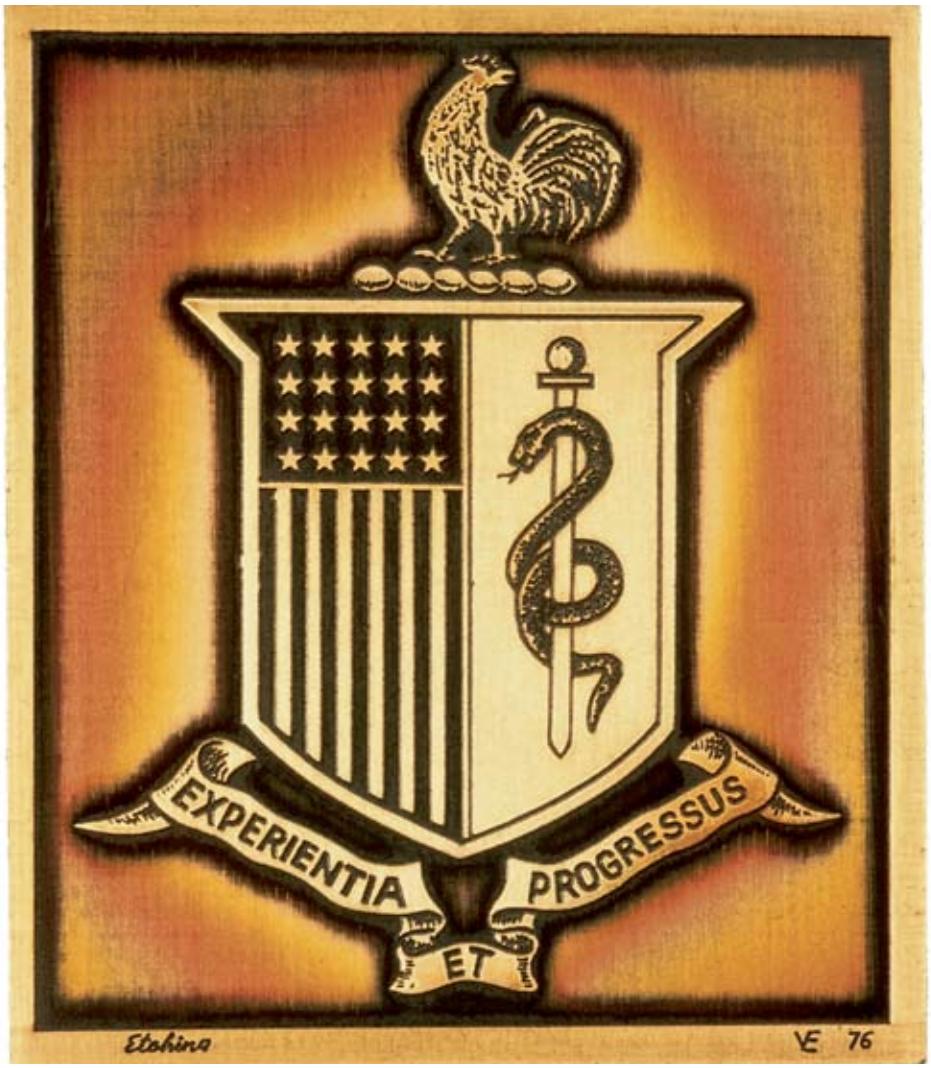
MEDICAL ASPECTS OF CHEMICAL WARFARE



The Coat of Arms
1818
Medical Department of the Army

A 1976 etching by Vassil Ekimov of an
original color print that appeared in
The Military Surgeon, Vol XLI, No 2, 1917

The first line of medical defense in wartime is the combat medic. Although in ancient times medics carried the caduceus into battle to signify the neutral, humanitarian nature of their tasks, they have never been immune to the perils of war. They have made the highest sacrifices to save the lives of others, and their dedication to the wounded soldier is the foundation of military medical care.

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Editor in Chief
Martha K. Lenhart, MD, PHD
Colonel, MC, US Army
Director, Borden Institute
Assistant Professor of Surgery
F. Edward Hébert School of Medicine
Uniformed Services University of the Health Sciences

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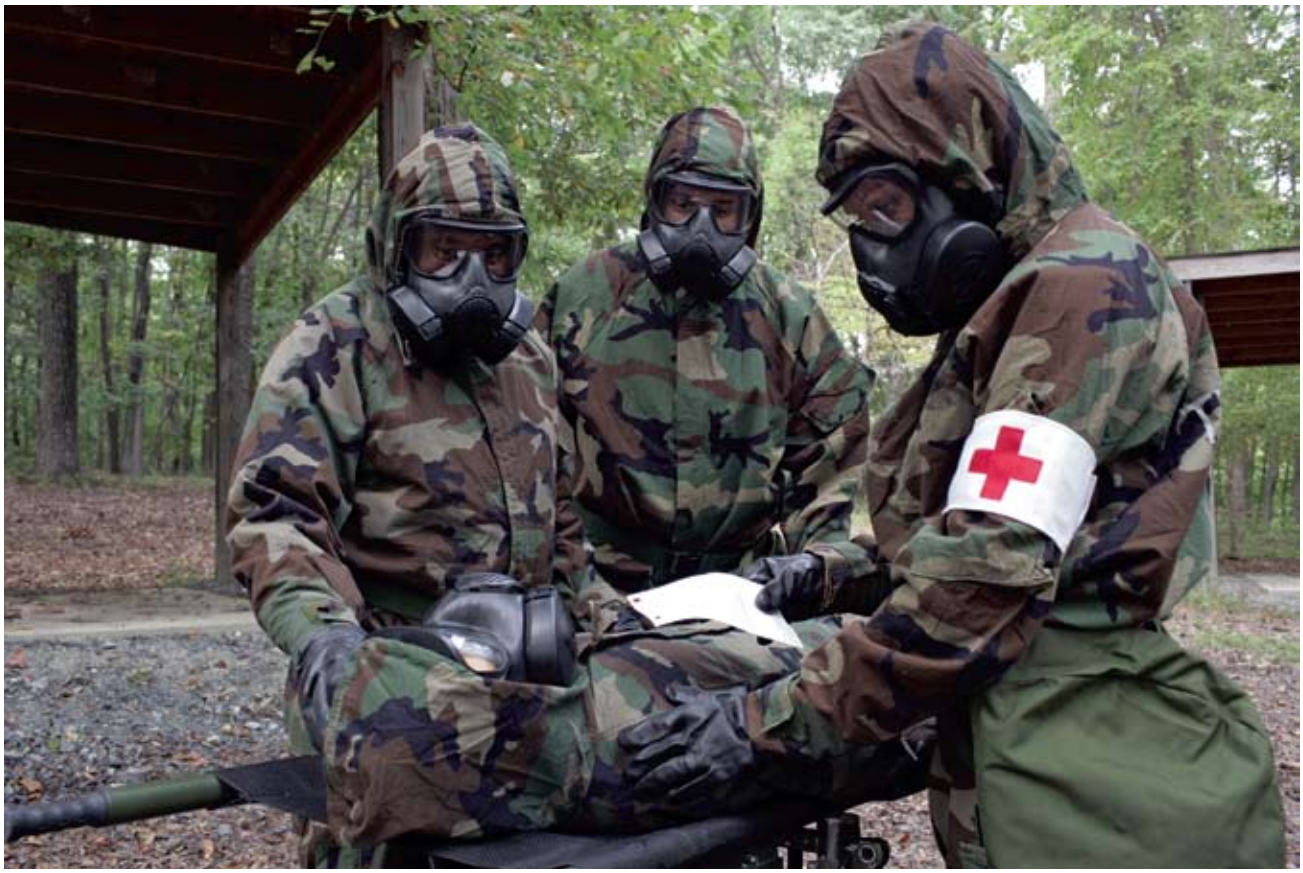

Medical Management of Chemical Casualties Field Training Site, Aberdeen Proving Ground, Edgewood Arsenal, Edgewood, Maryland. US Army healthcare professionals training for medical management of chemical casualties. The healthcare professionals are equipped with the latest protective equipment: the Joint Service Lightweight Integrated Suit Technology and the M50 protective mask.

Photograph by Stephanie R. Froberg, US Army Medical Research Institute of Chemical Defense, 2007.

MEDICAL ASPECTS OF CHEMICAL WARFARE

Senior Editor

SHIRLEY D. TUORINSKY, MSN
Lieutenant Colonel, AN, US Army
US Army Medical Research Institute of Chemical Defense

Office of The Surgeon General
United States Army
Falls Church, Virginia

Borden Institute
Walter Reed Army Medical Center
Washington, DC

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Editorial Staff: Joan Redding
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Contributors

MICHAEL ADLER, PhD
Research Pharmacologist, Neurobehavioral Toxicology, Department of Neurobehavioral Toxicology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

JAIME ANDERSON, DVM, PhD
Division Chief, Analytical Toxicology Division, Department of Neurobehavioral Toxicology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

GERALD P.H. BALLOUGH, PhD
Professor of Biology, La Salle University, 1900 West Olney Avenue, Philadelphia, Pennsylvania 19141

DAVID J. BARILLO, MD
Colonel, Medical Corps, US Army; Surgical Intensivist and Chief, Burn Flight Team/Special Medical Augmentation Response Team—Burn (SMART-B), US Army Institute of Surgical Research, 3400 Rawley E. Chambers Avenue, Fort Sam Houston, Texas 78234

JOHN R. BARR, PhD
Lead Research Chemist, Centers for Disease Control and Prevention, 4770 Buford Highway, Mailstop F47, Atlanta, Georgia 30341

STEVEN I. BASKIN, PhD
Deputy Research Coordinator, Cyanide Medical Countermeasures, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

CHARLES H. BOARDMAN, MS, ORR/L
Lieutenant Colonel, Biomedical Sciences Corps, US Air Force; Instructor/Air Force Liaison and Occupational Therapist, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

DANIEL E. BOEHM
Field Medical Education Specialist, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010-5400

CAROL A. BOSSONE, DVM, PhD
Lieutenant Colonel, US Army; Director of Toxicology, US Army Center for Health Promotion and Preventive Medicine, 5158 Blackhawk Drive, Aberdeen Proving Ground, Maryland 21010

ERNEST H. BRAUE, Jr, PhD
Scientist, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

CLARENCE A. BROOMFIELD, PhD
Research Chemist, Research Division, Department of Pharmacology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

JAMES BROSELOW, MD
Clinical Associate Professor, Emergency Medicine, University of Florida College of Medicine, 1329 SW 16th Street, Suite 2204, Gainesville, Florida 32610

DUANE C. CANEVA, MD
Commander, US Navy; Head, Medical Plans and Policy, Navy Medicine Office of Homeland Security, 2300 E Street, NW, Washington, DC 20372

BENEDICT R. CAPACIO, PhD
Chief, Medical Diagnostic and Chemical Branch, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

PATRICIA ANN CAPLE, RN
Lieutenant Colonel, Nurse Corps, US Air Force; Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

DOUGLAS M. CERASOLI, PhD
Research Microbiologist, Research Division, Department of Physiology and Immunology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

MATTHEW G. CLARK, PhD
Major, Medical Service Corps, US Army; Chief, Neurobehavioral Toxicology Branch, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Edgewood Arsenal, Maryland 21010

THOMAS R. DASHIELL
Formerly, Director, Environmental and Life Sciences , Office of the Director of Defense Research, Office of the Secretary of Defense, Department of Defense, Washington, DC; Deceased

KENNETH DESPAIN, DVM
Lieutenant Colonel, US Army; Commander, Rocky Mountain District Veterinary Command, 1661 O'Connell Boulevard, Building 1012, Fort Carson, Colorado 80913-5108

BHUPENDRA P. DOCTOR, PhD
Director, Division of Biochemistry, Walter Reed Army Institute of Research, 503 Robert Grant Avenue, Silver Spring, Maryland 20910

MARGARET G. FILBERT, PhD
Special Assistant to the Commander, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Edgewood Arsenal, Maryland 21010

BRENT R. GIBSON, MD, MPH
Captain, Medical Corps, US Army; Army Medical Department Center and School, 3151 Scott Road, Suite 3507, Fort Sam Houston, Texas 78234

RICHARD K. GORDON, PhD
Chief, Department of Biochemical Pharmacology, Biochemistry Division, Walter Reed Army Institute of Research, 503 Robert Grant Road, Silver Spring, Maryland 20910

JOHN S. GRAHAM, PhD
Research Biochemist, Medical Toxicology Branch, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010-5400

ROBERT GUM, DO, MPH
Chief of Bio Surety, Barquist Army Health Clinic, 1434 Porter Street, Fort Detrick, Maryland 21702

BRADFORD W. GUTTING, PhD
Toxicologist; Naval Surface Warfare Center; Dahlgren Division (NSWCDD); Chemical, Biological, Radiological Defense Division (Code B54); Dahlgren, Virginia 22448

JULIAN R. HAIGH, PhD
Research Scientist, Department of Biochemical Pharmacology, Biochemistry Division, Walter Reed Army Institute of Research, 503 Robert Grant Road, Silver Spring, Maryland 20910

CLAUDIA L. HENEMYRE-HARRIS, PHD
Major, Medical Service Corps, US Army; Physiology and Immunology Branch, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

BENJAMIN A. HILL, Jr, DO, MS, MEd
Lieutenant Colonel, Medical Corps, US Army; Physician Faculty, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

COREY J. HILMAS, MD, PhD
Research Physiologist and Pharmacologist, Analytical Toxicology Division, Department of Neurobehavioral Toxicology,US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

ELORA HILMAS, PharmD, BCPS
Clinical Pediatric Pharmacist and Pharmacy Practice Residency Coordinator, Department of Pharmacy, Alfred I. DuPont Hospital for Children, 1600 Rockland Road, Wilmington, Delaware 19803

JOSEPH J. HOUT
Researcher, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Road, Bethesda, Maryland 20814

CHARLES G. HURST, MD
Colonel (Retired), Medical Corps, US Army; Director, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

WILLIAM L. JACKSON, MD, PhD
Commander, US Public Health Service; Centers for Disease Control and Prevention Quarantine Station, Honolulu International Airport, 300 Rodgers Boulevard, Terminal Box 67, Honolulu, Hawaii 96819; formerly, Assistant Chief Medical Officer, US Coast Guard Personnel Command, Arlington, Virginia

JAMES B. KELLY
Research Chemist, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Room 92, Aberdeen Proving Ground, Edgewood Area, Maryland 21010

JAMES S. KETCHUM, MD
Colonel, Medical Corps, US Army (Ret); Clinical Assistant Professor of Psychiatry, University of California, Los Angeles, 2304 Fairbanks Drive, Santa Rosa, California 95403; formerly, Chief, Substance Abuse Program, Brentwood/UCLA VA Hospital, Los Angeles, California

ALLART B. KOK, MS
Biomedical Scientist, Science Applications International Corporation, 3465 Box Hill Corporate Center Drive, Abingdon, Maryland 21085

TIMOTHY A. KLUCHINSKY, Jr, PhD, MSPH
Manager, Health Hazard Assessment Program, Directorate of Occupational Health Sciences, US Army Center for Health Promotion and Preventive Medicine, 5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010

DAVID E. LENZ, PhD
Research Chemist, Research Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

ERIC S. LEVINE, PhD
Assistant Program Manager, Science Applications International Corporation, 3465 Boxhill Corporate Center Drive, MS 23, Abingdon, Maryland 21009

THOMAS P. LOGAN, PhD
Chemist, Medical Diagnostics Branch, Analytical Toxicology Division, United States Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Building E3081, Room 293, Aberdeen Proving Ground, Maryland 21010

BRIAN LUKEY, PhD
Colonel, Medical Service Corps, US Army; Commander, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

ROBERT C. LUTEN, MD
Professor, Emergency Medicine, University of Florida College of Medicine, 1329 SW 16th Street, Suite 2204, Gainesville, Florida 32610; Attending, Pediatric Emergency Medicine, Department of Emergency Medicine, Shands Jacksonville Medical Center, 655 W 8th Street #1, Jacksonville, Florida 32209

BEVERLY I. MALINER, DO, MPH
Colonel, Medical Corps, US Army; Director, Department of Occupational and Environmental Medicine, US Army Center for Health Promotion and Preventive Medicine, 5158 Blackhawk Road, Building E1930, Aberdeen Proving Ground, Maryland 21010

JOHN D. MALONE, MD, MSPH
Captain, US Navy; Professor of Medicine, Uniformed Services University of the Health Sciences, Bethesda, Maryland 20814; formerly, Commanding Officer, Medical Treatment Facility, USNS Mercy

AL MAURONI, MS
Senior Policy Analyst, Northrop-Grumman Information Technology, 8211 Terminal Road, Suite 1000, Lorton, Virginia 22079

DONALD M. MAXWELL, MS
Research Chemist, Research Division, Department of Pharmacology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

JOHN H. MCDONOUGH, PhD
Major, Medical Service Corps, US Army (Ret); Research Psychologist, Pharmacology Branch, Research Division, US Army Medical Research Institute of Chemical Defense, Room 161A, Building E-3100, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

MELANIE L. MURROW
Safety and Occupational Specialist, Safety, Surety, and Security Office, Office of the Commander, United States Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Building E3101, Room 104, Aberdeen Proving Ground, Maryland 21010

JONATHAN NEWMARK, MD
Colonel, US Army; Deputy Joint Program Executive Officer, Medical Systems, Joint Program Executive Office for Chemical/Biological Defense, Skyline #2, Suite 1609, 5203 Leesburg Pike, Falls Church, Virginia 22041; Adjunct Professor, Department of Neurology, F. Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences, Bethesda, Maryland

MICHAEL R. O'HERN
Sergeant First Class, US Army (Ret); PO Box 46, Aberdeen, Maryland 21010; formerly, Noncommissioned Officer in Charge, Chemical Casualty Care Office, US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, Maryland 21010-5425

JOHN P. PETRALI, PhD
Research Anatomist, Comparative Pathology Branch, Comparative Medicine Division, US Army Medical Research Institute of Chemical Defense, 3100 RicketTs Point Road, Aberdeen Proving Ground, Edgewood Arsenal, Maryland 21010

GENNADY E. PLATOFF, Jr, PhD
Colonel, US Army (Retired); Scientific Advisor, Office of Biodefense Research, National Institute of Allergies and Infectious Disease, National Institutes of Health, 6610 Rockledge Drive, Room 4069, Bethesda, Maryland 20892-6612

LAUKTON Y. RIMPEL
Sergeant First Class, US Army (Ret); Consultant, Battelle Scientific Program Office, 50101 Governors Drive, Suite 110, Chapel Hill, North Carolina 27517

GARY A. ROCKWOOD
Research Coordinator, Cyanide Medical Countermeasures, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

MICHELLE C. ROSS, DVM, PhD
Colonel, US Army; Director of CBRN Medical Defense Policy, Office of the Assistant Secretary of Defense for Health Affairs, 5111 Leesburg Pike, Skyline 5, Falls Church, Virginia 22041

HARRY SALEM, PhD
Chief Scientist for Life Sciences, US Army Edgewood Chemical Biological Center, 5183 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010

ASHIMA SAXENA, PhD
Chief, Division of Biochemistry, Department of Molecular Pharmacology, Walter Reed Army Institute of Research, 503 Robert Grant Avenue, Silver Spring, Maryland 20910

ALFRED M. SCIUTO, PhD
Research Physiologist, Analytical Toxicology Division, Medical Toxicology Branch, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

FREDERICK R. SIDELL, MD
Formerly, Chief, Chemical Casualty Care Division, and Director, Medical Management of Chemical Casualties Course, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010; Deceased

JEFFERY K. SMART, MA
Command Historian, US Army Research, Development, and Engineering Command, 5183 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010

J. RICHARD SMITH
Chemist, Medical Diagnostic and Chemical Branch, Analytical Toxicology Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

WILLIAM J. SMITH, PhD
Chief, Cellular and Molecular Biology Branch, Research Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

THOMAS B. TALBOT, MD, MS
Major, Medical Corps, US Army; Chief of Operations Branch, Chemical Casualty Care Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

MARY FRANCES TRACY
Research Scientist, Chemical, Biological, Radiological & Nuclear Defense Information Analysis Center, Aberdeen Proving Ground, Maryland 21010-5425

SHIRLEY D. TUORINSKY, MSN
Lieutenant Colonel, AN, US Army; Executive Officer, Combat Casualty Care Division, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

JOHN S. URBANETTI, MD
Lecturer, Pulmonary Disease, Yale University School of Medicine, New Haven, Connecticut 06510

KEITH VESELY, DVM, PhD
Colonel, US Army; Joint Product Manager, Medical Identification and Treatment Systems, Chemical Biological Medical Systems Joint Project Management Office, 64 Thomas Johnson Drive, Frederick, Maryland 21702

SCOTT WILLENS, DVM, PhD
Major, Veterinary Corps, US Army; Chief of Department of Neurobehavioral Toxicology, Analytical Toxicology Division, Department of Neurobehavioral Toxicology, US Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

PATRICK WILLIAMS, MS
Research Biologist, Department of Neurobehavioral Toxicology,
US Army Medical Research Institute of Chemical Defense, 3100
Ricketts Point Road, Aberdeen Proving Ground, Maryland 21010

CSABA K. ZOLTANI, PHD
Research Physicist, Army Research Laboratory, Building 394,
Aberdeen Proving Ground, Maryland 21005

Foreword

The US military has been concerned with the risk of chemical warfare for decades. By the end of the twentieth century, however, scenarios for the use of chemical weapons expanded beyond the battlefield as terrorist organizations began employing them against civilian populations. This development is not surprising, given that a great percentage of the world's population now has the ability and knowledge to develop weapons of mass destruction, particularly chemical weapons.

In 1995, Aum Shinrikyo, a well-funded Japanese religious cult with chemical expertise, released sarin, a deadly nerve agent, in five separate subway cars in downtown Tokyo. The attack not only caused panic, but also overwhelmed the medical response system. In Baghdad, Iraq, on May 18, 2004, a small amount of sarin was dispersed by a shell that exploded near a US military convoy, and on April 6, 2007, a chemical, first weaponized during World War I, reappeared when a suicide bomber in Baghdad detonated a truck loaded with chlorine gas, killing 20 people and wounding 30 others.

Although the events of September 11, 2001, did not involve chemical weapons, they did underscore terrorists' willingness to use unconventional weapons and shocked the United States into awareness of its own vulnerability to terrorist attacks. The use of chemical agents by terrorist groups is now a recognized threat to the American population and to US troops deployed abroad. We know terrorist groups have the knowledge and the financial support to design and disperse chemical weapons. Also, as our world becomes more highly industrialized, chemicals, some of which are highly toxic, are used in numerous manufacturing processes; the world's population is at risk of exposure to these lethal chemicals through their inadvertent release from manufacturing plants and accidents during their transportation or intentional release by terrorists.

Medical Aspects of Chemical Warfare is the most comprehensive source of information available on chemical agents. This text is strongly recommended reading for all military medical personnel. It should be placed in the reference libraries of every military medical treatment facility. It will serve to both enhance the knowledge and skills, and increase the level of preparedness and response capability, of those responsible for chemical casualty care. Many civilian medical professionals will also find this textbook to be a valuable reference as their hospitals prepare for the possibility of treating casualties of an accidental or deliberate exposure.

Lieutenant General Eric B. Schoomaker
The Surgeon General
US Army

Washington, DC
January 2008

Preface

A significant concern for the United States and its allies is that an ever-growing number of terrorist organizations will employ chemical warfare agents in an attack on military forces or civilians. As a result, efforts to prepare for such an attack have expanded and are now supported by the Department of Health and Human Services and Department of Homeland Security, as well as the Department of Defense.

Since its initial publication in 1997, this textbook has provided military physicians, nurses, physician assistants, and medics with the knowledge and skills to medically manage chemical agent casualties. This expanded second edition will not only continue to be an essential reference tool for military personnel, but should also become a requisite guide for civilian healthcare providers, first responders, and government agencies responsible for emergency preparedness, response, and management. Its 23 chapters will prepare these individuals and organizations to manage casualties from first chemical exposure to hospital discharge. In addition to detailed explanations of chemical agent detectors, personal protection equipment, and decontamination stations, this edition contains expanded discussions of the cutting-edge science behind countermeasure development, as can be seen in Chapter 7, Nerve Agent Bioscavenger: Development of a New Approach to Protect Against Organophosphorus Exposure. The textbook also addresses topics of particular interest to civilian healthcare providers, with chapters on the threat posed by toxic industrial chemicals and domestic preparedness.

I would like to offer my sincere thanks to the physicians, nurses, scientists, and support personnel who have contributed to this textbook either directly or indirectly. These professionals are recognized worldwide and are the foremost experts in the medical aspects of chemical warfare. Their overall goal is to provide the medical force with the understanding of the chemical agent threat, how to respond, and how to deliver quality chemical casualty care.

Major General George Weightman
Medical Corps, US Army
Commanding General, US Army Medical Research and Materiel Command

Fort Detrick, Maryland
January 2008

Prologue

The original edition of *Medical Aspects of Chemical and Biological Warfare* has been a tremendous resource for the past 10 years. Much has transpired, however, since its publication; in particular the terrorist attacks of September 11, 2001. As a result, this revised edition covers solely chemical warfare, and information on biological warfare is now published in a separate volume. Also, while the earlier edition focused on medical management of patients, a conscious effort was made in this edition to include discussions of cutting-edge science that has led to significant medical therapeutic advances.

This expanded edition covers four themes: (1) the history of chemical warfare; (2) medical diagnosis and treatment for chemical casualties; (3) the mechanisms and science behind treatments and advances in therapy; and (4) homeland security. The book addresses innovative new technologies, such as nerve agent bioscavenger enzymes, as well as advances in personal decontamination, wound healing, protective equipment, and more.

I would like to recognize and thank Lieutenant Colonel Shirley D Tuorinsky of the Army Nurse Corps, who served as the senior editor for this book. Her 2 years of thoughtful and relentless effort have resulted in a quality product of which we can all be proud.

Colonel Timothy K. Adams
Veterinary Corps, US Army
Commander, US Army Medical Research Institute of Chemical Defense

Fort Detrick, Maryland
February 2008

Acknowledgments

BOARD SUBJECT MATTER EDITORS

Lieutenant Colonel Shirley D. Tuorinsky, CRNA
Colonel (Ret) Charles G. Hurst, MD
Colonel (Ret) Gennady E. Platoff Jr, PHD
Colonel (Ret) Ernest T. Takafuji, MD, MPH
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