

Contents

List of Contributors	xi	9. Organophosphate Nerve Agents	87
		ANNETTA WATSON, DENNIS OPRESKO, ROBERT A. YOUNG, VERONIQUE HAUSCHILD, JOSEPH KING AND KULBIR BAKSHI	
I			
<hr/> INTRODUCTION, HISTORICAL PERSPECTIVE, AND EPIDEMIOLOGY			
1. Introduction	3	10. Russian VX	111
RAMESH C. GUPTA		VLADIMIR REMBOVSKIY, ANDREY RADILOV, ELENA SAVELIEVA, SERGEY KUZNETSOV, IGOR MINDUKSHEV, DARIA PROKOFIEVA, NADEZHDA KRIVOROTOVA, NATALIA KHLEBNIKOVA, RICHARD O. JENKINS AND NIKOLAY GONCHAROV	
2. Historical Perspective of Chemical Warfare Agents	7	11. Riot Control Agents	131
NATHAN H. JOHNSON, JOSEPH C. LARSEN AND EDWARD MEEK		COREY J. HILMAS	
3. Global Impact of Chemical Warfare Agents Used Before and After 1945	17	12. Psychotomimetic Agent BZ (3-Quinuclidinyl Benzilate)	151
JIRI BAJGAR, JOSEF FUSEK, JIRI KASSA, KAMIL KUCA AND DANIEL JUN		JOSEF FUSEK, JIRI BAJGAR, JIRI KASSA, KAMIL KUCA AND DANIEL JUN	
4. The Tokyo Subway Sarin Attack: Acute and Delayed Health Effects in Survivors	27	13. Neurological Effects and Mechanisms of Blast Overpressure Injury	159
TETSU OKUMURA, KENJI TAKI, KOUICHIRO SUZUKI, TAKEMI YOSHIDA, YUKIO KUROIWA AND TETSUO SATOH		DOROTHY L. DOBBINS AND XIAOPING PAN	
5. Early and Delayed Effects of Sulfur Mustard in Iranian Veterans After the Iraq-Iran Conflict	37	14. Thallium	167
MAHDI BALALI-MOOD		LARRY J. THOMPSON	
6. Epidemiology of Chemical Warfare Agents	47	15. Arsenicals: Toxicity, Their Use as Chemical Warfare Agents, and Possible Remedial Measures	171
LINDA A. MCCAULEY		SWARAN J.S. FLORA	
7. Chemical Weapons of Mass Destruction and Terrorism: A Threat Analysis	55	16. Fluoroacetate	193
RENÉ PITA AND ARTURO ANADÓN		NIKOLAY GONCHAROV, ELENA SAVELIEVA, VALERIY ZINCHENKO, SERGEY KUZNETSOV, IGOR MINDUKSHEV, MAXIM VINOKUROV, PAVEL AVDONIN, NATALIA VOITENKO, ANTON UKOLOV, TATIANA ORLOVA, RICHARD O. JENKINS AND ANATOLIY KUZNETSOV	
II			
<hr/> AGENTS THAT CAN BE USED AS WEAPONS OF MASS DESTRUCTION			
8. Mustards and Vesicants	69	17. Strychnine	215
ROBERT A. YOUNG AND CHERYL B. BAST		JIRI PATOCKA	
		18. Superwarfarins	223
		MICHAEL J. MURPHY AND ANDRES M. LUGO	
		19. PCBs, Dioxins and Furans: Human Exposure and Health Effects	239
		BOMMANNA G. LOGANATHAN AND SHIGEKI MASUNAGA	

20. Polycyclic Aromatic Hydrocarbons: Implications for Developmental, Molecular, and Behavioral Neurotoxicity	249		
CLAIRE E. BOLLINGER, MONIQUE MCCALLISTER, RYAN CLARK, RAINA RHOADES, MARK MAGUIRE, RUSSELL E. SAVAGE, YUQIN JIAO, ARAMANDLA RAMESH AND DARRYL B. HOOD			
21. Carbon Monoxide: From Public Health Risk to Painless Killer	267		
DAYA R. VARMA, SHREE MULAY AND SYLVAIN CHEMTOB			
22. Methyl Isocyanate: The Bhopal Gas	287		
DAYA R. VARMA AND SHREE MULAY			
23. Cyanide Toxicity and its Treatment	301		
RAHUL BHATTACHARYA AND SWARAN J.S. FLORA			
24. Chlorine	315		
SYLVIA MILANEZ			
25. Phosgene	327		
CHERYL B. BAST AND DANA F. GLASS-MATTIE			
26. Other Toxic Chemicals as Potential Chemical Warfare Agents	337		
JIRI BAJGAR, JIRI KASSA, JOSEF FUSEK, KAMIL KUCA AND DANIEL JUN			
27. Ricin	347		
RUSSELL DORSEY, GEORGE EMMETT AND HARRY SALEM			
28. Botulinum Toxin	361		
JAIME ANDERSON AND COREY J. HILMAS			
29. Anthrax	387		
COREY J. HILMAS AND JAIME ANDERSON			
30. Onchidal and Fasciculins	411		
ARTURO ANADÓN, MARIA ROSA MARTÍNEZ- LARRAÑAGA AND LUIS G. VALERIO JR.			
31. Cyanobacterial (Blue-Green Algae) Toxins	421		
DEON VAN DER MERWE			
32. Radiation and Health Effects	431		
KAUSIK RAY AND MELISSA STICK			
33. Depleted Uranium	447		
GEORGE C-T JIANG AND MICHAEL ASCHNER			
		III	
		TARGET ORGAN TOXICITY	
		34. Chemical Warfare Agents and the Nervous System	463
		JING LIU, CHIBUZOR UCHEA, LINNZI WRIGHT AND CAREY POPE	
		35. Behavioral Toxicity of Nerve Agents	477
		JIRI KASSA, JIRI BAJGAR, KAMIL KUCA AND DANIEL JUN	
		36. The Respiratory Toxicity of Chemical Warfare Agents	489
		ALFRED M. SCIUTO AND URMILA P. KODAVANTI	
		37. Cardiovascular System as a Target of Chemical Warfare Agents	519
		CSABA K. ZOLTANI	
		38. Ocular Toxicity of Chemical Warfare Agents	535
		PATRICK M. MCNUTT AND TRACEY L. HAMILTON	
		39. Dermal Toxicity of Sulfur Mustard	557
		JOSHUA P. GRAY, MICHAEL P. SHAKARJIAN, DONALD R. GERECKE AND ROBERT P. CASILLAS	
		40. Skeletal Muscle	577
		RAMESH C. GUPTA, SNJEZANA ZAJA-MILATOVIC, WOLF-D. DETTBARN AND JITENDRA K. MALIK	
		41. Reproductive Toxicity and Endocrine Disruption of Potential Chemical Warfare Agents	599
		TIMOTHY J. EVANS	
		42. Liver Toxicity of Chemical Warfare Agents	615
		SHASHI K. RAMAIAH AND ATRAYEE BANERJEE	
		43. Renal System	627
		SHARON M. GWALTNEY-BRANT	
		44. The Immune System as a Target for Chemical Warfare Agents	639
		KAVITA GULATI AND ARUNABHA RAY	
		45. Alternative Animal Toxicity Testing of Chemical Warfare Agents	657
		GOPALA KRISHNA AND SARYU GOEL	

IV

SPECIAL TOPICS

46. Genomics and Proteomics in Brain Complexity in Relation to Chemically Induced PTSD 677
BEENA M. KADAKKUZHA, XIN-AN LIU AND VALERIO RIZZO
47. Clinical and Cellular Aspects of Traumatic Brain Injury 691
JASON PITT AND YIUKA LEUNG
48. Excitotoxicity, Oxidative Stress, and Neuronal Injury 709
SNJEZANA ZAJA-MILATOVIĆ AND RAMESH C. GUPTA
49. Blood–Brain Barrier Damage and Dysfunction by Chemical Toxicity 725
RAMESH C. GUPTA, JASON PITT AND SNJEZANA ZAJA-MILATOVIĆ
50. Neuropathologic Effects of Chemical Warfare Agents 741
RANDALL L. WOLTJER
51. The Effects of Organophosphates in the Early Stages of Human Muscle Regeneration 751
TOMAZ MARS, KATARINA MIS, SERGEJ PIRKMAJER, MAJA KATALINIĆ AND ZORAN GRUBIĆ
52. Cholinesterase Inhibitors: From Molecular Mechanisms of Action to Current and Future Prospects 761
NIR WAISKOPF AND HERMONA SOREQ

V

RISKS TO ANIMALS AND WILDLIFE

53. Potential Agents That Can Cause Contamination of Animal Feedstuffs and Terror 781
ROBERT W. COPPOCK AND MARGITTA DZIWIENKA
54. Chemical Warfare Agents and Risks to Animal Health 791
TINA WISMER
55. Threats to Wildlife by Chemical and Warfare Agents 809
ROBERT W. COPPOCK AND MARGITTA DZIWIENKA

VI

TOXICOKINETICS,
TOXICODYNAMICS AND
PHYSIOLOGICALLY-BASED
PHARMACOKINETICS

56. Toxicokinetic Aspects of Nerve Agents and Vesicants 817
HARALD JOHN, FRANK BALSZUWEIT, KAI KEHE, FRANZ WOREK AND HORST THIERMANN
57. Toxicokinetics and Toxicodynamics of DFP 857
MIGUEL SOGORB, JORGE ESTEVEZ AND EUGENIO VILANOVA
58. Physiologically Based Pharmacokinetic Modeling of Chemical Warfare Agents 875
JEFFERY M. GEARHART, PETER J. ROBINSON AND EDWARD M. JAKUBOWSKI
59. Biotransformation of Warfare Nerve Agents 883
MILAN JOKANOVIĆ

VII

ANALYTICAL METHODS,
BIOSENSORS AND BIOMARKERS

60. On-Site Detection of Chemical Warfare Agents 897
YASUO SETO
61. Laboratory Analysis of Chemical Warfare Agents, Adducts, and Metabolites in Biomedical Samples 915
M.J. VAN DER SCHANS
62. Biosensors for the Detection of OP Nerve Agents 925
JUN-ICHI ANZAI
63. Neuropathy Target Esterase as a Biomarker and Biosensor of Delayed Neurotoxic Agents 935
RUDY J. RICHARDSON, R. MARK WORDEN, SANJEEVA J. WIJJEYAKERE, NICHOLE D. HEIN, JOHN K. FINK AND GALINA F. MAKHAEVA
64. Biomarkers of Exposure to Organophosphorus Poisons: A New Motif for Covalent Binding to Tyrosine in Proteins That Have No Active Site Serine 953
OKSANA LOCKRIDGE, LAWRENCE M. SCHOPFER AND PATRICK MASSON

65. Monitoring of Blood Cholinesterase Activity
in Workers Exposed to Nerve Agents 967
DANIEL JUN, JIRI BAJGAR, KAMIL KUCA AND JIRI KASSA

VIII

PROPHYLACTIC, THERAPEUTIC AND COUNTERMEASURES

66. Pharmacological Prophylaxis Against Nerve
Agent Poisoning: Experimental Studies and
Practical Implications 979
JIRI BAJGAR, JOSEF FUSEK, JIRI KASSA, KAMIL KUCA AND
DANIEL JUN
67. Prophylactic and Therapeutic Measures in
Nerve Agents Poisoning 989
TROND MYHRER AND AAS PÅL
68. Medical Management of Chemical
Toxicity in Pediatrics 1003
ELORA HILMAS AND COREY J. HILMAS
69. Physiologically Based Pharmacokinetic/
Pharmacodynamic Modeling of
Countermeasures to Nerve Agents 1035
ELAINE MERRILL, CHRIS RUARK, JEFFERY
GEARHART AND PETER J. ROBINSON
70. Strategies to Enhance Medical Countermeasures
After the Use of Chemical Warfare
Agents on Civilians 1049
DAVID A. JETT AND DAVID T. YEUNG

71. Pyridinium Oximes in the Treatment of
Poisoning with Organophosphorus
Compounds 1057
MILAN JOKANOVIĆ

72. Novel Cholinesterase Reactivators 1071
KAMIL MUSILEK, JAN KORABECNY, DANIEL JUN,
JIRI KASSA AND KAMIL KUCA

73. Paraoxonase (PON1) and Detoxication of
Nerve Agents 1089
LUCIO G. COSTA, TOBY B. COLE AND CLEMENT E.
FURLONG

74. The Role of Carboxylesterases in Therapeutic
Intervention of Nerve Gases Poisoning 1099
SIGRUN HANNE STERRI AND FRODE FONNUM

75. Catalytic Bioscavengers: The New Generation
of Bioscavenger-Based Medical
Countermeasures 1107
PATRICK MASSON

IX

DECONTAMINATION AND DETOXIFICATION

76. Rapid Decontamination of Chemical
Warfare Agents from the Skin 1127
EDWARD D. CLARKSON AND RICHARD K. GORDON

- Index 1141**