HIGH-TECH TERROR

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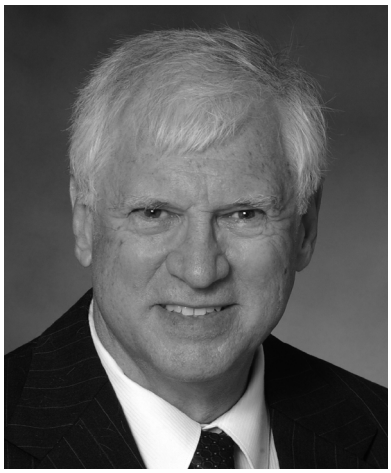

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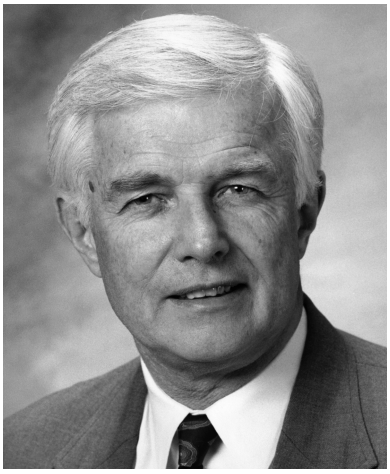

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HIGH-TECH TERROR

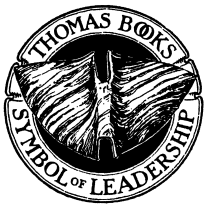
Recognition, Management, and Prevention of Biological, Chemical, and Nuclear Injuries Secondary to Acts of Terrorism

By

ROBERT SAMUEL CROMARTIE III, M.D., FACS

and

RICHARD JOSEPH DUMA, M.D., PH.D., FACP



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Dedicated to our supportive wives
Elaine
and
Mary Alyce

PREFACE

This book has been written to serve as a readable, "user-friendly" text, principally for health care professionals and all the varied personnel involved in initial response teams, to aid them in the prompt recognition and management of patients suffering from acts of terrorism with biological, chemical, or nuclear weapons, and to outline preventive measures that need to be taken to reduce casualties. Discussions in the book include those diseases and/or injuries that are most serious and believed most likely to be encountered.

Those professionals who will benefit most from the information provided are those who deal directly with patients and people; that is, physicians, especially those in family practice, primary care, internal medicine, and pediatrics, as well as surgeons, various subspecialists, intensivists, and hospitalists; emergency department personnel; physician assistants and nurse practitioners; nurses; and first-line responders. The book is especially valuable for those who may be involved in the initial or early care of patients. In addition, police and security personnel, public health workers; health care administrators, those involved in disaster preparedness, legislators and those on their staffs, and anyone responsible for the security and well-being of the nation will also find this text informative and useful.

Because most all of the previously mentioned people, including health care providers, have little or no experience with infectious, chemical, or nuclear agents that may be used in terrorist attacks, this book fills the need for an easily understandable source of information concerning the illnesses and/or injuries likely to occur. The authors believe that familiarity with this text and access to data contained herein could be vital to salvaging not only critically ill patients, but also in preventing diseases and/or injuries to those who are otherwise healthy who might become secondarily involved.

For legislators and nonmedical personnel responsible for the safety and welfare of the people, the book serves as a ready reference and description of the source, type, breadth, and magnitude of the disasters that are likely to occur. These people need only to complement this information with their imaginations to motivate them into action.

In Part I, *Biological Agents and Diseases,* the reader finds an overview and classification of biological agents and their associated syndromes most helpful in putting the subject in perspective. This material precedes separate and distinct sections containing terse descriptions of expected clinical presentations that should arouse suspicions of the presence of terrorist-promoted diseases and/or injuries and outlines how to diagnose, treat, prevent, and contain each of the major threats under consideration.

Similar approaches are utilized to present Part II, *Chemical Warfare Agents and Terrorism,* and Part III, *Radiation Injuries and Nuclear Terrorism;* that is, both of these subjects are previewed by helpful overviews of the history and basic sciences involved before the agents and diseases and/or injuries that might be encountered are separately discussed.

Although the thrust of this book focuses on early recognition, appropriate treatment and management, and prevention of illnesses and/or injuries that might result from terrorist attacks, many of the agents, principles, and approaches discussed may also be applied to managing natural (e.g., pandemic influenza) or accidental (e.g., nuclear power plant accidents) disasters.

Because the past can teach us much about infectious, chemical, and nuclear agents, a generous dose of relevant history is included throughout. Such historical content prepares us to understand and anticipate: (a) how these agents have been and might be weaponized and exploited for evil purposes, (b) the likelihood of encountering them, (c) the delivery systems or mechanisms of agent dispersions that might be used, (d) the difficulties of prompt recognition of the illnesses they produce, and (e) the immediate and secondary consequences of such diseases/injuries, in terms of both morbidity and mortality. Through the lens of history, we are then compelled to reflect on the unanticipated problems that these medical disasters might pose, such as widespread hysteria, crippled health care systems, absence of public safety, economic chaos, and shortage of food supplies, just to name a few.

Finally, this text is intended to remind us that terrible weapons will always exist and are certain to be used against humanity in the future–not just in the military, but also in the civilian arenas. Thus, the more health care providers and everyone else involved with the health care industry know about this subject and the diseases and injuries these agents or weapons can produce, the more likely mankind will be able to successfully mute, survive, or prevent their catastrophic consequences.

R.S.C.
R.J.D.

INTRODUCTION

The premeditated terrorist attacks of September 11, 2001, irrevocably altered the lives of Americans and, for that matter, most people of the world. Gone is that sense of security that allowed everyone to think of terrorism as a problem only for certain sects of people, perhaps in isolated corners of the world. The first attack on the World Trade Center on February 26, 1993, should have alerted everyone to the potential magnitude of future expected dangers, but most people looked on that event as little more than an action by a small fringe group of fanatics.

However, everything abruptly changed on September 11, 2001, at 8:45 a.m., when American Airlines Flight #11, en route from Boston to Los Angeles, crashed into the north tower of the World Trade Center. Any speculation that it was a freak accident evaporated 18 minutes later when United Airlines Flight #175, also en route from Boston to Los Angeles, crashed into the south tower.[1]

Shortly afterward, at 9:40 a.m., a third airliner, American Airlines Flight #77, traveling from Washington to Los Angeles, flew directly into the Pentagon. Then, at 9:58 a.m., a cell phone call was received from a male passenger on United Airlines Flight #93, traveling from Newark to San Francisco, alerting the world that the plane on which he was traveling was being hijacked. Two minutes later, as some of the passengers tried to gain control of the airplane, it crashed in a field in Pennsylvania, killing all aboard.[2]

Televisions across the world shocked transfixed and horrified audiences as the south tower and then the north tower of the building that had come to symbolize New York City and American economic and trade power completely collapsed. Using hijacked airliners as weapons, 19 terrorists had managed to kill more than three thousand people and to paralyze not just a great city, but an entire country of

300 million citizens–a nation that was indisputably the mightiest military power on Earth.

As authorities investigated how this could have happened, everyone's vulnerability became quite obvious. Mankind was faced with a highly advanced and well-funded army of rogue militants who hated the United States and Western civilization and were willing to do anything, even to sacrifice their own lives, for the sole purpose of making a point or killing those they disliked. Worse, with the recent political and financial collapse of the Soviet Union, a variety of awesome and exotic weapons stockpiled by that country were now potentially available to anyone with money and access to the "black market."

This vulnerability became even more evident just weeks after "9/11," when in October 2001, a photo editor in Florida was discovered to have contracted inhalational anthrax. He was the first person diagnosed with this form of the disease in the United States since 1976. He would be the first of 22 people in the United States to become ill with anthrax between October 4 and November 20, 2001, 11 of whom developed inhalational and 11 of whom developed the cutaneous form of this disease. Despite the best that modern medicine and antibiotics had to offer, 5 of the 11 (45%) patients with inhalational anthrax died.[3]

When the "epidemic" of terror was finally over, cases were confirmed in seven states: Connecticut, Florida, Maryland, New Jersey, New York, Pennsylvania, and Virginia. Twelve of the 22 patients terrorized were mail handlers, and 6 others worked at sites where mail containing anthrax spores was received and sorted. Four envelopes contaminated with spores of *Bacillus anthracis,* the bacterium causing anthrax, were subsequently identified, all of which were mailed from Trenton, New Jersey. Letters with September 18, 2001, postmarks were mailed to Tom Brokaw, a well-known NBC news anchor man, and to the editor of the *New York Post.* Similar letters with October 9, 2001, postmarks were sent to Senators Tom Daschle and Patrick Leahy.[4]

Anthrax contamination was subsequently discovered in the Senate Hart Building, in the mailroom of the Dirksen Senate Office Building, and in various U.S. Congressional House buildings. As a result, all the Congressional buildings were closed, and Congressional mail was quarantined. Tests of material obtained from nasal swabs from everyone associated with these buildings or with handling the Congressional mail revealed that a large number of people had been exposed to anthrax.[5] Thus, widespread antibiotic prophylaxis of these popula-

tions had to be employed and continued for extended periods of time, exhausting the supply of ciprofloxacin, the antibiotic of choice for prophylaxis and treatment. For 7 years, the source of the powdered anthrax spores remained unknown. Although identical anthrax spores were found in vials in a laboratory at Fort Detrick, the perpetrator(s) was (were) never apprehended, underscoring how difficult it can be to trace the use of biological weapons.

As evidence of the importance of these diseases and the threats they presented, shortly after the anthrax attacks of 2001, then-President George W. Bush proposed *Project Bioshield* in his 2003 State of the Union address. This project was a comprehensive effort involving the U.S. Department of Health and Human Services (HHS) and other federal agencies to speed the research, development, acquisition, and availability of medical countermeasures to improve government preparedness and its ability to counter biological, chemical, and nuclear threats. The passage of this legislation made available $5.6 billion over 10 years for advanced development and purchase of medical counter measures. Under *Project Bioshield,* HHS initially selected four major threat agents for support: **anthrax, smallpox, botulism,** and **radiological/nuclear agents**. This support was mostly diverted toward anthrax vaccines and therapeutics, the pediatric formulation of potassium iodide, chelating agents to treat ingestion of certain radiological particles, and botulinum antitoxins.

However, 60 years earlier, before "9/11" and before the anthrax episode of 2001, but still in "modern times," efforts to threaten or destroy mankind were already well known. During the Second World War, Nazi Germany allowed countless prisoners to die of iatrogenic diseases in concentration camps, often instilling germs into prisoners for experiments that culminated in the deaths of their subjects.[6] In 1944, Heinrich Himmler, *Reichsfuehrer S.S.* of the Third Reich, desired that the German Army deploy biological weapons to delay the anticipated Anglo-American invasion of Europe, but curiously *Fuehrer* Adolf Hitler strictly forbid their offensive use.[7]

In contradistinction, the Japanese Imperial Army established a military command, called Unit 731, whose existence was little publicized after the war, but which was devoted to biological warfare. This Unit, under the command of General Shiro Ishii, conducted experiments on prisoners in Manchuria from 1932 to 1945 and in China after 1939. The Unit built a number of facilities for human research with biologi-

cal and chemical weapons. Large operations were located in Changchun and Nanking, but the largest was south of Harbin at Ping Fan. It contained 76 buildings, including a prison for human "guinea pigs," whom the Japanese called "logs." "Logs" were infected with an incredible variety of bacteria or viruses causing plague, glanders, typhoid, smallpox, cholera, dysentery, tularemia, paratyphoid A and B, diphtheria, epidemic hemorrhagic fever, meningitis, pneumonia, undulant fever, tuberculosis, scarlet fever, infectious jaundice, tetanus, gas gangrene, tick encephalitis, whooping cough, erysipelas, venereal diseases, salmonellosis, and/or typhus.[8]

One study involved tying prisoners to posts and exploding a nearby bomb containing *Clostridium perfringes,* the bacterium responsible for gas gangrene, thus sending infected shrapnel into their legs and causing all to die over a week's time. Other victims were left tied to stakes as bombs containing germs were dropped on them from airplanes. Another heinous experiment involved impregnating female prisoners after infecting them with *Treponema pallidum,* the bacterium that causes syphilis. Then the women and their babies were dissected alive. Other prisoners were forced to eat cakes and biscuits containing the plague bacillus or chocolates infected with *B. anthracis* or to drink milk contaminated with *Vibrio cholerae,*[9] the organism causing cholera.

In 1939, during a border dispute with the Soviet Union, General Ishii's Unit crossed into Soviet territory and released 50 pounds of *Salmonella typhosa,* the bacterium that causes typhoid fever, into the Halha River. The results of this egregious attack are unknown, but the implications are obvious.[10]

In Nanking, another of Ishii's Units injected prisoners with the plague bacillus and later exsanguinated them. The blood obtained was used to infect fleas that were then dropped over Chinese villages, including Congshan in Zhejiang Province. There, an ensuing epidemic of plague killed 392 people, and even today cases of plague are still sporadically reported from this region. In another separate instance in China, an epidemic of cholera ensued after residents of Changchun were inoculated with *V. cholerae,* which caused severe, often fatal, diarrheic disease.[11]

The Japanese had huge stockpiles of infectious agents for producing plague, anthrax, typhoid, paratyphoid, cholera, and dysentery. In 1944, they planned to use porcelain bombs containing fleas infected with the plague bacillus or *Pasteurella pestis* (now called *Yersinia pestis*)

against American soldiers invading Saipan, but the submarine carrying the bombs and supplies for this planned attack was sunk before it could carry out its mission.[12]

"Operation Cherry Blossoms at Night" was scheduled for September 1945. A Japanese submarine was to carry kamikaze pilots and several planes with folded wings to the waters off San Diego. The planes were then to drop fleas infected with *Y. pestis* over the city. However, the war ended before this mission could ever be attempted. Another unaccomplished plan was to release the plague bacillus from gliders over Iwo Jima after the island fortress was occupied by the Americans.[13]

The reason for describing these terrible atrocities and sinister plans is to awaken the medical community and populations at large to the realization that attacks with biological weapons, either by bona fide troops or by desperate nations (or terrorists), have been employed all too frequently in recent times and are likely to be used again and again depending on the circumstances. Desperate people will do desperate things.

With the fall of the Soviet Union and the end of decades of nuclear threats between that country and the United States, it appeared that the world was entering a golden age, in which its people could peacefully share this planet with one another. However, this vision has proven to be nothing more than an apparition and, to some, a cruel hoax. Perhaps much of the world was simply naïve to hope and believe that evil might suddenly disappear. Just as there will always be people willing to sacrifice their lives for the good of mankind, there will also be others with dark motives, willing to kill or maim anyone and everyone, and even to sacrifice their own lives, to promote their own agendas or beliefs.

The world has never been more vulnerable than it is today. Technology has advanced to the point that biological, chemical, and nuclear weapons with the capacity to kill millions of people are within reach of rogue nations, terrorist groups, and/or deranged psychopaths outside the control of any civilized government. The blueprints for the creation and assembly of such weaponry are becoming increasingly available, even to the rankest amateur, through the Internet or lay press. Every day, people in every part of the globe, but especially in highly developed countries, are living with the threat of being consumed by horrific man-made terrors. Thus, the world has truly entered into and is living in the age of "High-Tech Terror."

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HIGH-TECH TERROR

Part I

BIOLOGICAL AGENTS AND DISEASES

Chapter 1

IDENTIFICATION AND CLASSIFICATION OF EXPECTED BIOLOGICAL/BIOTERRORIST AGENTS AND CHARACTERISTICS OF THEIR ASSOCIATED DISEASES AND SYNDROMES

In the early hours after a biological attack, it is unlikely that the biological agent employed will be promptly and correctly identified. Even more disturbing, it will probably not be quickly appreciated that an attack has even occurred due to the delay and/or variations in the time of onset of symptoms of infected patients or the mistaken impression that a "natural disaster" (e.g., pandemic or seasonal influenza) rather than a bioterrorist attack is taking or has taken place. A large number of sick people may simply begin to arrive at one or many different and perhaps unrelated hospital emergency rooms, suddenly or sporadically, over days or even weeks. Throughout this time frame, many different unrelated health care providers will probably see these people, so that no one provider will have a clear picture or suspicion as to exactly what might be happening. Also, because the victims involved may be seen at a variety of different emergency rooms, clinics, or doctors' offices scattered over the nation or countryside, physicians, health care providers, hospitals, public health authorities, and those responsible for disaster preparedness are likely to be unaware of what each of the others is facing.

Although "syndromic surveillance," which may monitor in real time emergency room visits nationwide for symptoms (e.g., diarrhea, shortness of breath and cough, headache, rash, etc.) common to certain epidemic and/or bioterrorist diseases, shows promise of being useful for early recognition of these diseases, the technique or plan is far from

perfected or ready. Specificity will be a problem, and the spectrum of diseases that can be studied will likely be limited.

If foul play is suspected by health care providers, hopefully local and state health departments will be notified immediately, as well as the Office of Homeland Security, Federal Bureau of Investigation (FBI) through its field offices, and the Centers for Disease Control and Prevention (CDC) in Atlanta. In addition, if such a problem is identified in a hospital or its emergency room, local hospital administrators and local hospital infection control personnel should be contacted as soon as possible. **Health care providers should remember that, whatever the disaster may be, it should be considered a medical problem first and a criminal act second.** What to do for sick patients and how to prevent further spread of the problem should be foremost in every health care provider's mind. The criminal aspects should be left for the FBI and/or Homeland Security. Each hospital, clinic, or emergency room should have the telephone numbers of all the aforementioned agencies and departments readily available. Table 1 describes some of the conditions that should alert medical practitioners, especially those on the "front lines," to the possibility of a biological terrorist attack.[14,15]

Table 1. Conditions Suggesting a Biological/Bioterrorist Attack.

1. Appearance of a disease that is not common or endemic to an area
2. The responsible pathogens exhibit the same and/or unusual antibiotic resistance patterns
3. The same disease or syndromic picture occurs in many patients
4. The sudden almost same-day appearance of large numbers of patients with infectious diseases, especially those due to the same organism
5. Evidence or suggestions that a "point-source outbreak" has occurred, particularly if massive
6. Evidence of aerosol or airborne spread of a disease
7. High morbidity and high mortality rates in patients with the same disease or clinical syndrome
8. Any localized geographic outbreak of illness (i.e., an epidemic)
9. The presence or reports of dead animals or birds, particularly in the same or nearby locale as that where the disease is occurring
10. A vector-borne disease identified in an area in which the responsible vector is not indigenous
11. An atypical clinical presentation or unusual clinical course of a well-known disease
12. Rapid emergence of an endemic disease at an unexpected time of the year, especially if combined with abnormal or unusual presentation patterns

In handling potentially infected patients, the rule of thumb should always be that the disease is contagious or communicable until proven otherwise. Thus, "standard precautions" should be used while handling all patients and their blood and body fluids. Such precautions routinely include hand washing before and after seeing patients and wearing sterile or clean (nonsterile) gloves whenever one may have to touch nonintact skin, mucous membranes; or body fluids (blood, excretions, and/or secretions). A gown, eye protection equipment, and a mask should be used during any examinations or procedures that may result in the splashing of body fluids, blood, excretions, and/or secretions.[16] In addition, in dealing with patients with respiratory symptoms, especially cough, masks should be worn until the etiologies of the diseases are clarified. More stringent isolation techniques than these are indicated for special diseases, such as smallpox, which requires negative pressure rooms for suspected patients, and for pneumonic plague and for other respiratory problems, in which droplet or aerosol spread of disease is deemed important.

CLASSIFICATION OF BIOTERRORIST AGENTS

A number of highly pathogenic microorganisms and toxic biological products have been developed and produced as military weapons by a variety of nations. Representatives of the CDC within the U.S. Public Health Service have classified bioterrorist agents into three categories based on their ability to cause *mass casualties,* to be *widely disseminated,* and to be *transmitted from person to person,* as well as their ability *to trigger panic* and *require special public health preparations.*

Category A agents are *easy to disseminate* or transmit from person to person, cause *high mortality,* have potential for *major public health impact,* may cause *panic and social disruption,* and *require special actions* for public health preparedness. These agents are presented in Table 2.

Category B agents are *moderately easy to disseminate,* cause *moderate to low mortality,* and *require special enhancements of the CDC's diagnostic capacity and disease surveillance.* A number of these are presented in Table 3.

Category C agents are *not believed to carry a high risk* of bioterrorism use, but are considered *potential future threats.* Some of these are