad</i>	503
Channel Blockers	<i>see</i> Calcium Channel Blockers	
Charcoal	<i>William S Utley</i>	505
Chemical Hazard Communication and Material Safety Data Sheets	<i>Michele R Sullivan and Patricia M Nance</i>	505
Chemical Interactions	<i>Carey N Pope</i>	515
Chemical Mixtures, Toxicology and Risk Assessment	<i>see</i> Mixtures, Toxicology and Risk Assessment	
Chemical Warfare Agents	<i>see</i> Anthrax; Arsenical Vomiting Agents; Bio Warfare and Terrorism: Toxins and Other Mid-Spectrum Agents; Blister Agents/Vesicants; Botulinum Toxin; BZ; Chlorine	
Chemical Warfare Delivery Systems	<i>Thomas Cain and George O Bizzigotti</i>	516
Chemical Warfare During WW1	<i>George O Bizzigotti</i>	523

Chemicals of Environmental Concern	<i>Steve J D'Surney and Mike D Smith</i>	526
Chemical-Specific Adjustment Factor (CSAF)	<i>Bette Meek</i>	530
Chemotherapeutic Agents	<i>see Cancer Chemotherapeutic Agents</i>	
Chernobyl	<i>Amy Bickham Baird and Ronald K Chesser</i>	533
Chloral Hydrate	<i>Michael Wahl</i>	535
Chlorambucil	<i>Larry J Dziuk</i>	536
Chloramphenicol	<i>Greene Shepherd</i>	538
Chlordane	<i>Benny L Blaylock</i>	540
Chlordecone	<i>Harihara M Mehendale and Zhengwei Cai</i>	542
Chlordimeform	<i>Paul R Harp</i>	544
Chlorination By-Products	<i>S Satheesh Anand and Harihara M Mehendale</i>	546
Chlorine	<i>Sanjay Chanda and Harihara M Mehendale</i>	553
Chlorine Dioxide	<i>Zhengwei Cai</i>	555
Chlorobenzene	<i>Linda A Malley</i>	556
Chloroethyl Sulfide, Bis-2	<i>see Mustard Gas</i>	
Chlorobenzilate	<i>David Janz</i>	559
Chloroform	<i>Anna M Fan</i>	561
Chloromethyl Ether, Bis-	<i>C Vaman Rao</i>	565
Chlorophenols	<i>Murali Badanthadka and Harihara M Mehendale</i>	567
Chlorophenoxy Herbicides	<i>Subramanya Karanth</i>	569
Chloropicrin	<i>Priya Raman</i>	571
Chloroquine	<i>F Lee Cantrell</i>	573
Chloroethalonil	<i>Priya Raman</i>	574
Chlorpheniramine	<i>Brenda Swanson-Biearman</i>	577
Chlorpromazine	<i>Linda A Malley</i>	578
Chlorpyrifos	<i>Anuradha Nallapaneni and Carey N Pope</i>	583
Chlorzoxazone	<i>Kashyap N Thakore and Harihara M Mehendale</i>	585
Cholesterol	<i>Brad Hirakawa</i>	586
Choline	<i>Brad Hirakawa</i>	587
Cholinesterase Inhibition	<i>Barry W Wilson</i>	588
Cholinesterases	<i>see Cholinesterase Inhibition</i>	
Chromated Copper Arsenate	<i>see CCA-Treated Wood</i>	
Chromium	<i>Abbi Heilig</i>	600
Chromium Hexavalent Compounds	<i>Robert Kapp</i>	602
Chromosome Aberrations	<i>Antone L Brooks</i>	606
Chronic Toxicity	<i>see Toxicity, Chronic</i>	
Chrysene	<i>Linda A Malley</i>	607
Ciguatoxin	<i>David Elridge and Christopher P Holstege</i>	610
Cimetidine	<i>Michael D Reed</i>	611
Ciprofloxacin	<i>Teresa Dodd-Butera and Molly Broderick</i>	613
Cisplatin	<i>Linda A Malley</i>	614
Clean Air Act (CAA), US	<i>Robert Kapp</i>	616
Clean Water Act (CWA), US	<i>Robert Kapp</i>	618
Clinical Chemistry	<i>Shayne C Gad</i>	620
Clofibrate	<i>Sanjay Chanda and Harihara M Mehendale</i>	622
Clonidine	<i>Elizabeth J Scharman</i>	623
<i>Clostridium perfringens</i>	<i>Lee R Shugart</i>	625
CN Gas	<i>Harry Salem, Bryan Ballantyne and Sidney A Katz</i>	626
Coal Tar	<i>Richard D Phillips</i>	628
Cobalt	<i>Shayne C Gad</i>	631
Cocaine	<i>Michael Wahl</i>	632

Codeine	<i>F Lee Cantrell</i>	634
Coke Oven Emissions	<i>Shashi K Ramaiah and Harihara M Mehendale</i>	635
Colchicine	<i>Henry A Spiller</i>	638
Combustion Toxicology	<i>Barbara C Levin and Erica D Kuligowski</i>	639
Common Mechanism of Toxicity	<i>Beth Mileson</i>	653
Comprehensive Environmental Response, Compensation, and Liability Act, US	<i>Robert Kapp</i>	654
Computational Toxicology	<i>S Satheesh Anand and Harihara M Mehendale</i>	656
Conine	<i>Murali Badanthadka and Harihara M Mehendale</i>	660
Consumer Products	<i>Nancy Linde</i>	661
Copper	<i>Shayne C Gad</i>	665
Coprine	<i>see</i> Mushrooms, Coprine	
Corrosives	<i>Greene Shepherd</i>	668
Corticosteroids	<i>Prathibha S Rao</i>	669
Corticosterone	<i>see</i> Corticosteroids	
Cortisone	<i>see</i> Corticosteroids	
Cosmetics and Personal Care Products	<i>Paul Sterchele</i>	671
Cotinine	<i>Sanjay Chanda and Harihara M Mehendale</i>	673
Coumarins	<i>Betsy D Carlton</i>	674
Crafts Materials	<i>see</i> Arts and Crafts Materials and Processes	
Creosote	<i>William S Utley</i>	677
Cresols	<i>Murali Badanthadka and Harihara M Mehendale</i>	678
Criminal Enforcement of Environmental Laws	<i>Grant R Trigger</i>	680
Cromolyn	<i>F Lee Cantrell</i>	685
Crude Oil	<i>see</i> Oil, Crude	
CS Gas	<i>Harry Salem, Bryan Ballantyne and Sidney A Katz</i>	686
Culture and Toxicology	<i>see</i> Toxicology in the Arts, Culture, and Imagination	
Cumene	<i>Ralph Gingell</i>	690
Cumulative Risk Assessment	<i>Jeffrey H Driver</i>	693
Curare	<i>Susan M Stejskal</i>	694
Cuyahoga River	<i>Lee R Shugart</i>	695
Cyanamide	<i>Leonard I Sweet</i>	696
Cyanide	<i>Zhengwei Cai</i>	698
Cyanogen Chloride	<i>Leonard I Sweet</i>	701
Cyclodienes	<i>Benny L Blaylock</i>	703
Cyclohexamide	<i>Midhun C Korrapati and Harihara M Mehendale</i>	704
Cyclohexane	<i>Samantha E Gad</i>	705
Cyclohexene	<i>Patricia J Beattie</i>	707
Cyclopeptide	<i>see</i> Mushrooms, Cyclopeptide	
Cyclophosphamide	<i>Greene Shepherd</i>	709
Cyclosporine	<i>Teresa Dodd-Butera and Molly Broderick</i>	711
Cyfluthrin	<i>Subramanya Karanth</i>	713
Cypermethrin	<i>Paul R Harp</i>	714
Cysteine, N-Acetyl-L	<i>Stephen R Clough</i>	716
Cytochrome P-450	<i>Kartik Shankar and Harihara M Mehendale</i>	718
D		
2,4-D (2,4-Dichlorophenoxy Acetic Acid)	<i>Raja S Mangipudy and Harihara M Mehendale</i>	721
Dalapon	<i>Priya Raman</i>	723

DDT (Dichlorodiphenyltrichloroethane)	<i>Benny L Blaylock</i>	725
Decane	<i>Stephen R Clough</i>	727
DEET (Diethyltoluamide)	<i>Mark L Winter</i>	728
DEF (Butyl Phosphorotrithioate)	<i>Priya Raman</i>	730
Deferoxamine	<i>Greene Shepherd</i>	731
DEHP (Di-Ethyl Hexyl Phthalate)	<i>Raja S Mangipudy and Harihara M Mehendale</i>	733
Delaney Clause	<i>Robin C Guy</i>	735
Deltamethrin	<i>Paul R Harp</i>	736
Deodorants and Antiperspirants	<i>Zhengwei Cai and Pertti J Hakkinen</i>	737
Deoxyribonucleic Acid	<i>see Aneuploidy; Carcinogen-DNA Adduct Formation and DNA Repair; Chromosome Aberrations; DNA Phosphoramidites; Genetic Toxicology; Genomics, Toxicogenomics</i>	
Dermal Toxicity Testing	<i>see Toxicity Testing, Dermal</i>	
Desferrioxamine	<i>see Deferoxamine</i>	
Desipramine	<i>see Tricyclic Antidepressants</i>	
Detergent	<i>Zhengwei Cai and Pertti J Hakkinen</i>	739
Development Toxicity Testing	<i>see Toxicity Testing, Developmental</i>	
Developmental Toxicology	<i>Calvin C Willhite and Philip E Mirkes</i>	742
Dextromethorphan	<i>Michael Wahl</i>	780
Diabetes, Effect of Toxicity	<i>Kartik Shankar and Harihara M Mehendale</i>	781
Diazepam	<i>Teresa Dodd-Butera and Molly Broderick</i>	783
Diazinon	<i>Subramanya Karanth</i>	785
Diazoaminobenzene	<i>Ruth Custance and Cathy Villaroman</i>	787
Diazoxide	<i>William S Utley</i>	789
Dibenz[<i>a,h</i>]anthracene	<i>William S Utley</i>	790
Dibenzofuran	<i>Kashyap N Thakore and Harihara M Mehendale</i>	791
Dibromochloropropane	<i>Mark L Winter</i>	793
Dibutyl Ether	<i>see Diethyl Ether</i>	

Volume 2

Dibutyl Phthalate	<i>David R Wallace</i>	1
Dicamba	<i>Xun Song</i>	2
Dichlone	<i>Xun Song</i>	4
Dichlorobenzene	<i>Elmar Udarbe Zamora</i>	5
Dichloroethanes	<i>Madhusudan G Soni and Harihara M Mehendale</i>	7
Dichloroethylene, 1,2-	<i>Sachin S Devi and Harihara M Mehendale</i>	9
Dichloropropene, 1,3-	<i>Jing Liu</i>	11
Dichlorvos	<i>Nikita Mirajkar and Carey N Pope</i>	13
Dieldrin	<i>Benny L Blaylock</i>	15
Diesel Exhaust	<i>Kathryn A Wurzel</i>	17
Diesel Fuel	<i>Shayne C Gad</i>	19
Dietary Restriction	<i>Udayan M Apte and Harihara M Mehendale</i>	22
Dietary Supplements	<i>Abbi Heilig</i>	28
Diethyl Ether	<i>Angelica Becaria</i>	33
Diethylamine	<i>Janice McKee</i>	34
Diethylene Glycol	<i>Lu Yu</i>	36
Diethylstilbestrol	<i>Xuannga Mahini</i>	38
Diflubenzuron	<i>Nili Jin</i>	42
Difluoroethylene, 1,1-	<i>Kashyap N Thakore and Harihara M Mehendale</i>	43

Digitalis Glycosides	<i>Michael Wahl</i>	45
Dimethoate	<i>Nikita Mirajkar and Carey N Pope</i>	47
Dimethyl Ether	<i>Gerald L Kennedy</i>	49
Dimethyl Sulfoxide	<i>Samantha E Gad</i>	51
Dimethylaminoazobenzene	<i>Heriberto Robles</i>	53
Dimethylmercury	<i>Diem HaMai and Stephen C Bondy</i>	55
Dinitroanilines	<i>Robert A Young</i>	57
Dinitrophenols	<i>David Janz</i>	59
Dinitrotoluene	<i>Robert A Young</i>	60
Dinoseb	<i>Priya Raman</i>	63
Diocrylphthalate	<i>Robert A Young</i>	65
Dioxane, 1,4-	<i>Julie A Stickney and Eric M Silberhorn</i>	67
Dioxins	<i>Robert A Young</i>	70
Diphenhydramine	<i>Michael Wahl</i>	72
Diphenoxylate	<i>Alexander B Baer and Christopher P Holstge</i>	73
Diphenylhydrazine	<i>Robert A Young</i>	75
Diphosgene	<i>Fu-Min Menn</i>	76
Diquat	<i>Carey N Pope</i>	78
Disc Batteries	<i>Toby Litovitz</i>	80
Distribution	<i>Jules Brodeur and Robert Tardif</i>	81
Disulfiram	<i>F Lee Cantrell</i>	84
Disulfoton	<i>Jamaluddin Shaikh</i>	85
Dithiocarbamates	<i>David Janz</i>	86
Diuron	<i>Jing Liu</i>	89
DNA <i>see</i> Aneuploidy; Carcinogen-DNA Adduct Formation and DNA Repair; Chromosome Aberrations; DNA Phosphoramidites; Genetic Toxicology; Genomics, Toxicogenomics; Molecular Toxicology-Recombinant DNA Technology; Toxicity Testing, Mutagenicity		
DNA Adduct <i>see</i> Carcinogen-DNA Adduct Formation and DNA Repair		
DNA Phosphoramidites	<i>Sang-Tae Kim</i>	90
DNA Repair <i>see</i> Carcinogen-DNA Adduct Formation and DNA Repair		
Dominant Lethal Tests	<i>Samantha E Gad</i>	92
Donora: Air Pollution Episode	<i>Michael A Kamrin</i>	93
Dose-Response Relationship	<i>Samantha E Gad</i>	95
Drinking Water Criteria	<i>Betty J Locey</i>	99
Drugs of Abuse	<i>Molly Broderick and Teresa Dodd-Butera</i>	102
Dyes	<i>Christophe J Le Coz</i>	104
E		
<i>E. coli</i> (<i>Escherichia coli</i>)	<i>Lee R Shugart</i>	115
<i>Echinacea</i>	<i>Lee R Shugart</i>	116
Ecotoxicology	<i>Chris Theodorakis</i>	117
Ecotoxicology, Aquatic	<i>Yuan Zhao and Michael C Newman</i>	120
Ecotoxicology, Avian	<i>Pierre Mineau</i>	121
Ecotoxicology, Genetic	<i>Wendy L Rose and Susan L Anderson</i>	126
Ecotoxicology, Invertebrate	<i>Pawel J Migula</i>	133
Ecotoxicology, Terrestrial	<i>Anne Fairbrother and Bruce Hope</i>	138
Ecotoxicology, Wildlife	<i>Richard S Halbrook</i>	143
EDTA (Ethylenediaminetetraacetic Acid)	<i>C Charles Barton and Haribara M Mehendale</i>	147
Education and Careers in Toxicology <i>see</i> Toxicology, Education and Careers		

Effluent Biomonitoring	<i>Peter G Meier, Leonard I Sweet and Kyungho Choi</i>	148
Electromagnetic Fields	<i>CF del Pozo</i>	155
Emergency Response and Preparedness	<i>Glenn C Millner, Patrick M Brady and Thomas L Murta</i>	158
Endocrine System	<i>Karen Chou</i>	170
Endosulfan	<i>Elmar Udarbe Zamora</i>	174
Endrin	<i>Benny L Blaylock</i>	176
Environmental Advocacy in the United States	<i>Peter Montague and Maria B Pellerano</i>	178
Environmental Change	<i>see Global Environmental Change</i>	
Environmental Health	<i>Chris Theodorakis</i>	202
Environmental Hormone Disruptors	<i>Lorenz Rhomberg and Mara Seeley</i>	205
Environmental Processes	<i>Chris Theodorakis</i>	208
Environmental Toxicology	<i>Chris Theodorakis</i>	210
Eosinophilia-Myalgia Syndrome	<i>Ken Kulig</i>	212
Ephedra	<i>Vishal S Vaidya and Harihara M Mehendale</i>	223
Ephedrine	<i>see Speed</i>	
Epichlorohydrin	<i>Brad Hirakawa</i>	228
Epidemiology	<i>Shayne C Gad</i>	230
Epinephrine	<i>see Catecholamines</i>	
Ergot	<i>Christopher P Holstege</i>	235
Erionite	<i>A Umran Dogan, Meral Dogan and Salih Emri</i>	237
Erythromycin	<i>Michael D Reed</i>	242
Estrogens I: Estrogens and Their Conjugates	<i>James L Wittliff and Sarah A Andres</i>	244
Estrogens II: Catechol Estrogens	<i>James L Wittliff, Sarah A Andres and D Alan Kerr II</i>	248
Estrogens III: Phytoestrogens and Mycoestrogens	<i>James L Wittliff, Sarah A Andres, and D Alan Kerr II</i>	251
Estrogens IV: Estrogen-Like Pharmaceuticals	<i>James L Wittliff, D Alan Kerr II and Sarah A Andres</i>	254
Estrogens V: Xenoestrogens	<i>James L Wittliff, D Alan Kerr II and Sarah A Andres</i>	258
Ethane	<i>Stephen R Clough</i>	262
Ethanol	<i>Bradford H Strohm and Leonard I Sweet</i>	263
Ethanolamine	<i>William Stott</i>	266
Ethchlorvynol	<i>S Rutherford Rose</i>	270
Ethene	<i>Patricia J Beattie</i>	271
Ether	<i>see Diethyl Ether</i>	
Ethionine	<i>Fu-Min Mem</i>	273
Ethoxyethanol	<i>Brad Stanard</i>	274
Ethyl Acetate	<i>Dale J Marino</i>	277
Ethyl Acrylate	<i>Ralph J Parod</i>	279
Ethyl Benzene	<i>William S Utley</i>	282
Ethyl Bromide	<i>Kathryn A Wurzel</i>	283
Ethylamine	<i>Dale J Marino</i>	285
Ethylene Glycol	<i>Christopher P Holstege</i>	287
Ethylene Glycol Monoethyl Ether	<i>Christopher P Holstege</i>	289
Ethylene Glycol Mono-n-Butyl Ether	<i>Bradford H Strohm, Leonard I Sweet, Sharmilee P Sawant and Harihara M Mehendale</i>	290
Ethylencimine	<i>Shayne C Gad</i>	293
Ethylene Oxide	<i>Ralph J Parod</i>	294
EU	<i>see European Union and Its European Commission</i>	
Excretion	<i>Jules Brodeur and Robert Tardif</i>	297
Exposure	<i>Gary Whitmyre and Sam Kacew</i>	300

Exposure Assessment	<i>Gary Whitmyre and Jeffrey H Driver</i>	303
Exposure Criteria	<i>Andrew Maier</i>	306
Exxon Valdez	<i>Michael A Kamrin, Pallavi B Limaye and Harihara M Mehendale</i>	310
Eye Irritancy Testing	<i>Samantha E Gad</i>	313

F

FAO	<i>see</i> Food and Agriculture Organization of the United Nations	
Federal Insecticide, Fungicide, and Rodenticide Act, US	<i>Chris F Wilkinson and Michael A Kamrin</i>	321
Female Reproductive System	<i>see</i> Reproductive System, Female	
Fentanyl	<i>Amanda Lofton</i>	322
Fentanyl Derivatives, Illicit	<i>Amanda Lofton</i>	324
Fenthion	<i>Andrew M Geller</i>	325
Fenvalerate	<i>Betty J Loeyer and Janice Reeves</i>	328
Fetal Alcohol Syndrome	<i>Kartik Shankar and Harihara M Mehendale</i>	330
Fexofenadine	<i>Stephen R Clough</i>	332
Fipronil	<i>Xilong Zhao</i>	334
Fish Consumption Advisory	<i>John L Hesse</i>	337
Flame Retardants	<i>see</i> Polybrominated Diphenyl Ethers (PBDEs)	
Fluometuron	<i>Elmar Udarbe Zamora</i>	340
Fluoride	<i>Greene Shepherd</i>	342
Fluorine	<i>Robert Kapp</i>	343
Fluoxetine	<i>Rebeca Gracia</i>	347
Folic Acid	<i>Diana Ku</i>	348
Folpet	<i>Paul R Harp</i>	349
Food	<i>see</i> Dietary Restriction; Dietary Supplements; Food Additives; Food Quality Protection Act, US; Food Safety and Toxicology; Food, Drug, and Cosmetic Act, US; Food and Agriculture Organization of the United Nations; Genetically Engineered Foods; Monosodium Glutamate	
Food Additives	<i>James C Griffiths and Joseph F Borzelleca</i>	351
Food Additives: Joint FAO/WHO Expert Committee	<i>see</i> Joint FAO/WHO Expert Meetings (JECFA and JMPR)	
Food Quality Protection Act, US	<i>Patricia M Nance</i>	357
Food Safety and Toxicology	<i>Michael Bolger and Clark D Carrington</i>	359
Food, Drug, and Cosmetic Act, US	<i>Robert Kapp</i>	365
Foreign Body Response	<i>Shayne C Gad</i>	367
Forensic Toxicology	<i>Felix K Adatsi</i>	369
Formaldehyde	<i>Kathryn J Kehoe</i>	375
Formamide	<i>Gerald L Kennedy</i>	377
Formic Acid	<i>Heriberto Robles</i>	378
Foxglove	<i>Fermin Barrueto Jr.</i>	380
Fragrances and Perfumes	<i>Anne Marie Api and Pertti J Hakkinen</i>	382
Freons	<i>Kathryn A Wurzel</i>	384
Fuel Oils	<i>Richard D Phillips</i>	385
Fuel Oxygenates	<i>Ann de Peyster</i>	387
Furan	<i>Heriberto Robles</i>	392
Furfural	<i>Richard A Parent</i>	394

G

Galactosamine	<i>Udayan M Apte and Harihara M Mehendale</i>	399
Gallium	<i>Shayne C Gad</i>	400

Gap Junctional Intercellular Communication in Epigenetic Toxicity	<i>James E Trosko and Randall J Ruch</i>	402
Gasoline	<i>Michael A Kamrin</i>	408
Gastrointestinal System	<i>M Joseph Fedoruk and Tee L Guidotti</i>	410
Generally Recognized as Safe (GRAS)	<i>Samantha E Gad</i>	417
Genetic Ecotoxicology	<i>see Ecotoxicology, Genetic</i>	
Genetic Toxicology	<i>Joseph R Landolph</i>	421
Genetically Engineered Foods	<i>William Frez</i>	432
Genetically Modified Organisms	<i>see Genetically Engineered Foods</i>	
Genomics, Toxicogenomics	<i>Kartik Shankar and Harihara M Mehendale</i>	438
GF	<i>Harry Salem and Frederick R Sidell</i>	439
GI Tract	<i>see Gastrointestinal System</i>	
Ginger Jake	<i>Robin C Guy</i>	441
Ginseng	<i>Michael Wahl</i>	443
Global Environmental Change	<i>Thomas Wilbanks</i>	444
Global Warming	<i>see Global Environmental Change</i>	
Glutathione	<i>Shayne C Gad</i>	446
Glutethimide	<i>Rebeca Gracia</i>	447
Glyceraldehyde	<i>Stephen R Clough</i>	448
Glycerol	<i>Kathryn A Wurzel</i>	449
Glycol Ethers	<i>Linda A Malley</i>	451
Glyphosate	<i>Kevin N Baer</i>	455
Gold	<i>Shayne C Gad</i>	456
Good Clinical Practice (GCP)	<i>Sharmilee P Sawant and Harihara M Mehendale</i>	457
Good Laboratory Practices (GLP)	<i>Robin C Guy</i>	460
Grain Incidents and Other Mercury Tragedies: Forms, Fate, and Effects	<i>Sandip Chattopadhyay</i>	464
Great Smog of London	<i>Yvonne R Rodriguez</i>	469
Green Chemistry	<i>Richard E Engler</i>	471
G-Series Nerve Agents	<i>Harry Salem</i>	473
Guaifenesin	<i>Brenda Swanson-Bearman</i>	473
H		
Hair	<i>Pertti J Hakkinen</i>	475
Hallucinogens	<i>see LSD (Lysergic Acid Diethylamide); Belladonna Alkaloids.</i>	
Harmonization	<i>Carolyn Vickers</i>	477
Hazard Identification	<i>Michael A Kamrin</i>	479
Hazard Ranking	<i>Andrew Maier and Charley Pittinger</i>	481
Hazardous Chemicals, Import/Export of	<i>Marjorie Collins</i>	483
Hazardous Waste	<i>Kristin M Fitzgerald</i>	487
Health Assessments	<i>C Charles Barton and Alan G Parham</i>	490
Hearing	<i>see Sensory Organs</i>	
Heat Shock Proteins	<i>Kartik Shankar and Harihara M Mehendale</i>	494
Helium	<i>Mary Lee Hultin</i>	494
Hemlock, Poison	<i>Michael Wahl</i>	496
Hemlock, Water	<i>Michael Wahl</i>	496
Hemocompatibility	<i>Kathleen Rodgers</i>	497
Heparin	<i>David Eldridge and Christopher P Holstege</i>	500
Hepatotoxicology	<i>see Liver</i>	

Heptachlor	<i>Benny L. Blaylock</i>	502
Heptane	<i>Stephen R. Clough</i>	504
Heptanone	<i>Murali Badanthadka and Harihara M. Mehendale</i>	506
Herbicides	<i>see Chlorophenoxy Herbicides</i>	
<i>hERG</i> (Human Ether-a-Go-Go Related Gene)	<i>Jill Steidl</i>	508
Heroin	<i>Michael Hiotis</i>	510
Hexachlorobenzene	<i>Elmar Udarbe Zamora</i>	511
Hexachlorobutadiene	<i>David Janz</i>	513
Hexachlorocyclohexanes	<i>Guangping Chen</i>	515
Hexachlorocyclopentadiene	<i>Murali Badanthadka and Harihara M. Mehendale</i>	517
Hexachlorophene	<i>Cathy Villaroman and Robin C. Guy</i>	520
Hexane	<i>Stephen R. Clough and Leyna Mulbolland</i>	522
High Production Volume (HPV) Chemicals	<i>Pertti J. Hakkinen</i>	526
History of Toxicology	<i>see Toxicology, History of</i>	
Holly	<i>Ann P. Slattery</i>	528
Hormesis	<i>Elysha A. Hanniman and Christopher J. Sinal</i>	529
Hormone Disruptors	<i>see Environmental Hormone Disruptors</i>	
Hormones	<i>see Anabolic Steroids; Androgens; Estrogens I: Estrogens and Their Conjugates; Estrogens II: Catechol Estrogens; Estrogens III: Phytoestrogens and Mycoestrogens; Estrogens IV: Estrogen-Like Pharmaceuticals; Estrogens V: Xenoestrogens</i>	
Host-Mediated Assay	<i>David A. Eastmond</i>	532
Hydrangea	<i>Brenda Swanson-Bearman</i>	534
Hydraulic Fluids	<i>Richard D. Phillips</i>	534
Hydrazine	<i>Christopher P. Holstege</i>	536
Hydrobromic Acid	<i>Mary Lee Hultin</i>	537
Hydrochloric Acid	<i>Christopher P. Holstege</i>	538
Hydrocodone	<i>Christopher P. Holstege</i>	540
Hydrofluoric Acid	<i>Samantha E. Gad</i>	542
Hydrogen Cyanide	<i>see Cyanide</i>	
Hydrogen Peroxide	<i>David Eldridge and Christopher P. Holstege</i>	543
Hydrogen Sulfide	<i>Betty J. Locey</i>	545
Hydroiodic Acid	<i>Mary Lee Hultin</i>	551
Hydromorphone	<i>Christopher P. Holstege</i>	552
Hydroperoxide, <i>tert</i> -Butyl	<i>Samantha E. Gad</i>	554
Hydroquinone	<i>Shayne C. Gad</i>	555
Hydroxylamine	<i>Samantha E. Gad</i>	557
Hymenoptera	<i>Gary W. Everson</i>	558
Hypersensitivity, Delayed Type	<i>Leigh Ann Burns-Naas</i>	559
Hypoglycemics, Oral	<i>Henry A. Spiller</i>	562
Iatrogenic Disease	<i>Beck Bertine Goldberg</i>	565
Ibotenic Acid	<i>see Mushrooms, Ibotenic Acid</i>	
Ibuprofen	<i>Christopher P. Holstege</i>	566
Imidacloprid	<i>Larry P. Sheets</i>	567
Immediately Dangerous to Life or Health (IDLH) Values	<i>Alan J. Weinrich</i>	571
Immune System	<i>Michael P. Holsapple and Norbert E. Kaminski</i>	573
Implant Studies	<i>Shayne C. Gad</i>	597

Import and Export of Chemicals <i>see</i> Hazardous Chemicals, Import/Export of	
<i>In Vitro</i> Test <i>Shayne C Gad</i>	598
<i>In Vivo</i> Test <i>Shayne C Gad</i>	599
Indole <i>Samantha E Gad</i>	602
Indoor Air Pollution <i>see</i> Pollution, Air Indoor	
Industrial Hygiene <i>Andrew Maier</i>	603
Inert Ingredients (in Pesticides) <i>Andrew M Geller</i>	605
Information Resources in Toxicology <i>Frederick W Berman</i>	606
Inhalation <i>see</i> Respiratory Tract	
Inhalation Testing <i>see</i> Toxicity Testing, Inhalation	
Insect <i>see</i> Hymenoptera	
Insecticides <i>see</i> Permethrin	
Interactions <i>see</i> Interactive Toxicity	
Interactive Toxicity <i>S Satbeesh Anand and Harihara M Mehendale</i>	626
Intercellular Communication <i>see</i> Gap Junctional Intercellular Communication in Epigenetic Toxicity	
Intuitive Toxicology <i>see</i> Toxicology, Intuitive	
Invertebrate Ecotoxicology <i>see</i> Ecotoxicology, Invertebrate	
Investigative New Drug Application <i>Shayne C Gad</i>	631
Iodine <i>Shayne C Gad</i>	635
Ionizing Radiation <i>see</i> Radiation Toxicology, Ionizing and Nonionizing	
Iron <i>Shayne C Gad</i>	637
Irritation Testing <i>see</i> Toxicity Testing, Irritation	
Islip Garbage Barge <i>Todd Canedy</i>	639
Isocyanates <i>Robert Kapp</i>	640
Isodrin <i>KS Rao</i>	645
Isoniazid <i>Lisa Vivero</i>	647
Isophorone <i>Leonard I Sweet</i>	649
Isoprene <i>Kathryn A Wurzel</i>	652
Isopropanol <i>Michael D Reed</i>	653
<i>Itai-Itai</i> <i>Rika Shuto</i>	655
Ivermectins <i>see</i> Avermectins	
J	
Jequirity Bean <i>Brenda Swanson-Bearman</i>	657
Jet Fuels <i>Udayan M Apte and Harihara M Mehendale</i>	658
Jimsonweed <i>Brenda Swanson-Bearman</i>	659
Joint FAO/WHO Expert Meetings (JECFA and JMPR) <i>Angelika Tritscher</i>	660
K	
Kava <i>Molly Broderick and Teresa Dodd-Butera</i>	663
Kerosene <i>Shayne C Gad</i>	664
Kidney <i>Gary O Rankin</i>	666
Killer Lakes <i>Perti J Hakkinen</i>	689

L

Lanthanide Series of Metals	<i>Charles E Lambert</i>	691
Law and Toxicology	<i>Jack W Snyder</i>	694
LD ₅₀ /LC ₅₀ (Lethal Dosage 50/Lethal Concentration 50)	<i>Shayne C Gad</i>	701
Lead	<i>Shayne C Gad</i>	705
Lethal, Dosage or Concentration	<i>see LD₅₀/LC₅₀ (Lethal Dosage 50/Lethal Concentration 50)</i>	
Levels of Effect in Toxicological Assessment	<i>Michael Dourson</i>	709
Levothyroxine	<i>Christopher P Holstege</i>	711
Lewisite	<i>Harry Salem</i>	712
Lidocaine	<i>Christopher P Holstege</i>	714
Life Cycle Assessment	<i>David W Pennington and Tomas Rydberg</i>	715
Lily of the Valley	<i>Amanda Lofton</i>	719
Limonene	<i>Samantha E Gad and Pertti J Hakkinen</i>	720
Lindane	<i>Benny L Blaylock</i>	725
Linuron	<i>Guangping Chen</i>	727
Liothyronine	<i>F Lee Cantrell</i>	729
Lipid Peroxidation	<i>Zhengwei Cai</i>	730
Lithium	<i>Shayne C Gad</i>	734
Liver	<i>Janet E Kester</i>	736
Loperamide	<i>F Lee Cantrell</i>	743
Lotronex	<i>Shayne C Gad</i>	745
Love Canal	<i>Michael A Kamrin</i>	746
Lowest-Observed-Adverse-Effect Level	<i>see Levels of Effect in Toxicological Assessment</i>	
Lowest-Observed-Effect Level	<i>see Levels of Effect in Toxicological Assessment</i>	
Loxapine	<i>F Lee Cantrell</i>	749
LSD (Lysergic Acid Diethylamide)	<i>Christopher P Holstege</i>	750
Lubricating Oil	<i>see Oil, Lubricating</i>	
Lung	<i>see Respiratory Tract</i>	
Lye	<i>Samantha E Gad</i>	752
Lyme Disease	<i>Michael A Kamrin</i>	753

Volume 3

M

Mad Cow Disease	<i>see Bovine Spongiform Encephalopathy (Mad Cow Disease)</i>	
Magnesium	<i>Russell Barbare</i>	1
Malathion	<i>Kevin N Baer</i>	3
Male Reproductive System	<i>see Reproductive System, Male</i>	
Mancozeb	<i>Mona Thiruchelvam</i>	5
Maneb	<i>Mona Thiruchelvam</i>	8
Manganese	<i>Shayne C Gad</i>	11
Margin of Exposure (MOE)	<i>Udayan M Apte and Harihara M Mehendale</i>	13
Marijuana	<i>Christopher P Holstege</i>	14
Marine Organisms	<i>William R Kem</i>	16

Material Safety Data Sheets <i>see</i> Chemical Hazard Communication and Material Safety Data Sheets	
Maximum Allowable Concentration (MAC) <i>Shayne C Gad</i>	21
Maximum Tolerated Dose (MTD) <i>Shayne C Gad</i>	21
Mechanisms of Toxicity <i>Sanjay Chanda and Harihara M Mehendale</i>	22
Medical Surveillance <i>Christopher P Holstege</i>	26
Meperidine <i>Michael Hiotis</i>	28
Meprobamate <i>David Eldridge and Christopher P Holstege</i>	29
Mercaptans <i>Lee R Shugart</i>	31
Mercaptoethanol, 2- <i>Patricia J Beattie</i>	32
Mercuric Chloride <i>Vishal S Vaidya and Harihara M Mehendale</i>	33
Mercury <i>Shayne C Gad</i>	36
Mescaline <i>Christopher P Holstege</i>	40
Metabonomics <i>Vishal S Vaidya, Jeremy K Nicholson and Harihara M Mehendale</i>	41
Metaldehyde <i>Guangping Chen</i>	46
Metallothionein <i>Shayne C Gad</i>	48
Metals <i>Shayne C Gad</i>	49
Methadone <i>Michael Hiotis</i>	50
Methamidophos <i>Kevin N Baer</i>	51
Methane <i>Stephen R Clough</i>	53
Methanol <i>Greene Shepherd</i>	54
Methaqualone <i>Christopher P Holstege</i>	56
Methylol <i>Carey N Pope</i>	57
Methoprene <i>Eric M Silberhorn</i>	59
Methoxychlor <i>Guangping Chen</i>	61
Methoxyethanol <i>Michael J Brabec</i>	63
Methoxypsoralen, 8- <i>Samantha E Gad</i>	66
Methyl Acrylate <i>Ralph J Parod</i>	69
Methyl Bromide <i>Danny Villalobos and Marilyn Weber</i>	71
Methyl CCNU <i>Jaya Chilakapati and Harihara M Mehendale</i>	74
Methyl Disulfide <i>Sara J Risch</i>	75
Methyl Ethyl Ketone <i>Samantha E Gad</i>	77
Methyl Isobutyl Ketone <i>Samantha E Gad</i>	79
Methyl Isocyanate <i>Pallavi B Limaye and Harihara M Mehendale</i>	81
Methyl Parathion <i>Kelly McCracken</i>	85
Methylamine <i>Dale J Marino</i>	86
Methylcholanthrene, 3- <i>Richard A Parent</i>	89
Methyldopa <i>Elizabeth J Scharman</i>	91
Methylene Chloride <i>Richard A Parent</i>	92
Methylenedioxymethamphetamine <i>Alexander B Baer and Christopher P Holstege</i>	96
Methylfentanyl, α - <i>Abraham Dalu</i>	97
Methylmercury <i>Shayne C Gad and Kevin N Bayer</i>	98
Methylnitrosourea <i>Robin C Guy</i>	100
Methyprylon <i>S Rutherford Rose</i>	102
Metronidazole <i>David Eldridge and Christopher P Holstege</i>	103
Mevinphos <i>Priya Raman</i>	104
Microarray Analysis <i>Kartik Shankar and Harihara M Mehendale</i>	107
Micronucleus Assay <i>Robin C Guy</i>	108
Microtox <i>Gary P Bond and John Martin</i>	110
Minamata <i>Stephen C Bondy</i>	112
Minoxidil <i>Elizabeth J Scharman</i>	114
Mirex <i>Carey N Pope</i>	115
Mistletoe <i>Christopher P Holstege</i>	116
Mithramycin <i>Christopher P Holstege</i>	117
Mitomycin C <i>Samantha E Gad</i>	118

Mixtures, Toxicology and Risk Assessment	<i>Glenn Rice, Linda K Teuschler, Jane Ellen Simmons and Richard C Hertzberg</i>	120
Mode of Action	<i>Lynne Haber</i>	123
Models	<i>see Animal Models</i>	
Modifying Factors of Toxicity	<i>Frank C Lu and Sam Kacew</i>	125
Mold	<i>Martha Boss</i>	132
Molecular Toxicology–Recombinant DNA Technology	<i>Evan A Thackaberry</i>	135
Molinate	<i>Danny Villalobos</i>	143
Molybdenum	<i>Robert Kapp</i>	145
Monoamine Oxidase Inhibitors	<i>Rebeca Gracia</i>	148
Monomethylhydrazine	<i>see Mushrooms, Monomethylhydrazine</i>	
Monosodium Glutamate	<i>Arezo Campbell</i>	150
Monte Carlo Analysis	<i>MA Jayjock, Paul Price and Cristine F Chaisson</i>	152
Morning Glory	<i>Christine Stork and Jeanna Marraffa</i>	157
Morphine	<i>Michael Hiotis</i>	158
Mothball	<i>see Naphthalene</i>	
Mouse Lymphoma Assay	<i>Robin C Guy</i>	160
Mouthwash	<i>Nancy Linde</i>	162
Multiple Chemical Sensitivities	<i>Kathleen Rodgers</i>	164
Muscarine	<i>see Mushrooms, Muscarine</i>	
Mushrooms, Coprine	<i>Anthony S Manoguerra</i>	167
Mushrooms, Cyclopeptide	<i>Anthony S Manoguerra</i>	168
Mushrooms, Ibotenic Acid	<i>Anthony S Manoguerra</i>	170
Mushrooms, Monomethylhydrazine	<i>Anthony S Manoguerra</i>	171
Mushrooms, Muscarine	<i>Anthony S Manoguerra</i>	172
Mushrooms, Psilocybin	<i>Anthony S Manoguerra</i>	173
Mustard Gas	<i>Harry Salem</i>	174
Mutagenicity Tests	<i>see Sister Chromatid Exchanges; Ames Test</i>	
Mutagenicity Toxicity Testing	<i>see Toxicity Testing, Mutagenicity</i>	
Mycotoxins	<i>Samantha E Gad and Shayne C Gad</i>	177
N		
Nails (of the Fingers and Toes)	<i>Perti J Hakkinen</i>	179
Naled	<i>Danny Villalobos</i>	180
Nanotechnology	<i>David B Warheit</i>	182
Naphthalene	<i>Heriberto Robles</i>	185
Naphthyl Thiourea, α -	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	188
Naphthylamine, 2-	<i>Glenn Talaska</i>	190
Naphthylisothiocyanate	<i>Samantha E Gad</i>	192
National Environmental Policy Act, US	<i>Samantha E Gad and Shayne C Gad</i>	193
Nematocides	<i>Samantha E Gad</i>	193
Neon	<i>Lynda M Ewers</i>	194
Neonicotinoids	<i>Josef Seifert</i>	196
Neoplasia	<i>see Carcinogenesis</i>	
Nephrotoxicity	<i>see Kidney</i>	
Nerve Agents	<i>Harry Salem and Frederick R Sidell</i>	201
Neurotoxicity	<i>Peter S Spencer and Pamela J Lein</i>	206

New Drug Application	<i>see</i> Investigative New Drug Application	
Niacin	<i>Diana Ku</i>	218
Nickel and Nickel Compounds	<i>Shayne C Gad</i>	220
Nickel Chloride	<i>Shayne C Gad</i>	223
Nicotine	<i>Brian Hughes</i>	225
Nithiazine	<i>Josef Seifert</i>	228
Nitric Oxide	<i>Shayne C Gad</i>	230
Nitrite Inhalants	<i>Keiko Okamoto</i>	231
Nitrites	<i>Betty J Locey</i>	232
Nitrobenzene	<i>Robin C Guy</i>	236
Nitrocellulose	<i>Dennis J Naas</i>	238
Nitroethane	<i>Christopher P Holstege</i>	240
Nitrogen Mustard	<i>Harry Salem and Frederick R Sidell</i>	241
Nitrogen Oxides	<i>Lee R Shugart</i>	244
Nitrogen Tetraoxide	<i>Samantha E Gad</i>	245
Nitromethane	<i>Richard D Phillips</i>	247
Nitrosamines	<i>Heriberto Robles</i>	249
Nitrous Oxide	<i>Shayne C Gad</i>	251
N-Methylpyrrolidone	<i>Ralph J Parod</i>	252
N-Nitrosodimethylamine	<i>Sidhartha D Ray and Harihara M Mehendale</i>	255
Nonionizing Radiation	<i>see</i> Radiation Toxicology, Ionizing and Nonionizing	
Non-Lethal Weapons, Chemical	<i>Patricia M Nance</i>	258
Nonsteroidal Antiinflammatory Agents	<i>see</i> Acetaminophen; Acetylsalicylic Acid; Ibuprofen	
Nonylphenol	<i>Alan L Blankenship and Katie Coady</i>	260
No-Observed-Adverse-Effect Level	<i>see</i> Levels of Effect in Toxicological Assessment	
No-Observed-Effect Level	<i>see</i> Levels of Effect in Toxicological Assessment	
Norbormide	<i>Lynn Weber</i>	264
Norepinephrine	<i>see</i> Catecholamines	
Notorious Poisoners and Poisoning Cases	<i>Joanna Willis, Thomas Holdsworth and Katherine Cathrow</i>	265
Nutmeg	<i>Christopher P Holstege</i>	276
O		
Occupational Exposure Limits	<i>Andrew Maier</i>	279
Occupational Safety and Health Act, US	<i>Michael A Kamrin</i>	281
Occupational Toxicology	<i>Elizabeth V Wattenberg</i>	282
Octachlorostyrene	<i>Alan L Blankenship</i>	288
Octane	<i>Stephen R Clough</i>	291
Ocular Toxicology	<i>see</i> Eye Irritancy Testing; Sensory Organs	
OECD	<i>see</i> Organisation for Economic Cooperation and Development	
Oil, Crude	<i>Michael J Sullivan</i>	292
Oil, Lubricating	<i>Michael J Sullivan</i>	295
Oleander	<i>Fermin Barrueto Jr.</i>	298
Olfaction	<i>see</i> Sensory Organs	
Opium	<i>Christopher P Holstege</i>	299
Organochlorine Insecticides	<i>Benny L Blaylock</i>	301
Organophosphate Poisoning, Delayed Neurotoxicity	<i>Rudy J Richardson</i>	302

Organophosphate Poisoning, Intermediate Syndrome	<i>Ramesh C Gupta</i>	306
Organophosphates	<i>Marion Ehrlich</i>	308
Organotins	<i>Philip J Bushnell and Kimberly D Ehman</i>	312
Orototoxicity	<i>Michael J Sullivan</i>	315
Otto Fuel II	<i>Richard D Phillips</i>	318
Oxalates	<i>Eric M Silberhorn</i>	320
Oxidative Stress	<i>Kartik Shankar and Harihara M Mehendale</i>	322
Oxygen	<i>Shayne C Gad</i>	323
Oxygenates	<i>see Fuel Oxygenates</i>	
Ozone	<i>Shayne C Gad</i>	325
P		
Paraoxon Detoxification	<i>see A-Esterases</i>	
Paraquat	<i>Kevin N Baer</i>	329
Parathion	<i>Jason R Richardson</i>	331
Paregoric	<i>Fermin Barrueto Jr.</i>	333
PBT (Persistent, Bioaccumulative, and Toxic) Chemicals	<i>Thomas M Murray</i>	334
Pendimethalin	<i>KS Rao</i>	336
Penicillin	<i>Brenda Swanson-Bearman</i>	338
Pentachlorobenzene	<i>Jing Liu</i>	340
Pentachloronitrobenzene	<i>Jing Liu</i>	341
Pentachlorophenol	<i>Kevin N Baer</i>	343
Pentane	<i>Stephen R Clough</i>	345
Pentazocine	<i>Christopher P Holstege</i>	346
Peptide Coupling Agents	<i>Sang-Tae Kim</i>	348
Perchlorate	<i>David R Mattie</i>	349
Perchloric Acid	<i>Samantha E Gad</i>	352
Perfluoroisobutylene	<i>Shayne C Gad</i>	353
Perfluorinated Chemicals	<i>see Perfluorooctanoic Acid (PFOA)</i>	
Perfluorooctanoic Acid (PFOA)	<i>Cathy Villaroman and Ruth Custance</i>	355
Perfumes	<i>see Fragrances and Perfumes</i>	
Periodic Acid	<i>Samantha E Gad and Shayne C Gad</i>	358
Permethrin	<i>Paul R Harp</i>	358
Permissible Exposure Limit	<i>see Occupational Exposure Limits</i>	
Peroxisome Proliferators	<i>Abraham Dalu and Harihara M Mehendale</i>	360
Personal Care Products	<i>see Cosmetics and Personal Care Products</i>	
Pesticide Residues: Joint FAO/WHO Meeting	<i>see Joint FAO/WHO Expert Meetings (JECFA and JMPR)</i>	
Pesticides	<i>Carey N Pope</i>	371
Petroleum Distillates	<i>Stephen R Clough</i>	372
Petroleum Ether	<i>Patricia J Beattie</i>	375
Petroleum Hydrocarbons	<i>Shayne C Gad</i>	377
Peyote	<i>Amanda Lofton</i>	379
Pharmacokinetic Models	<i>Natalie Eddington</i>	381
Pharmacokinetics/Toxicokinetics	<i>Robert Tardif and Jules Brodeur</i>	383
Pharmacology and Safety	<i>see Safety Pharmacology</i>	
Phenacetin	<i>Shayne C Gad</i>	390

Phenanthrene	<i>Samantha E Gad</i>	392
Phenazopyridine	<i>Christopher P Holstege</i>	394
Phencyclidine	<i>Christopher P Holstege</i>	395
Phenelzine	<i>see Monoamine Oxidase Inhibitors</i>	
Phenobarbital	<i>see Barbiturates, Long-Acting</i>	
Phenol	<i>Kathryn J Keboe</i>	397
Phenothiazines	<i>Julie Weber</i>	399
Phenylmercuric Acetate	<i>Lynn Weber</i>	401
Phenylpropanolamine	<i>Brenda Swanson-Biearman</i>	403
Phenytoin	<i>S Rutherford Rose</i>	405
Phorbol Esters	<i>Samantha E Gad and Shayne C Gad</i>	407
Phosgene	<i>Samantha E Gad</i>	408
Phosgene Oxime	<i>David R Wallace</i>	410
Phosphine	<i>Danny Villalobos</i>	411
Phosphoric Acid	<i>Samantha E Gad and Russell Barbare</i>	414
Phosphorus	<i>Heriberto Robles</i>	415
Photoallergens	<i>Shayne C Gad</i>	417
Photochemical Oxidants	<i>Shayne C Gad</i>	421
Phthalate Ester Plasticizers	<i>Shayne C Gad</i>	422
Phthalates	<i>see Phthalate Ester Plasticizers</i>	
Physical Hazards	<i>Gene Rider</i>	424
Picloram	<i>Richard A Parent</i>	436
Picric Acid	<i>Samantha E Gad</i>	438
Piperazine	<i>David Brandwene</i>	440
Piperonyl Butoxide	<i>Marilyn Weber</i>	442
Plants, Poisonous	<i>Teresa Dodd-Butera and Molly Broderick</i>	443
Plasticizers	<i>see Phthalate Ester Plasticizers</i>	
Platinum	<i>Shayne C Gad</i>	448
Plutonium	<i>Richard Belanger</i>	450
Poinsettia	<i>Allison A Muller</i>	453
Poisoning Emergencies in Humans	<i>Christopher P Holstege</i>	454
Pokeweed	<i>Ann P Slattery</i>	462
Pollutant Release and Transfer Registers (PRTs)	<i>Philip Wexler and Henrik Harjula</i>	463
Pollution Prevention Act, US	<i>Shayne C Gad</i>	467
Pollution, Air	<i>Terry Gordon</i>	468
Pollution, Air Indoor	<i>Dieter Schwela and Dimitrios Kotzias</i>	475
Pollution, Soil	<i>Thomas E McKone</i>	489
Pollution, Water	<i>Ruth Custance</i>	496
Polybrominated Biphenyls (PBBs)	<i>Alan L Blankenship</i>	503
Polybrominated Diphenyl Ethers (PBDEs)	<i>Alan L Blankenship, John Newsted and Paul Jones</i>	507
Polychlorinated Biphenyls (PCBs)	<i>Swarupa G Kulkarni and Harihara M Mehendale</i>	509
Polycyclic Aromatic Amines	<i>Shayne C Gad</i>	512
Polycyclic Aromatic Hydrocarbons (PAHs)	<i>Shayne C Gad and Samantha E Gad</i>	513
Polyethylene Glycol	<i>Hon-Wing Leung</i>	515
Polymers	<i>Samantha E Gad</i>	516
Potassium	<i>Shayne C Gad</i>	520
Potassium Iodide	<i>Elizabeth J Scharman</i>	521
Potentiation	<i>see Chemical Interactions</i>	
Primidone	<i>S Rutherford Rose</i>	523
Probabilistic Analysis	<i>see Monte Carlo Analysis</i>	

Procainamide	<i>Christopher P Holstege</i>	524
Prometryn	<i>Larry J Dziuk</i>	526
Propachlor	<i>Larry J Dziuk</i>	527
Propane	<i>Stephen R Clough</i>	529
Propanil	<i>Marcia D Howard</i>	531
Propargite	<i>Jing Liu</i>	532
Propazine	<i>Raju Kacham</i>	534
Propene	<i>Patricia J Beattie</i>	535
Propionic Acid	<i>Shayne C Gad and Samantha E Gad</i>	536
Proposition 65, California	<i>Samantha E Gad</i>	538
Propoxur	<i>Paul R Harp</i>	541
Propoxyphene	<i>Christopher P Holstege</i>	543
Propylene Glycol	<i>Vijay M Vulava</i>	544
Propylene Oxide	<i>Ada Kolman and Siv Osterman-Golkar</i>	548
Prostaglandins	<i>Samantha E Gad</i>	550
Proteomics	<i>Udayan M Apte and Harihara M Mehendale</i>	551
<i>Prunus</i> Species	<i>Christopher P Holstege</i>	555
Pseudoephedrine	<i>Brenda Swanson-Biearman</i>	556

Psilocybin *see* Mushrooms, psilocybin

Psoralen (P) and Long-Wave Ultraviolet Radiation (UVA) *see* PUVA

Psychological Indices of Toxicity	<i>Bernard Weiss</i>	558
Puromycin	<i>Midhun C Korrapati and Harihara M Mehendale</i>	567
PUVA	<i>Jean L Lim and Robert S Stern</i>	569
Pyrene	<i>Lu Yu</i>	571
Pyrethrins/Pyrethroids	<i>David E Ray</i>	574
Pyridine	<i>Kathryn J Keboe</i>	580
Pyridostigmine	<i>Teresa Dodd-Butera and Molly Broderick</i>	581
Pyridoxine	<i>Diana Ku</i>	583
Pyriminil	<i>Lynn Weber</i>	584
Pyrrolizidine Alkaloids	<i>Gerardo Ibanez</i>	585

Q

QT Interval	<i>Russell Barbare</i>	589
Quantitative Structure-Activity Relationship	<i>see</i> Toxicity Testing, Modeling	
Quinidine	<i>Dennis J Naas</i>	593
Quinine	<i>Dennis J Naas</i>	594
Quinoline	<i>David R Wallace</i>	596
Quinone	<i>Sachin S Devi and Harihara M Mehendale</i>	597
Quintozene	<i>see</i> Pentachloronitrobenzene	

R

Radiation Toxicology, Ionizing and Nonionizing	<i>Bobby R Scott and Raymond A Guilmette</i>	601
Radium	<i>Shayne C Gad</i>	615
Radon	<i>Richard A Parent</i>	617
Ranitidine	<i>Alexander B Baer and Christopher P Holstege</i>	620
Read Across Analysis	<i>see</i> Toxicity Testing, 'Read Across Analysis'	
Recombinant DNA	<i>see</i> Molecular Toxicology-Recombinant DNA Technology	

Recommended Exposure Limits (REL)	<i>Alan J Weinrich</i>	621
Red Dye No. 2	<i>Janice McKee</i>	622
Red Phosphorus	<i>S Satheesh Anand and Harihara M Mehendale</i>	624
Red Squill	<i>Alexander B Baer and Christopher P Holstege</i>	626
Red Tide	<i>Robin C Guy</i>	628
Redbook	<i>Robin C Guy</i>	630
Reference Concentration (RfC)	<i>Patricia M Nance</i>	632
Reference Dose (RfD)	<i>Patricia M Nance</i>	633
Refrigerants	<i>see Freons</i>	
Regulation, Toxicology and	<i>Michael A Kamrin</i>	634
Renal Toxicology	<i>see Kidney</i>	
Reproductive System, Female	<i>Bill L Lasley</i>	636
Reproductive System, Male	<i>Marion G Miller and Shelley Brown DuTeaux</i>	650
Reproductive Toxicity Testing	<i>see Toxicity Testing, Reproductive</i>	
Reserpine	<i>Elizabeth J Scharman</i>	661
Resistance to Toxicants	<i>Stephen R Clough</i>	662
Resource Conservation and Recovery Act, US	<i>Mario Mangino</i>	663
Respiratory Tract	<i>Donald E Gardner and Daniel T Kirkpatrick</i>	665
Retino	<i>see Vitamin A</i>	
Rhodium	<i>Shayne C Gad</i>	698
<i>Rhododendron</i> Genus	<i>Alexander B Baer and Christopher P Holstege</i>	699
Rhubarb	<i>Ann P Slattery</i>	700
Riboflavin	<i>Diana Ku</i>	701
Ricin and Other Toxalbumins	<i>Mark A Hostetler</i>	702
Rifampin	<i>Christopher P Holstege</i>	705
Riot Control Agents	<i>Harry Salem, Bryan Ballantyne and Sidney A Katz</i>	706
Risk Assessment, Ecological	<i>Steven Bartell</i>	723
Risk Assessment, Human Health	<i>Betty J Locey</i>	727
Risk Based Corrective Action (RBCA)	<i>Shawn L Sager</i>	733
Risk Characterization	<i>Michael A Kamrin</i>	736
Risk Communication	<i>Michael A Kamrin</i>	738
Risk Management	<i>Xuannga Mahini</i>	740
Risk Perception	<i>Patricia M Nance</i>	743
Rotenone	<i>Carey N Pope</i>	744
S		
S-(1,2-Dichlorovinyl)-L-Cysteine	<i>Vishal S Vaidya and Harihara M Mehendale</i>	747
Saccharin	<i>Robin C Guy</i>	750
Safe Drinking Water Act, US	<i>Robert Kapp</i>	752
Safety Pharmacology	<i>S Satheesh Anand and Harihara M Mehendale</i>	754
Safety Testing, Clinical Studies	<i>Alessandra Pagnoni</i>	759
Saint John's Wort	<i>Molly Broderick and Teresa Dodd-Butera</i>	760
Salicylates	<i>Alexander Baer and Christopher P Holstege</i>	761
<i>Salmonella</i>	<i>Melanie J Karst</i>	764
Sarin	<i>Harry Salem and Frederick P Sidell</i>	766
Saxitoxin	<i>Samantha E Gad and Shayne C Gad</i>	769
Scombroid	<i>F Lee Cantrell</i>	770
Scorpions	<i>Gary W Everson</i>	771
Selamectin	<i>Ramesh C Gupta</i>	772
Selenium	<i>Shayne C Gad</i>	774

Semustine	<i>Roberta Turci</i>	776
Sensitivity Analysis	<i>Virginia Lau</i>	779
Sensitization Testing	<i>see Toxicity Testing, Sensitization</i>	
Sensory Organs	<i>Lewis Nelson</i>	780
Sertraline Hydrochloride	<i>Bruce Ruck</i>	785

Volume 4

Seveso Disaster, and the Seveso and Seveso II Directives	<i>Perti J Hakkinen</i>	1
Shampoo	<i>Paul Sterchele</i>	5
Shellfish Poisoning, Paralytic	<i>F Lee Cantrell</i>	6
<i>Shigella</i>	<i>Melanie J Karst</i>	7
Short-Term Exposure Limit	<i>see Occupational Exposure Limits</i>	
Sick Building Syndrome	<i>Michael Hodgson</i>	8
Silent Spring	<i>Michael A Kamrin</i>	13
Silica, Crystalline	<i>Kent E Pinkerton and Randal J Southard</i>	14
Silver	<i>Shayne C Gad</i>	17
Sister Chromatid Exchanges	<i>David A Eastmond</i>	19
Skeletal System	<i>M Joseph Fedoruk and Tee L Guidotti</i>	20
Skin	<i>Peter Robinson</i>	25
Smog	<i>see Great Smog of London</i>	
Snake, Crotalinae	<i>Gary W Everson</i>	54
Snake, Elapidae	<i>Gary W Everson</i>	56
Snakes	<i>Randy Powell</i>	57
Sodium	<i>Shayne C Gad</i>	60
Sodium Fluoroacetate	<i>David R Wallace</i>	62
Sodium Sulfite	<i>Stephen R Clough</i>	64
Soil Pollution	<i>see Pollution, Soil</i>	
<i>Solanum</i> Genus	<i>Christopher P Holstege</i>	66
Soman	<i>Harry Salem and Frederick R Sidell</i>	67
Speed	<i>Henry A Spiller</i>	69
Spider, Black Widow	<i>Gary W Everson</i>	71
Spider, Brown Recluse	<i>Gary W Everson</i>	73
Spiders	<i>Julie Weber</i>	75
SSRIs (Selective Serotonin Reuptake Inhibitors)	<i>Samantha E Gad</i>	79
<i>Staphylococcus aureus</i>	<i>Melanie J Karst</i>	86
Statistics	<i>Shayne C Gad</i>	88
Stoddard Solvent	<i>Richard D Phillips</i>	100
Strontium	<i>Shayne C Gad</i>	102
Structure-Activity Relationship	<i>see Toxicity Testing, Modeling</i>	
Strychnine	<i>Fermin Barraeto Jr.</i>	104
Styrene	<i>Ralph J Parod</i>	105
Subchronic Toxicity	<i>see Toxicity, Subchronic</i>	
Sudan Grass	<i>Julie Weber</i>	108
Sulfates	<i>JR Clarkson, Lu Yu and Lance Fontenot</i>	110
Sulfites	<i>Shayne C Gad</i>	113
Sulfonylureas	<i>see Hypoglycemics, Oral</i>	
Sulfur Dioxide	<i>Shayne C Gad</i>	115

Sulfuric Acid	<i>Heriberto Robles</i>	117
Surfactants	<i>see</i> Surfactants, Anionic and Nonionic; Surfactants, Perfluorinated; Detergent	
Surfactants, Anionic and Nonionic	<i>Gerald L Kennedy</i>	119
Surfactants, Perfluorinated	<i>John Newsted and Paul Jones</i>	121
Synergism	<i>see</i> Chemical Interactions	
T		
2,4,5-T	<i>Lynn Weber</i>	125
Tabun	<i>Harry Salem and Frederick R Sidell</i>	127
Tacrine	<i>Ramesh C Gupta</i>	130
Talc	<i>Shayne C Gad</i>	131
Tamoxifen	<i>Teresa Dodd-Butera and Molly Broderick</i>	133
Tannic Acid	<i>Heriberto Robles</i>	134
Taste	<i>see</i> Sensory Organs	
TCDD (2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin)	<i>Robert Kapp</i>	136
Teflon	<i>see</i> Perfluorooctanoic Acid (PFOA)	
Tellurium	<i>Shayne C Gad</i>	140
Teratology	<i>see</i> Developmental Toxicology	
Teratology Testing	<i>see</i> Toxicity Testing, Developmental	
Terbutaline	<i>Henry A Spiller</i>	143
Terfenadine	<i>Elizabeth J Scharman</i>	144
Terrestrial Ecotoxicology	<i>see</i> Ecotoxicology, Terrestrial	
Terrorism	<i>see</i> Bio Warfare and Terrorism: Toxins and Other Mid-Spectrum Agents	
Testosterone	<i>see</i> Androgens	
Tetrabromobisphenol A	<i>Paul Jones, Katie Coady and John Newsted</i>	146
Tetrachlorodibenzo- <i>p</i> -dioxin, 2,3,7,8-	<i>see</i> TCDD (2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin)	
Tetrachloroethane	<i>Robert Kapp</i>	148
Tetrachloroethylene	<i>Richard A Parent</i>	150
Tetrachlorvinphos	<i>Subramanya Karanth</i>	154
Tetrahydrofuran	<i>Sree L Jasti</i>	155
Tetranitromethane	<i>Ruth Custance and Cathy Villaroman</i>	159
Tetrodotoxin	<i>Elizabeth J Scharman</i>	161
Texas City Disaster	<i>Paramasivam Srinivasan</i>	162
Thalidomide	<i>S Rutherford Rose</i>	163
Thallium	<i>Shayne C Gad</i>	165
Theophylline	<i>Henry A Spiller</i>	167
Thiamine	<i>Diana Ku</i>	169
Thiazide Diuretics	<i>Elizabeth J Scharman</i>	170
Thioacetamide	<i>Shayne C Gad</i>	172
Thiomerosal	<i>Arezoo Campbell</i>	174
Thiotepa	<i>Marcia D Howard</i>	175
Thiothixene	<i>see</i> Thioxanthenes	
Thioxanthenes	<i>Douglas J Borys</i>	177
Thiram	<i>Mona Thiruchelvam</i>	179
Thorium and Thorium Dioxide	<i>Shayne C Gad</i>	183
Three Mile Island	<i>John Sorensen</i>	184

Threshold Limit Value <i>see</i> Occupational Exposure Limits	
Thyroid Extract <i>Greene Shepherd</i>	186
Ticks <i>see</i> Lyme Disease	
Times Beach <i>Pertti J Hakkinen</i>	187
Tin <i>Shayne C Gad</i>	188
Tissue Repair <i>Udayan M Apte and Harihara M Mehendale</i>	190
Titanium <i>Shayne C Gad</i>	194
Titanium Tetrachloride <i>Robert Kapp</i>	195
Tobacco <i>C Lynn Humbertson</i>	197
Tobacco Smoke <i>Robert Kapp</i>	200
Toluene <i>Stephen R Clough</i>	202
Toluene Diisocyanate <i>Shayne C Gad</i>	204
Toluidine <i>Shayne C Gad</i>	206
Toxaphene <i>David R Wallace</i>	207
Toxic Substances Control Act, US <i>Robert Kapp</i>	210
Toxic Torts <i>Jack W Snyder</i>	213
Toxicity Testing, Alternatives <i>Shayne C Gad</i>	228
Toxicity Testing, Aquatic <i>Shayne C Gad</i>	233
Toxicity Testing, Behavioral <i>Samantha E Gad</i>	240
Toxicity Testing, Carcinogenesis <i>Shayne C Gad</i>	247
Toxicity Testing, Dermal <i>Samantha E Gad and Shayne C Gad</i>	252
Toxicity Testing, Developmental <i>Rochelle W Tyl</i>	262
Toxicity Testing, Inhalation <i>Samantha E Gad and Shayne C Gad</i>	276
Toxicity Testing, Irritation <i>Pertti J Hakkinen</i>	286
Toxicity Testing, Modeling <i>Charles A Pittinger, Andrew Worth, Joanna Jaworska and Joanne Shatkin</i>	288
Toxicity Testing, Mutagenicity <i>Robin C Guy</i>	293
Toxicity Testing, 'Read Across Analysis' <i>Pertti J Hakkinen</i>	298
Toxicity Testing, Reproductive <i>Rochelle W Tyl</i>	299
Toxicity Testing, Sensitization <i>Robin C Guy</i>	309
Toxicity Testing, Validation <i>Leon H Bruner, GJ Carr, M Chamberlain and RD Curren</i>	315
Toxicity, Acute <i>Donald J Ecobichon</i>	332
Toxicity, Chronic <i>Donald J Ecobichon</i>	338
Toxicity, Subchronic <i>Donald J Ecobichon</i>	343
Toxicokinetics <i>see</i> Pharmacokinetics/Toxicokinetics	
Toxicology <i>Gabriel L Plaa</i>	347
Toxicology in the Arts, Culture, and Imagination <i>Philip Wexler</i>	350
Toxicology, Education and Careers <i>Susan J Borghoff</i>	358
Toxicology, History of <i>Katherine D Watson</i>	364
Toxicology, Intuitive <i>Pertti J Hakkinen</i>	370
Trans Fatty Acids <i>Pertti J Hakkinen</i>	372
Transgenic Animals <i>Kartik Shankar and Harihara M Mehendale</i>	374
Triadimefon <i>Marcia D Howard</i>	375
Trichlorfon <i>Ramesh C Gupta</i>	377
Trichloroethane <i>Robert Kapp</i>	380
Trichloroethylene <i>Richard A Parent</i>	382
Tricyclic Antidepressants <i>Fermin Barrueto Jr.</i>	386
Trifluralin <i>David R Wallace</i>	388
Trihalomethanes <i>Shayne C Gad</i>	389
Trinitrotoluene <i>Shayne C Gad</i>	391
Tungsten <i>Shayne C Gad</i>	392
Turpentine <i>Vijay M Vulava</i>	394

U

UN <i>see</i> Food and Agriculture Organization of the United Nations	
Uncertainty Analysis <i>Virginia Lau</i>	399
Uncertainty Factors <i>Michael Dourson</i>	401
Uranium <i>Fletcher F Hahn and Raymond A Guilmette</i>	406
Urea <i>Midhun C Korrapati and Harihara M Mehendale</i>	409
Urethane <i>Heriberto Robles</i>	411

V

Validation of Toxicity Testing <i>see</i> Toxicity Testing, Validation	
Valium <i>see</i> Diazepam	
Valley of the Drums <i>Pertti J Hakkinen</i>	413
Valproic Acid <i>Dennis J Naas</i>	414
Vanadium <i>Shayne C Gad</i>	416
Vanillin <i>Lu Yu</i>	418
Vein <i>see</i> Blood	
Venoms and Poisons from Animals <i>see</i> Animals, Poisonous and Venomous	
Vesicants <i>see</i> Blister Agents/Vesicants	
Veterinary Toxicology <i>Wilson K Rumbeiba and Frederick W Oehme</i>	420
Vinyl Acetate <i>Heriberto Robles</i>	434
Vinyl Bromide <i>Karl K Rozman</i>	435
Vinyl Chloride <i>Robert Kapp</i>	438
Vinylidene Chloride <i>Anna M Fan</i>	440
Virtually Safe Dose (VSD) <i>Stephen M DiZio</i>	445
Vision <i>see</i> Sensory Organs	
Vitamin A <i>Allison A Muller</i>	446
Vitamin B ₁ <i>see</i> Thiamine	
Vitamin B ₂ <i>see</i> Riboflavin	
Vitamin B ₆ <i>see</i> Pyridoxine	
Vitamin B ₉ <i>see</i> Folic Acid	
Vitamin C <i>see</i> Ascorbic Acid	
Vitamin D <i>Allison A Muller</i>	448
Vitamin E <i>Allison A Muller</i>	449
Vitamins <i>see</i> Vitamin A; Vitamin D; Vitamin E	
Volatile Organic Compounds (VOC) <i>S Satbeesh Anand and Harihara M Mehendale</i>	450
Vomiting Agents <i>see</i> Arsenical Vomiting Agents	
V-Series Nerve Agents: Other than VX <i>Harry Salem</i>	456
VX <i>Harry Salem and Frederick R Sidell</i>	457

W

Warfarin <i>Henry A Spiller</i>	461
Wasp <i>see</i> Hymenoptera	

Water Pollution	<i>see</i> Pollution, Water	
Wildlife Toxicology	<i>see</i> Ecotoxicology, Wildlife	
Wisteria	<i>Ann P Slattery</i>	463
Wood Dusts	<i>Alan J Weinrich and Paul Demers</i>	464
Workplace Environmental Exposure Levels (WEELs)	<i>see</i> Occupational Exposure Limits	
World Health Organization	<i>see</i> Joint FAO/WHO Expert Meetings (JECFA and JMPR)	
Wound Healing	<i>see</i> Tissue Repair	
X		
Xenobiotics	<i>Midhun C Korrapati and Harihara M Mehendale</i>	469
Xylene	<i>Stephen R Clough</i>	470
Xyrem	<i>Arezo Campbell</i>	472
Y		
Yew	<i>Ann P Slattery</i>	475
Yohimbine	<i>Rebeca Gracia</i>	476
Z		
Zinc	<i>Shayne C Gad</i>	479
Zinc Oxide	<i>Rebeca Gracia</i>	481

Appendix 1: Selected Toxicology-Related Institutions

Academy of Toxicological Sciences	<i>Sachin S Devi and Harihara M Mehendale</i>	485
American Academy of Clinical Toxicology	<i>Christopher P Holstege</i>	485
American Association of Poison Control Centers	<i>Christopher P Holstege</i>	487
American Board of Toxicology	<i>Sachin S Devi and Harihara M Mehendale</i>	488
American College of Medical Toxicology	<i>Christopher P Holstege</i>	489
American College of Toxicology	<i>Harihara M Mehendale</i>	489
American Conference of Governmental Industrial Hygienists	<i>Andrew Maier</i>	491
American Industrial Hygiene Association	<i>Andrew Maier</i>	492
CIIT Centers for Health Research	<i>Sachin S Devi and Harihara M Mehendale</i>	492
Consumer Product Safety Commission	<i>Michael A Babich</i>	494
Department of Defense, US	<i>Ruth Custance</i>	495
Department of Energy, US	<i>Ruth Custance</i>	499
Environmental Protection Agency, US	<i>Patricia M Nance</i>	502
European Centre for Ecotoxicology and Toxicology of Chemicals	<i>Michael Gribble</i>	504
European Society of Toxicology	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	506
European Union and Its European Commission	<i>Perti J Hakkinen</i>	507
Flavor and Extract Manufacturers Association	<i>Gwendolyn L Ball</i>	511
Food and Agriculture Organization of the United Nations	<i>Manfred Luetzow</i>	511
Food and Drug Administration, US	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	516
Intergovernmental Forum on Chemical Safety (IFCS)	<i>Judy A Stober</i>	517
International Agency for Research on Cancer	<i>Peter Boyle</i>	519
International Conference on Harmonisation	<i>Robin C Guy</i>	521
International Fragrance Association (IFRA)	<i>Audrey Martin</i>	524
International Labour Organization (ILO)	<i>Perti J Hakkinen</i>	525

International Life Sciences Institute – North America	<i>Penny Fenner-Crisp</i>	527
International Organization of the Flavor Industry (IOFI)	<i>Thierry Cachet</i>	527
International Programme on Chemical Safety	<i>Lynne Haber</i>	529
International Society for the Study of Xenobiotics	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	532
International Society of Exposure Analysis	<i>Pertti J Hakkinen</i>	533
International Union of Pure and Applied Chemistry	<i>John H Duffus</i>	534
International Union of Toxicology	<i>Paolo Preziosi</i>	537
Inter-Organization Programme for the Sound Management of Chemicals	<i>Pertti J Hakkinen</i>	539
National Center for Environmental Health	<i>Sachin S Devi and Harihara M Mehendale</i>	540
National Center for Toxicological Research	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	541
National Institute for Occupational Safety and Health	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	542
National Institute of Environmental Health Sciences	<i>Harihara M Mehendale</i>	543
National Institutes of Health	<i>Ankur V Dnyanmote and Harihara M Mehendale</i>	544
National Library of Medicine/TEHIP	<i>Carlo Nuss</i>	545
National Toxicology Program	<i>Harihara M Mehendale</i>	549
Occupational Safety and Health Administration	<i>Harihara M Mehendale</i>	551
Organisation for Economic Cooperation and Development	<i>Robert Visser</i>	551
Public Health Service, US	<i>C Charles Barton and Alan G Parham</i>	561
Research Institute for Fragrance Materials (RIFM)	<i>Anne Marie Api</i>	563
Society for Chemical Hazard Communication	<i>Michele R Sullivan</i>	564
Society for Environmental Toxicology and Chemistry	<i>Harihara M Mehendale</i>	567
Society for Risk Analysis (SRA)	<i>Mike Dowson and Pertti J Hakkinen</i>	568
Society of Toxicology	<i>Sachin S Devi and Harihara M Mehendale</i>	569
Trade Associations	<i>Patricia M Nance</i>	571
Toxicology Excellence for Risk Assessment	<i>Jacqueline Patterson</i>	574
Toxicology Forum	<i>Latrice Vincent</i>	575
UNEP Chemicals	<i>Pertti J Hakkinen</i>	576
United States Pharmacopoeia (USP)	<i>Shayne C Gad</i>	578

Appendix 2: Public Domain Online Chemical Compendia – A Brief Selection 581

Glossary 583

Index 643