
**MEDICAL CONSEQUENCES OF RADIOLOGICAL AND
NUCLEAR WEAPONS**



The Coat of Arms
1818
Medical Department of the Army

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MEDICAL CONSEQUENCES OF RADIOLOGICAL AND NUCLEAR WEAPONS

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Foreword

The events of September 11, 2001, catalyzed a long-recognized terror threat around the world and heightened global concern regarding the management and creation of weapons of mass destruction in the post-Cold War era. The US Army Medical Department, in conjunction with other US military commands and military health services, government agencies, and our allies, has undertaken ambitious programs to meet the unique nuclear and radiation challenges and threats that have grown increasingly complex in today's world. Other long-standing nuclear realities include industrial radiation leaks and associated potential catastrophic events caused by human error and natural disasters, such as the earthquake and tsunami that resulted in the disaster at the Japanese Fukushima Daiichi Nuclear Power Plant. Continual global conversation and collaboration among principal entities is needed to improve medical doctrine and policies that not only address combat operations, but how military medicine influences and works with other agencies—international, federal, state, and local—in large-scale, multi-agency responses.

Military medicine sustains the health of the force regardless of the environment. Weapons of mass destruction and natural disasters pose potential threats to our military forces and their families. Military medicine must be prepared to sustain the force in any environment and ensure they meet the challenges presented by the chemical, biological, radiological, nuclear, and explosive (CBRNE) threat. Military medical providers must also have contingencies that address the environment post-incident and through humanitarian relief efforts. When working internationally with NATO and other military forces in combat operations or in support of humanitarian relief efforts, Army Medicine has the opportunity to strengthen medical response around the world. Frequent technological advances make it imperative to constantly seek improvements in medical procedures, research, equipment, and logistics to sustain the force. The CBRNE threat adds a complex layer to planning for and executing the military medical response if an event was to occur.

Meeting the medical imperatives in the nuclear and radiological CBRNE threat requires a large, comprehensive healthcare system effort. In cooperation with other US and foreign government agencies, civilian academic institutions, and private industry, we know our capabilities progressively improve and create better outcomes for populations affected by natural or manmade disasters. Ongoing research in the realms of protectants, medications, colony-stimulating factors, and decorporation agents that will increase the survival of radiological casualties while decreasing late-term health effects is improved by biodosimetry, in conjunction with radioinformatics, and offers the medical provider a more precise and rapid way to triage radiological casualties during a mass casualty radiological incident. Preventive measures, including the use of robotics, improved personal protective equipment, and detection equipment can minimize the radiation exposure of first responders and medical personnel as well. The Army is currently developing better methods for recording the dose assessment in a permanent database for individuals exposed to radiation, and making the database accessible to the Veterans Administration for long-term monitoring and treatment of our veterans. These are just a few of the efforts military medicine is involved in that will sustain the health of our military forces and their fighting strength well into the future.

I hope you find this *Textbook of Military Medicine* to be an invaluable guide that stimulates your interest in this subject and sharpens your focus on how to best sustain the health of the force as it relates to CBRNE threats. It is our collective responsibility to be prepared and plan for these medical challenges because the threats, both human and natural, are real. It is my hope that this textbook will serve as a definitive reference to influence your current operations and training programs regarding the response to contingent nuclear and radiological medical threats. As past is often prologue, then preparedness is essential.

Patricia D. Horoho
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The Surgeon General and
Commanding General, US Army Medical Command

Washington, DC
October 2012

Preface

The initial Medical Consequences of Nuclear Warfare component of the *Textbooks of Military Medicine* series was published in 1989. In the years since that publication, many changes have occurred in areas of research, technology, doctrine, and medical practice. An update for the radiological portion of the textbook in particular was long overdue to address the challenges of a post-September 11, 2001, world.

The radiological and nuclear threat has expanded from Cold War nuclear warfare to radiological terrorism and domestic accidents. Radiological incidents, such as Chernobyl, Goiânia, and the Fukushima Daiichi Nuclear Power Plant disaster demonstrate the importance of continued vigilance and preparedness, as these types of disasters affect the physical and mental health of surrounding populations and result in negative effects on the environment and economy.

To minimize the consequences of radiation exposure, it is important to harness technological and scientific advances of medical radiobiology. Since establishment in 1961, the Armed Forces Radiobiology Research Institute (AFRRI) has been the leader in Department of Defense medical radiobiology research, working alongside other US government agencies, the private sector, and our allies. AFRRI continues work aimed at maximizing use of available technologies that have potential to expand medical radiobiology capabilities. Other initiatives include the development of protectants to minimize the harmful effects of ionizing radiation, the creation of biologically friendly metal alloy alternatives for depleted uranium, and quantifying the radiation required to eradicate various microorganisms.

Along with its research mission, educating the force is an equally important facet of AFRRI. As a subordinate organization to the Uniformed Services University for the Health Sciences, AFRRI continues to educate military and civilian medical providers, including first responders, through activities such as the Medical Effects of Ionizing Radiation course, the Military Radiobiology Advisory Team, and numerous publications to assist in improving our nation's emergency response.

It is by the contributions of many that this book is now a reality. Among individuals who merit specific recognition are Colonel Patricia Lillis-Hearne, MC, US Army (Ret); Colonel Donald Hall, MSC, US Army (Ret); and Captain Christopher Lissner, MSC, US Navy (Ret). They initiated this project and provided expert guidance in developing its content and format. Colonel Lester "Andy" Huff, MC, US Air Force, and Colonel Mark Melanson, MSC, US Army, unflaggingly oversaw this publication project to its completion. And special recognition and sincere appreciation is due to each author who willingly contributed his or her expertise to this valuable resource. Their input will immensely benefit both military and civilian communities by enhancing knowledge of the consequences and management of radiation injuries.

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