



**STRATEGY
RESEARCH
PROJECT**

The views expressed in this paper are those of the author and do not necessarily reflect the views of the Department of Defense or any of its agencies. This document may not be released for open publication until it has been cleared by the appropriate military service or government agency.

BIOTERRORISM – MEDICAL PREPAREDNESS

BY

**LIEUTENANT COLONEL GARRY F. ATKINS
United States Army**

**DISTRIBUTION STATEMENT A:
Approved for Public Release.
Distribution is Unlimited.**

USAWC CLASS OF 2002



U.S. ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013-5050

20021015 097

USAWC STRATEGY RESEARCH PROJECT

BIOTERRORISM – MEDICAL PREPAREDNESS

by

Lieutenant Colonel Garry F. Atkins
United States Army

Mr. Darryl R. Carattini
Project Advisor

The views expressed in this academic research paper are those of the author and do not necessarily reflect the official policy or position of the U.S. Government, the Department of Defense, or any of its agencies.

U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

DISTRIBUTION STATEMENT A:
Approved for public release.
Distribution is unlimited.

ABSTRACT

AUTHOR: Lieutenant Colonel Garry F. Atkins
TITLE: Bioterrorism – Medical Preparedness
FORMAT: Strategy Research Project
DATE: 09 April 2002 PAGES: 39 CLASSIFICATION: Unclassified

This strategic research paper re-enforces the urgent need for preparing our medical health care infrastructure to be able to respond effectively against a bioterrorist attack. This paper further isolates shortcomings in the health care system and identifies where the Department of Defense can assist our federal, state, and local communities with their preparedness issues and their ability to respond to a bioterrorist attack. The recommendations include a discussion outlining potential improvements in the key health community issue areas of Leadership, Policy and Communication; Facilities and Logistics; Training and Education; and Detection and Response.

TABLE OF CONTENTS

ABSTRACTIII

BIOTERRORISM - MEDICAL PREPAREDNESS1

BACKGROUND - BIOTERRORISM.....2

 ANTHRAX (BACILLUS ANTHRACIS).....2

 SMALLPOX (VARIOLA MAJOR)3

 PLAGUE (YERSINIA PESTIS).....4

BACKGROUND - MEDICAL MANAGEMENT.....5

A BIOTERRORISM INCIDENT: TOPOFF WAR GAME7

 May 17:7

 May 20 (Day 1 of exercise):7

 May 21 (Day 2 of exercise):8

 May 22 (Day 3 of exercise):9

 May 23 (Day 4 of exercise):9

MILITARY RESPONSIBILITIES10

 NATIONAL SECURITY IMPLICATIONS AND ISSUES.....11

 COOPERATION12

 COORDINATION.....13

RECOMMENDATIONS15

 ISSUE 1. LEADERSHIP, POLICY AND COMMUNICATION.....15

 ISSUE 2. FACILITIES AND LOGISTICS.....18

 ISSUE 3. TRAINING AND EDUCATION.....19

 ISSUE 4. DETECTION AND RESPONSE PLANNING20

CONCLUDING THOUGHTS.....20

ENDNOTES23

BIBLIOGRAPHY.....29

BIOTERRORISM - MEDICAL PREPAREDNESS

During October 2001, a bioterrorist used anthrax as a weapon of mass destruction to attack the United States. Through the simple expedient of using letters containing anthrax spores from an extremely lethal strain, the National Capital area and several postal sites around the Eastern United States were literally besieged. Until this anthrax attack, which claimed five lives and cost hundreds-of-millions of dollars in clean-up, the term bioterrorist rarely received attention from federal officials. But it is now apparent that the use of a deadly virus or biotoxin (bioweapon) as a weapon of mass destruction is becoming an acceptable choice from among the growing terrorist arsenal of weapons with the ability to inflict mass casualties. Bioterrorism is a real threat to our national security.

This strategic research paper will re-enforce the urgent need for preparing our medical health care infrastructure to be able to respond effectively against a bioterrorist attack. This paper will further isolate shortcomings in the health care system and identify where the Department of Defense can assist our federal, state, and local communities with their preparedness issues and their ability to respond to a bioterrorist attack. The recommendations in this paper will include a discussion outlining potential improvements in the key health community issue areas of Leadership, Policy and Communication; Facilities and Logistics; Training and Education; and Detection and Response.

The United States has sponsored a number of exercises specifically design to evaluate the local, state, and federal responsiveness to a variety of terrorist attacks. One such exercise, TOPOFF, was a \$3 million dollar war game testing the ability of top government officials to respond to terrorist attacks at multiple geographic locations. It remains the largest exercise of its kind to date. Results of the TOPOFF exercise will be used in this paper to provide a framework for analysis through illustrating the enormous issues confronting the health care community in planning for and responding to a bioterrorist attack.

The TOPOFF exercise confirms that a bioterrorist attack will impose heavy demands on the public health system. This same public health system is the crucial factor for a capable response. The local, state, and federal medical infrastructure of the United States is not presently equipped to handle an attack from a bioweapon that would potentially create massive amounts of casualties.¹ This well documented issue has become a critical concern to the President of the United States and the new Secretary of Homeland Security.

The ability to defend from a foreign or domestic bioterrorist attack must be at the forefront of our national security and homeland defense strategy. Essential health care in the course of such an attack is the hinge-pin to providing this defensive capability.

This paper will first examine the bioterrorist threat more closely to better comprehend the nature and extent of the problem. There will also be a brief, but necessary look at the basic medical management considerations that are general baseline knowledge in the health care community. Knowing these considerations will be very helpful in understanding the issues as the paper progresses. Then, through the lens of the TOPOFF exercise, this paper will investigate in succession; Department of Defense opportunities to assist the health care community, general health care concerns, the state of existing cooperation among the various responsible agencies, and finally the established coordination structure. This investigation leads to recommendations in four key areas: (1) Leadership, Policy and Communication; (2) Facilities and Logistics; (3) Training and Education; (4) Detection and response.

BACKGROUND - BIOTERRORISM

As horrific are the events of September 11, 2001, they pale in comparison to the immense loss of life that a well planned and supported bioterrorist event could produce. A growing number of Americans (42%) believe that if there's another attack it will come from a biological or chemical attack.² Considering that the impact of an attack may not be felt for several days, bioweapons are also attractive if the attacker wishes to remain anonymous. This is particularly relevant in light of the "new" terrorists who appear less interested in claiming responsibility for an attack to draw attention to their political cause and more concerned about merely killing large numbers of people. For those with such a goal, bioweapons have another attractive characteristic: lethality.

ANTHRAX (BACILLUS ANTHRACIS)

Given appropriate weather and wind conditions, 50 kilograms of anthrax released from an aircraft along a 2-kilometer line could create a lethal cloud of anthrax spores that would extend beyond 20 kilometers downwind.³ The aerosol cloud would be colorless, odorless and invisible following its release. Given the small size of the spores, people indoors would receive the same amount of exposure as people on the street. There are currently no atmospheric warning systems to detect an aerosol cloud of anthrax spores. The first sign of a bioterrorist attack would most likely be patients presenting with symptoms of inhalation anthrax.

A 1970 analysis by the World Health Organization concluded that the release of aerosolized anthrax upwind of a population of 5,000,000 could lead to an estimated 250,000

casualties, of whom as many as 100,000 could be expected to die. A later analysis, by the Office of Technology Assessment of the United States Congress, estimated that 130,000 to 3 million deaths could occur following the release of 100 kilograms of aerosolized anthrax over Washington D.C., making such an attack as lethal as a hydrogen bomb.⁴ The Centers for Disease Control and Prevention estimate that such a bioterrorist attack would carry an economic burden of \$26.2 billion per 100,000 people exposed to the spores.⁵

The largest experience with inhalation anthrax occurred after the accidental release of aerosolized anthrax spores in 1979 at a military biology facility in Sverdlovsk, Russia. Some 79 cases of inhalation anthrax were reported, of which 68 were fatal.⁶

One of the major problems with anthrax spores is the potentially long incubation period of subsequent infections. Exposure to an aerosol of anthrax spores could cause symptoms as soon as 2 days after exposure. However, illness could also develop as late as 6-8 weeks after exposure -- in Sverdlovsk, one case developed 46 days after exposure.⁷

Further, the early presentation of anthrax disease would resemble a fever or cough and would therefore be exceedingly difficult to diagnose without a high degree of suspicion. Once symptoms begin, death follows 1-3 days later for most people. If appropriate antibiotics are not started *before* development of symptoms, the mortality rate is estimated to be 90%.⁸

SMALLPOX (VARIOLA MAJOR)

Smallpox spreads directly from person to person, primarily by droplet nuclei expelled from the oropharynx of the infected person or by aerosol. Natural infection occurs following implantation of the virus on the oropharyngeal or respiratory mucosa (the secretion of mucus in the lungs).

Contaminated clothing or bed linen could also spread the virus. Special precautions need to be taken to insure that all bedding and clothing of patients are autoclaved (high temperature sterilization).

A smallpox outbreak poses difficult problems because of the ability of the virus to continue to spread throughout the population unless checked by vaccination and/or isolation of patients and their close contacts. Between the time of an aerosol release of smallpox and diagnosis of the first cases, an interval of as much as two weeks is apt to occur. This is because there is an average incubation period of 12 to 14 days.⁹

Approximately 140,000 vials of vaccine are in storage at the Centers for Disease Control and Prevention, each with doses for 50-60 people, and an additional 50-100 million doses are estimated to exist worldwide. This stock cannot be immediately replenished, since all vaccine

production facilities were dismantled after 1980, and renewed vaccine production is estimated to require at least 24-36 months. In 2000, Center for Disease Control awarded a contract to Oravax of Cambridge, Massachusetts to produce smallpox vaccine. Initially producing 40 million doses, Oravax anticipates delivery of the first full-scale production lots in 2004.¹⁰

PLAGUE (YERSINIA PESTIS)

In 1346, the second plague pandemic, also known as the Black Death or the Great Pestilence, erupted. Within 5 years plague had ravaged the Middle East and killed more than 13 million in China. Twenty to thirty million were killed in Europe, about one third of the European population. Population losses attributable to plague during those years were between 50 and 60 percent.¹¹

Advances in living conditions, public health and antibiotic therapy make such natural pandemics improbable, but plague outbreaks following an attack with a biological weapon do pose a serious threat. Plague is one of very few diseases that can create widespread panic following the discovery of even a small number of cases. This was apparent in Surat, India, in 1994, when an estimated 500,000 persons fled the city in fear of a plague epidemic.¹²

In the 1950s and 1960s, the United States and Soviet biological weapons programs developed techniques to directly aerosolize plague particles, a technique that leads to pneumonic plague, an otherwise uncommon, highly lethal and potentially contagious form of plague. A modern attack would most probably occur via aerosol dissemination of a strain of plague (*Yersinia pestis*), and the ensuing outbreak would be almost entirely pneumonic plague. More than 10 institutes and thousands of scientists were reported to have worked with plague in the former Soviet Union.¹³

Given the availability of *Yersinia pestis* in microbe banks around the world, reports that techniques for mass production and aerosol dissemination of plague have been developed, the high fatality rate in untreated cases and the potential for secondary spread, a biological attack with plague is a serious concern. An understanding of the epidemiology (ecology of a disease), clinical presentation and the recommended medical and public health response following a biological attack with plague could substantially decrease the morbidity and mortality of such an event.

A plague outbreak developing after the use of a biological weapon would follow a very different epidemiologic pattern than a naturally occurring plague epidemic. The size of a pneumonic plague epidemic following an aerosol attack would depend on a number of factors. These factors include the amount of agent used, the meteorological conditions, methods of

aerosolization and dissemination of the agent. A group of initial pneumonic cases would appear in about 1-2 days following the aerosol cloud exposure, with many people dying quickly after symptom onset. Human experience and animal studies suggest that the incubation period in this setting is 1 to 6 days.¹⁴

A 1970 World Health Organization assessment asserted that, in a worst case scenario, a dissemination of 50 kg of *Yersinia pestis* in an aerosol cloud over a city of 5 million. The results may produce 150,000 cases of pneumonic plague, 80,000-100,000 of whom would require hospitalization. Of these, 36,000 would be expected to die. There are no effective environmental warning systems to detect an aerosol cloud of plague bacilli. Also there are no useful diagnostic tests that are both widely available and yield quick results. The first sign of a bioterrorist attack with plague would most likely be a sudden outbreak of patients presenting with severe symptoms.¹⁵

A United States licensed vaccine exists and in a pre-exposure setting appears to have some efficacy (power to produce effects or intent) in preventing or ameliorating bubonic disease. The mortality of untreated pneumonic plague approaches 100%. To respond to the plague or any bioterrorist event the medical community has several standard, generally accepted management practices that will come into play. These need to be understood, to fully comprehend the perspective of the medical community concerning the issues.¹⁶

BACKGROUND - MEDICAL MANAGEMENT

Medical responses for a bioweapon incident involve four key functional areas: prophylaxis treatment, triage, and logistics. Prophylaxis is the prevention of or protection from disease. It includes the provision of medicines or vaccines necessary to prevent the onset of symptoms and the further transmission of the disease to potential bioterrorism victims. Providing prophylaxis to a large population entails overcoming significant challenges, including: quickly determining the agent used and the segment of the population most likely to have been exposed; finding adequate supplies of the appropriate medicine or vaccine; and rapidly mobilizing distribution systems to disseminate the medicine or vaccine. Mobilization is achieved by either bringing medical supplies to the people or asking people to come to the supplies.

Providing treatment to victims is also challenging. While the extent of the task ultimately depends on the number of people affected, three elements are essential to effective treatment. First, resource needs must be met. This includes providing material equipment, medicines, treatment space and staff. Second, a care standard for those affected must be developed and appropriate treatment measures implemented. Third, care providers must establish appropriate

procedures to provide adequate levels of care, while at the same time preventing transmission of disease (if the agent is contagious).¹⁷

Providing prophylaxis and treatment hinges upon effective triage mechanisms. Effective triage is the process that separates the worried well from the potentially exposed, and these groups from those actually sick. Proper triage will send patients to the appropriate care facility, which may even include self-medication at home.¹⁸ Effective triage can reduce health care system stress dramatically. All of these activities depend on the establishment and exploitation of adequate logistical arrangements for materials, equipment, and personnel. Bioterrorism related logistics systems begin with the creation of tracking systems at the local, state, and federal levels to monitor the availability and expenditure of medicines, equipment, and medical supplies, in addition to the establishment of local and federal supply stockpiles of these materials.¹⁹

The recent establishment of the National Pharmaceutical Stockpile represents an excellent first step. Considerable progress has been made in developing a national response capacity built upon local, state, and federal capabilities. Among the notable elements are:

- The National Disaster Medical System, including the Disaster Medical Assistance Teams and cooperative hospital agreements.
- A series of 70 Metropolitan Medical Response Systems whose purpose is to support the organization and development of a local medical response system for Chemical Biological Radiological and Nuclear (CBRN) terrorism incidents in designated urban areas.
- National stockpiles of pharmaceuticals and medical supplies, including Center for Disease Control's National Pharmaceutical Stockpile Program started in 1999.²⁰

There are a number of areas, however, in which capability remains insufficient or uncertainty remains. An important area of uncertainty is the degree to which hospitals and treatment facilities are preparing for bioterrorism. For example, while hospitals have been involved in some planning efforts, they remain unwilling and unable to bolster their bioterrorism response capacity. Hardly any hospitals maintain more than a few weeks supply of medicines and other materials, and generally they maintain less than 100 available beds at any one time. In addition, localities are developing plans for triage, mass prophylaxis, and treatment, but there is a lack of means to thoroughly test these plans. Most of these plans, for example, fail to identify additional sources of manpower for contingencies that would be needed when the size and scale of the response quickly absorbs local resources. A related problem is the relatively narrowly defined urban areas covered by the Metropolitan Medical Response Systems

approach, which leaves many suburban areas uncovered.²¹ This is abundantly clear whenever the health care system is seriously challenged in war-gaming exercises.

A BIOTERRORISM INCIDENT: TOPOFF WAR GAME

The TOPOFF exercise, a \$3 million dollar war game testing the readiness of top government officials and agencies to respond to terrorist attacks at multiple geographic locations, has been the largest exercise of its kind to date. The bioweapons event took place in Denver, Colorado in May 2000.²²

TOPOFF provided the most comprehensive effort to date to test the medical and public health system and infrastructure, which would be called upon in the event of a bioterrorist event. The exercise effectively revealed a number of important vulnerabilities and challenges for the future. Identifying these challenges will be useful for local, state and federal efforts to counter the threat of biological weapons.²³ Addressing these challenges will also strengthen the ability of public health agencies to perform important routine tasks of medical care and public health. A number of health agencies [including the county health agency, the state health agency, the Centers for Disease Control and Prevention, the Office of Emergency Preparedness and elements of the Public Health Service, as well as 3 hospitals in the Denver area (Swedish Medical Center, Medical Center of Aurora, and Denver Health Medical Center)] participated in the exercise. The bioterrorism component of the exercise centered on the release of an aerosol of *Yersinia pestis*, the bacteria that causes plague. Denver was selected in part because it had received Domestic Preparedness training and equipment.²⁴ The TOPOFF exercise proceeded according to the following chronology.

May 17:

An aerosol of plague (*Yersinia pestis*) bacilli is released covertly at the Denver Performing Arts Center.

May 20 (Day 1 of exercise):

The Colorado Department of Public Health and Environment receives information that increasing numbers of persons begin seeking medical attention at Denver area hospitals for cough and fever during the evening of May 19th. By early afternoon on May 20th, 500 persons with these symptoms have received medical care, 25 of who have died. The Health Department notifies the Center for Disease Control of the increased volume of sick. Plague is confirmed first by the state laboratory and subsequently confirmed in a patient specimen by the Center for Disease Control lab at Ft. Collins. The State Health Officer declares a public health emergency.

The State Health Officer places an official request for support from the Department of Health and Human Service's Office of Emergency Preparedness. The Governor's Emergency Epidemic Response Committee assembles to respond to the unfolding crisis.

Thirty-one staff members from the Atlanta office of the Center for Disease Control (CDC) are sent to Denver to assist in the emerging crisis. Law enforcement officials notified the Center for Disease Control that a dead man has been found with terrorist literature and paraphernalia in his possession; his cause of death is unknown. Hospitals and clinics around the Denver area who just a day ago were dealing with what appeared to be an unusual increase in influenza cases are recalling staff members, implementing emergency plans, and seeking assistance in determining treatment protocols and protective measures. By late afternoon, hospital staff is beginning to call in sick and antibiotics and ventilators are becoming scarcer. Some hospital staff has donned respiratory protective equipment.

The Governor issues an Executive Order that restricts travel - including bus, rail and air travel - into or out of 14 Denver Metro counties, and commandeers all antibiotics that can be used to prevent or treat plague. During a VNN press conference where a number of agencies are represented, the Denver public is informed that there is a plague outbreak in the city following a terrorist attack and is told of the governor's Executive Order.

Citizens are told to seek treatment at a medical facility if feeling ill or if they have been in contact with a known or suspected case of plague. Those who are well are directed to stay in their homes and avoid public gatherings. The public is told that the disease is spread from person to person only "if you are within 6 feet of someone who is infected and coughing" and that dust masks are effective at preventing the spread of disease.

Confirmed cases of plague are identified in Colorado locations other than Denver. Patient interviews suggest that most victims were at the Performing Arts Center days earlier. It is announced that the governor is working with the President of the United States to resolve the crisis and that federal resources are being brought in to support of state agencies. By the end of the day, 783 cases of pneumonic plague have occurred; 123 persons have died.

May 21 (Day 2 of exercise):

VNN reports that a "national crash effort" is underway to move large quantities of antibiotics to the region as the Center for Disease Control brings in its "national stockpile", but the quantity of available antibiotics is uncertain. The report explains that early administration of antibiotics is effective in treating plague but that antibiotics must be started within 24 hours of

developing symptoms. A VNN story a few-hours later reports that hospitals are running out of antibiotics.

A "Push-Pack" from the National Pharmaceutical Stockpile (NPS) arrives in Denver, but there are great difficulties moving antibiotics from the stockpile delivery point to the persons who need it for treatment and prophylaxis (prevention of or protection from disease). Out-of-state cases are now being reported. The Center for Disease Control notifies bordering states of the epidemic. Cases are reported in England and Japan. Both Japan and the World Health Organization (WHO) request technical assistance from the Center for Disease Control.

A number of hospitals in Denver are full to capacity and by the end of the day are unable to see or admit new patients. Thirteen hundred ventilators from the National Pharmaceutical Stockpile are to be flown to Colorado. Bodies in hospital morgues are reported to have reached critical levels. By 5 pm, the Center for Disease Control has carried out an epidemiological (ecology of the disease) investigation on 41 cases.

The United States Surgeon General flies to Colorado to facilitate communications issues. Many states now are requesting that they receive components of the National Pharmaceutical Stockpile from the Center for Disease Control. By the end of the day, 1,871 plague cases have occurred throughout the United States, London and Tokyo. Of these, 389 persons have died.

May 22 (Day 3 of exercise):

Hospitals are under-staffed and have insufficient antibiotics, ventilators, and beds to meet demand. They cannot manage the influx of sick patients into the hospitals. Medical care is "beginning to shut down" in Denver. State and federal health officials pursuing the epidemiological investigation have reviewed 151 patient charts. There are difficulties getting antibiotics from the National Stockpile to the facilities that need them. Details of a distribution plan are still not formalized.

Officials from the Health Department and the Center for Disease Control have determined that secondary spread of disease appears to be occurring. The population in Denver is encouraged to wear facemasks. The Center for Disease Control advises that Colorado state borders be cordoned off in order to limit further spread of plague throughout the United States and other countries. Colorado officials express concern about their ability to get food and supplies into the state. The governor's executive order is extended to prohibit travel into or out of the state of Colorado. By noon, there are 3,060 United States and international cases of pneumonic plague, 795 of who have died.

May 23 (Day 4 of exercise):

There are conflicting reports of the number of sick and dead. Some reports show an estimated 3,700 cases of pneumonic plague with 950 deaths. Others are reporting over 4,000 cases and more than 2,000 deaths. **The TOPOFF Exercise is terminated.**

As illustrated by the TOPOFF exercise the capacities and responsibilities that would be demanded from the medical and public health communities in the event of a bioweapons attack are not commensurate with the resources now available. The lessons of TOPOFF should provoke consideration of future directions for bioterrorism planning and preparedness at all levels of government and among the many communities and practitioners with responsibilities for national security and public health.²⁵

Analytically, the potential range of scenarios for bioweapon use is virtually unlimited, and conceptual boundaries to this aspect of the threat must be elaborated. As mentioned, bioterrorism imposes particularly heavy demands on public health systems. The public health sector, for example, must focus not just on what it must be capable of doing after a bioweapon incident; it also must consider key actions that should be taken that can contribute to deterring or preventing an attack in the first place.²⁶ A significant question is what role will the military have in responding to a bioterrorism event?

MILITARY RESPONSIBILITIES

The Department of Defense has the potential to assume major responsibilities in the health care arena when dealing with a bioterrorist attack. The military-medical infrastructure is built around a six-region concept. This structure allows for easy access to trained personnel and facilities throughout the country. Military clinics and hospitals can be readily expanded to augment the civilian capabilities that exist today. Although the government is planning to increase the civilian infrastructure, the billions being spent today will not have a benefit for years to come. Achieving success in meeting preparedness and response requirements in the short and med-term must involve intervention by the military-medical structure.

The Department of Defense, Office of Health Affairs, and Service Component medical structures have tremendous capabilities for assisting the federal, state, and local community with the wide array of requirements necessary to defend against a biological attack. Several external issues must be understood to fully examine the preparedness and responsiveness by our federal, state, and local officials. These issues include the threat, risk, and casualties levels affecting the situation. They would also include an understanding of the construct of an incident: employment and targeting of biological agents; health facility requirements;

cooperation between federal, state, and local communities; health as a national security issue; and developing partnerships, future roles and responsibilities.²⁷

The President's appointee, former Governor Tom Ridge, the nation's first Secretary for Homeland Security, has the daunting task of redefining the roles and responsibilities of the hundreds of various local, state and federal agencies providing crisis' response for combating-terrorism in the United States. The Department of Defense's senior leadership is also attempting to establish a new strategy for America's defense. This strategy would embrace uncertainty and contend with surprise. It would be a strategy premised on the idea that to be effective abroad, America must be safe at home.²⁸

The Department of Defense has established a new Joint Command (U.S. Northern Command) to effectively fuse together the military organizations with Homeland Security. The initiative to commission another Commander-In-Chief (CINC), for the purpose of providing command and control of military assets in the Homeland Defense mission was finalized on 29 January 2002.²⁹ A command of this scope will not become fully operational over night. Despite the Bush administration's apparent plan to create a new military structure for homeland defense, the existing U.S. Joint Forces Command will figure prominently in domestic security efforts for at least a few more months with the new command beginning operations in October 2002.³⁰

This timetable is very optimistic and may require several additional months before overcoming the challenges of resourcing the personnel, and fusing together the Service Components with the inter-agencies responsibilities to effectively assume such a daunting mission. Also uncertain is the future organizational structure of the military "civil support teams" established by Joint Forces Command. Currently these civil-military organizations are essential conduits for providing aid to civilian agencies through identifying military augmentation requirements necessary to successfully respond to an attack by a bioterrorist.³¹

NATIONAL SECURITY IMPLICATIONS AND ISSUES.

President Bush has directed a significant increase in the National Defense Budget over the next several years to both combat terrorism and provide security to the nation. Since the attacks of September 11, 2001, President Bush has called for a 300-percent increase in spending for bioterrorism protection; saying that "without the money he may not have the confidence to say America is truly secure".³² The White House budget released on February 4, 2002 requested nearly \$38 billion for homeland defense, \$5.9 billion of that dedicated to bioterrorism preparedness.³³

A large part of that budget-increase is already designated to improve the infrastructure issues posed by the massive amounts of casualties projected in the event of a prospected bioterrorism attack. But to ensure that the vital and important security issues of health care are appropriately addressed in the future they must also be identified in the National Security Strategy. An analysis of the balance between health care and national security suggests that the United States should integrate health care issues more systematically into its overall National Security Strategy (NSS).³⁴ This is not an argument for making every health care challenge a national security problem. But rather, introducing even a limited national security perspective into one's thinking may add a greater sense of urgency about addressing such problems, shift the calculations that support current thinking, and/or open up new approaches. The smooth interaction of the numerous agencies involved in addressing bioterrorism is vital to any efficient planning activities and the ultimate cooperative response.

COOPERATION

A couple of challenges must be overcome to achieve success. First is to define appropriate roles for each of the key agencies in such a way that those definitions are well understood and accepted by all parties. "Culture clashes"—such as those between the military and those civilians responsible for providing relief—must be anticipated.³⁵ Significant differences in perceptions of fundamental purposes, basic attitudes, and existing priorities all contribute to alternative perspectives in relation to any given situation and what a particular entity's role should be in dealing with it. The U.S. military, for example, always is likely to consider the protection and support of civilians in complex emergencies as secondary to its primary war-fighting mission.³⁶ Accepting differences, however, does not mean accepting that each entity is entitled to define its own role in each emergency situation; nor does it mean that differences cannot be reduced and expectations clarified by prior consultations and exchanges among those that are likely to find themselves needing to work together in such emergencies.³⁷

The development of a central-strategic perspective by all the critical agencies that widens their appreciation beyond their own interests is a crucial task that must be addressed and will of itself promote very useful interaction prior to the onset of an emergency. Key agencies involved in the emergency must concentrate on doing the job well and understanding the way they fit into the larger framework, of what all the agencies should be trying to accomplish. A central-strategic perspective also allows for leveraging limited resources to maximize impact, and promotes a mentality that is not reactive to events, but proactive in seeking to shape them.

The second challenge for agencies at the health care and security intersection is forging stronger cooperative relationships. The issues created by the convergence of health and security are not solvable through the action of one party alone. There is considerable merit in the calls for the creation of "strategic partnerships," between governmental and nongovernmental entities, especially coming from the corporate sector and the scientific community. Motivated by the recognition of compatible if not identical objectives, such partnerships can leverage limited resources and expertise, enhance research and development, bolster policy implementation, and open up new opportunities for action.³⁸

COORDINATION

The Federal Emergency Management Agency, under the Federal Response Plan serves as the lead agency for managing the consequences of a chemical or biological terrorist attack within the United States. Presidential Decision Directives 39 and 62 establish Health and Human Services as the lead agency for coordination of medical assistance in the event of a federally declared disaster, including chemical or biological terrorism incidents. Within Health and Human Services, the Office of Emergency Preparedness and the Center for Disease Control have major responsibilities for providing medical support. The Office of Emergency Preparedness coordinates the national medical response and assists local agencies with its national medical response teams, which are specially trained to deal with Weapons of Mass Destruction. The Center for Disease Control is responsible for augmenting local supplies of pharmaceuticals, chemical antidotes, and other medical material to counter the effects of nerve agents, biological pathogens, and chemical agents.³⁹

The Department of Defense is still defining its role in the event of a domestic weapon of mass destruction attack. However, the Chairman, Joint Chiefs of Staff, Draft Contingency Plan 0500 provides for military involvement under Joint Forces Command to support the Federal Emergency Management Agency, as the lead federal agency, in consequence management.⁴⁰ This responsibility includes integrating military medical capabilities with civilian medical resources and the interagency planning needed to make that integration effective. The Center for Disease Control has worked with the Soldier Biological and Chemical Command on training and technology development. It has had limited involvement and coordination with other Department of Defense activities.

As cited in the TOPOFF exercise, local and state authorities have primary responsibility for responding to such attacks, but their scale and duration will likely overwhelm local resources, requiring federal assistance. The key agencies involved in consequence management of a

disaster are: the Federal Bureau of Investigation, Department of Health and Human Services, Department of Veterans Affairs, Federal Emergency Management Agency, and Department of Defense.

The establishment of a Department of Defense and Center for Disease Control relationship will help both organizations develop response plans, evaluate exercises, and share research. This coordination will reduce planning time, improve the quality of crisis response plans, and enhance the execution of such efforts. Cooperative possibilities include the use of the stockpile in a military crisis and the use of military assets in a domestic situation. If the military becomes more involved in domestic Weapons of Mass Destruction response, or the Center for Disease Control takes on an international mission, joint planning and coordination will also make these challenges easier, reduce the amount of duplicated effort, and possibly reduce costs.⁴¹

Cooperation will also facilitate the sharing of information needed to continually improve operational plans on the basis of chemical and biological research. The sharing of the Center for Disease Control's best business practices, research, and improved techniques with the military's research in developing countermeasures and field laboratory diagnostics will benefit both organizations. A linkage between the Armed Forces Medical Intelligence Center (which tracks foreign research, production, and flow of medical materiel of Weapons of Mass Destruction interest) and the Center for Disease Control could be of great value to both organizations.

The Department of Defense could also benefit from involvement and evaluation of the Center for Disease Control's major exercises. Training exercises such as "TOPOFF" test the deployment of its medical supply caches and the integration with commercial and governmental organizations. The sharing of information and expertise while evaluating major exercises could benefit both the Department of Defense and the Center for Disease Control. Additionally, if the military becomes more involved in Homeland defense, the Department of Defense will benefit from the involvement in these exercises.

In the event of an actual bioweapon response, Department of Defense and the Center for Disease Control cooperation will facilitate communication and coordination with other government agencies to minimize on site confusion, especially when the Department of Defense will assist in consequence management.⁴²

RECOMMENDATIONS

It would be a significant loss if the lessons learned by the health community in the Denver TOPOFF exercise were not used as a platform to further improve the medical and public health infrastructure needed to respond to epidemics, whether following bioterrorism or a natural event. The recommended improvements to the medical-infrastructure are broken out into the following four key issue areas.

ISSUE 1. LEADERSHIP, POLICY AND COMMUNICATION

The TOPOFF exercise was instructive in illuminating problematic issues of leadership and decision-making; the difficulties of prioritization and distribution of scarce resources; the crisis that contagious epidemics would cause in health care facilities; and the critical need to formulate sound principles of disease containment. From these lessons, a number of recommendations can be advanced.

Political leadership will be essential to management of the consequences of a serious epidemic following a bioterrorist event. In this type of crisis, efficient decision-making would be paramount, and would require not only strong and clear leadership, but also the sustained counsel of a multi-disciplinary body of experts, such as was represented by the Colorado Epidemic Expert Response Committee. Without political leadership, many highly consequential decisions would lack the moral and legal authority to carry them through. Without the advice of expert counsel, the same decisions are liable to lack the technical and practical expertise needed to control and end the epidemic.⁴³

Decision-making in such a crisis would also require information sources, conduits, and analytical capacities that do not now exist within the current medical and public health infrastructure. Information systems that would be vital to decision making include: systems that deliver real-time data showing the number and locations of persons with the specific illness in the affected area; systems that allow rapid collection and analysis of patient epidemiological (all the elements contributing to the occurrence or nonoccurrence of a disease in a population) information to determine source(s) of exposure to an agent; and systems that allow decision-makers to communicate efficiently with hospitals and the public health community.⁴⁴ No doubt such capabilities could be designed to significantly augment routine organizational purposes such as monitoring of natural disease outbreaks, but resources will be needed to construct and implement such systems.⁴⁵

Clear principles are needed that allow decision-makers to assign priorities for the use of scarce resources and to implement such decisions in an unfolding bioterrorist epidemic crisis. A

well-designed and managed National Pharmaceutical Stockpile is important, but equally critical is the local capability to efficiently and rapidly distribute antibiotics and other needed resources (e.g., simple face masks) to where they are needed.

In addition to supplying health care facilities, antibiotic distribution plans should be able to support additional centers of antibiotic distribution, thereby drawing crowds away from besieged hospitals and ensuring the ability to reach all segments of the population. These principles and planning efforts should be a priority in bioterrorism planning efforts and funded accordingly.⁴⁶ Bioterrorism planning related activities should be administered at the state level to ensure that not only “metropolitan proper”, but the surrounding municipalities and suburbs are included in planning activities. The Bioterrorism Preparedness Plan contracts currently included as an annex to the Metropolitan Medical Response Systems emergency response plans should be developed at the outset. Some level of federal follow-on funding is required to sustain bioterrorism-planning activities to ensure that the current level of communication and interaction between the local health and medical and public safety communities continues. Planning and coordination activities at all levels need to pay special attention to the challenge of integrating hospitals into the bioterrorism response system.⁴⁷

A federal Task Force or Working Group should be established to identify the challenges that hospitals will face in becoming integrated in the bioterrorism response system, and to devise some realistic solutions for overcoming those challenges. Federal grants for building public health and medical capacity for responding to bioterrorism should be extended to an additional focus area aimed at hospitals. Public health must be more fully integrated into the command and control infrastructure at the local level. Roles of the federal government versus the state and local government need to be examined and clarified to prevent confusion. Responders at all levels must continue to resolve intergovernmental issues, including minimizing redundancy among federal, state and local efforts and eliminating confusion at the recipient level.⁴⁸

The United States should integrate health concerns more systematically in its strategic planning. The federal government’s approach toward health and security should be proactive and not just reactive to specific situations or crises, short- or long-term. The United States approach must emphasize striking an effective balance among competing political, security, economic, and humanitarian interests that come into play in the convergence of health and security. Emphasis should be placed on identifying measures that leverage limited resources by serving both health and security objectives.⁴⁹ Examples include bolstering disease surveillance and reporting at both an international and national level and supporting medical

research and development that is applicable to infectious diseases and defense against bioweapon.⁵⁰

The enormous amount of casualties generated by the plague virus during the TOPOFF exercise demonstrates the necessity for the United States government to forge strategic partnerships with nongovernmental entities—particularly in the corporate sector—and the medical, relief, and scientific communities. Special attention should go to developing ways to utilize more effectively United States' leadership in science and biotechnology.⁵¹

In TOPOFF the effects of the Colorado bioterrorism incident quickly spread across international boundaries. This has long-term implications for national and international entities to address challenges at the intersection of health and security. The United States should proactively establish partnerships for response and further exert leadership in prosecuting violations of existing international law, including the laws of war, represented by the practices of community/humanitarian warfare and promote additional legal measures where necessary. Other legal instruments that can be brought to bear, such as the Biological Weapons Convention, should be strengthened too, but in ways that ensure a balance among potentially competing interests.⁵²

Communications among public health officials, others in the medical community, technical analysts, law enforcement officials, and policymakers will be critical in identifying and reacting effectively to a bioweapon attack. Another dimension of communications is the development of public affairs strategies to ensure that civilian populations receive information that is critical to their well-being, reassuring, and sufficient to ensure that public health capabilities are not overwhelmed.⁵³

In a crisis, hospitals would need to communicate with and receive the support of a wide variety of organizations, including other hospitals, and local, state and federal health officials, as well as emergency management and public safety agencies. The capacity for efficient communication throughout the health care system in a crisis must be built now. The Center for Disease Control and other federal agencies must further emphasize the need for a greatly improved information infrastructure.⁵⁴ Work must be done now to provide state and local partners with both the necessary financial resources and the consultative expertise to build a truly national public health information network. Traditional local public health agencies, as well as other key bioterrorism preparedness and response partners like federal and local law enforcement entities must be included. The keys to developing a national bioterrorist preparedness and response information infrastructure are first identifying the individual

components and starting new initiatives where gaps exist, and then integrating the various technical communication systems into an effective network.⁵⁵

In order to ensure interoperability of their communication systems, health departments, hospitals, other primary care givers, and public safety agencies need to be contacted and consulted throughout the process of developing such standards. Federal departments and agencies must coordinate their various information infrastructure-building initiatives to ensure the communication systems they are supporting are integrated and interoperable. The Bioterrorism Preparedness and Response Program Office should establish an information sharing and outreach branch within the office.⁵⁶

ISSUE 2. FACILITIES AND LOGISTICS

Wary of further bioterrorist attacks, public health officials are proposing budget plans aimed at building new laboratories, improving hospital readiness, and figuring out how much of the entire population of affected cities to vaccinate in the middle of a crisis.⁵⁷ During an epidemic of contagious disease as seen by TOPOFF, hospitals could quickly face unprecedented challenges brought on by the requirement to: care for overwhelming numbers of special needs-contagious patients beyond their capacity; manage shortages of personnel, medicines, and equipment; provide security for crowd control; ensure the safety of health care workers and patients; and in all likelihood enforce mandatory isolation of the numerous contagious patients.

The bioterrorism challenge creates a need for at least two sets of facilities: those for doing technical analyses, particularly analytical laboratory capability, and those for treatment of victims. Currently there are 81 labs around the country that handle identification of commonly seen bacteria, but they are not specialized and do not have sufficient experience working with potential bioterrorist material. Two national labs handle the most dangerous substances, but they are too busy to handle every suspicious threat. As director of the newly created Office of Public Health Preparedness, D.A. Henderson would like to create six new regional laboratories.⁵⁸

With respect to treatment facilities, the critical issue is capacity.⁵⁹ The risk is that capacity for any given situation will be too small to prevent adequate treatment or so large that it represents an undue drain on resources. Note that military Installations have both a standing and expansion bed capability for minimal or convalescing categories of patients. Plans for making use of these facilities must be integrated with current proposals.

Identifying logistically the kinds and amounts of drugs, including vaccines, that should be available is an obvious requirement. But another logistical requirement is also determining the ways in which these drugs should be used in the prevention, crisis management, and consequence management stages of a bioweapon incident.⁶⁰

To ensure efficient use of local resources, a real-time tracking system must be set up to monitor the movement and use of medical supplies during a bioterrorism response. For example, as a hedge against a possible smallpox incident, the current supplies of vaccine should be readied for a rapid mass prophylaxis program, and a surge vaccine production capability should be established.⁶¹ Additional planning is needed to determine how the state and federal government can provide additional manpower in support of prophylaxis and treatment as a hedge against large-scale bioterrorism incidents. Improved evaluation methods, including the development of computer simulations, must be developed to assess the adequacy of local prophylaxis and treatment plans. Local plans for prophylaxis should recognize and account for additional state and federal assets that will be made available by planning for how these assets will be utilized. Given the size of its available manpower base and its logistical capabilities, the Department of Defense is in an excellent position to lead this effort.

ISSUE 3. TRAINING AND EDUCATION

Training to date to address bioterrorism has been conducted largely through programs that take a "train the-trainer" approach. The Nunn-Lugar-Domenici Domestic Preparedness Program, established in 1996, has played the largest role in training. The Domestic Preparedness Program has provided training to over 90 cities since its inception, and many of the cities have institutionalized various adaptations of its weapons of mass destruction training, primarily in their fire and law enforcement training academies.⁶²

While the Domestic Preparedness Program has resulted in substantial improvements in the "first responder" community's preparedness for chemical terrorism incidents, problems specific to the organization and content of the courses have contributed less to bioterrorism preparedness. During TOPOFF large numbers of health care workers became infected and were unable to work. They became part of the problem. The existing programs have focused heavily on traditional agent recognition and treatment. Training has not fully addressed some issues related to the public health and medical response, such as implementing a community-based surveillance system, expanding the current capacity of the health care system, creating more bed space, accessing additional supplies and equipment, and providing adequate staff. Medical personnel should be more involved with the planning of local, state, and federal

government response efforts. Public health and medical organizations must play a greater role in shaping training guidelines, class content, and program structure.⁶³

The Domestic Preparedness Program must place a greater focus on health and medical response issues. Training should be adapted from HAZMAT criteria to focus more closely on procedures dealing specifically with biological weapons response, including agent and outbreak recognition, and treatment measures.⁶⁴ Training should focus on “big picture” response, incorporating integrated response issues, communication, surveillance, and reporting.⁶⁵ Medical personnel must be involved with actual hands on training that includes the planning of local, state, and federal government response efforts.⁶⁶

ISSUE 4. DETECTION AND RESPONSE PLANNING

Seeing how quickly the disease spread in the TOPOFF exercise, public health officials as the first line of defense must be involved in decisions on whether to provide other equipment needed to respond to the bioterrorism threat and, if so, in what amounts. This may include protective equipment for civilian populations, such as having simple masks on hand, that could be distributed prior to an attack, if sufficient warning were received. Public health professionals also could be involved in determining the necessary detection, identification, and warning systems for certain categories of potential targets i.e. performing arts centers, subways or sports arenas.⁶⁷

In an epidemic crisis, public health would need to undertake: surveillance for new or as yet undetected cases; epidemiological investigation; facilitation of laboratory diagnosis; the dispensing of medical and public health recommendations; distribution of scarce resources; and the communication with the public, hospitals, other local as well as federal health agencies, and the broad panoply of other local and federal emergency management and law enforcement agencies. Few public health agencies now have a plan to address surge capacity needs – they need resources to create plans that address this issue. The art of planning is a well recognized military competency. The use of the military planners to assist in this area would be invaluable.

CONCLUDING THOUGHTS

The United States Public Health system is well trained and sufficiently equipped to satisfy the public's daily health care requirements. But as illustrated in the TOPOFF exercise, even a small bioweapon release demonstrates that this same medical system is not currently capable of responding to the enormous demands that will accompany a bioterrorist attack. The United States Government has now recognized the need to improve its medical-logistical infrastructure

including facilities, medicines, and training. Billions of dollars are being spent that will ultimately mitigate such a bioterrorist attack. The importance of coordination and cooperation between all the agencies involved in responding to a bioterrorism event, exposed as a weakness in the TOPOFF exercise, cannot be over emphasized and must start at the very top.

The ability to respond to such a biological attack is greatly enhanced when the Department of Defense's medical structure can be leveraged. The Department of Defense is well positioned to facilitate the fusion of the various agencies involved. Health care and security are coming together in today's world in ways that merit closer examination and assessment by such new actors as the Homeland Security Office. The results of such assessments must find their way into a strengthened National Security Strategy that fully addresses the health care-security issue.

The TOPOFF exercise revealed many valuable lessons about how the United States might deal with future epidemics - whether deliberate or naturally occurring. Perhaps the most striking observation overall is the recognition/confirmation that the systems and resources now in place would fail under a bioweapons attack of any magnitude.

The many questions concerning preparedness and response are still being addressed by our public health officials at the federal, state, and local levels. Importantly, since the scope of homeland security responsibilities spans an array of federal, state, and local organizations, it also will require enhanced inter-agency processes and capabilities to effectively defend the United States against attacks.⁶⁸ Budgetary explanations may fall short, are only part of the solution, and in most cases are more than a decade away from an answer. The short-term solution to mitigating the risk of a bioterrorism incident will in part rest with the overall capability of a partnership between the Department of Defense and Homeland Security. In order to truly mitigate a bioterrorist attack we must resolve the coordination issues facing the Secretary for Homeland Security, Department of Defense, and officials at the federal, state, and local levels.⁶⁹

The bioterrorism threat enumerated by this paper, and demonstrated by the TOPOFF exercise in Denver, illustrates that a renewed sense of urgency is necessary for preparing our domestic health care system for a potential bioterrorist attack. Coordination and cooperation of all local, state, and federal agencies coupled with the assistance of the Department of Defense's medical structure can achieve a measure of success in the short-term. But for the long term, our nation must focus on the key medical community issues represented by Leadership, Policy and Communication; Facilities and Logistics; Training and Education; and Detection and Response Planning. This focus is essential in order to ensure the safety of generations of Americans to come.

WORD COUNT = 8563

ENDNOTES

¹ Health and Human Services, "Health and Medical Services Support Plan for the Federal Response to Acts of Chemical/Biological (C/B) Terrorism", 21 June 1996. pp.26-38.

²"Unmasking Bioterror." Newsweek, 8 October 2001, Volume CXXXVIII, No. 15, 21-26.

³ Center for Disease Control. "Anthrax Information." Available from <<http://www.bt.cdc.gov/agent/anthrax>>; Internet. Accessed 16 March 2002.

⁴ Office of Technology Assessment, U.S. Congress, " Technical Aspects of Biological Weapons Proliferation," Technologies Underlying Weapons of Mass Destruction, OTA-BP-ISC-115, (Washington, DC: U.S. Government Printing Office, December 1993). Available from <<http://www.ota.nap.edu/pdf/data/1993/9344.PDF>>; Internet. Accessed from 16 December 2001.

⁵ Center for Disease Control. "Facts about Anthrax." Available from <<http://www.bt.cdc.gov/agent/anthrax>>; Internet. Accessed 16 March 2002.

⁶ Center for Disease Control. "Anthrax." Available from <<http://www.bt.cdc.gov/agent/anthrax>>; Internet. Accessed 16 March 2002.

⁷ General Accounting Office, "Biological Weapons: Efforts to Reduce Former Soviet Threat Offers Benefits, Poses New Risks", Report GAO/NSIAD-00-138: to Congressional Requesters, (Washington D.C.:U.S. General Accounting Office, April 2000). Available from <<http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAIISdocID=6015594477+0+2+0&WAIISaction=retrieve>>; Internet. Accessed from 3 December 2001.

⁸ Center for Disease Control. "Facts about Anthrax." Available from <<http://www.bt.cdc.gov/agent/anthrax>>; Internet. Accessed 16 March 2002.

⁹ Center for Disease Control. "Smallpox Fact Sheet". Available from <<http://www.hopkins-biodefense.org/pages>>; Internet. Accessed 16 March 2002.

¹⁰ Ibid.

¹¹ Center for Disease Control. "Plague in Renaissance Europe." Available from <<http://www.jefferson.village.virginia.edu/osheim/>>; Internet. Accessed 16 March 2002.

¹² Bushey, Starr., Ginder, Stephanie., O'Sullivan, Katie. "The Bubonic Plague". Available from <<http://www.ecnet.net/users/gemedia3/Plague/PI>>; Internet. Accessed 16 March 2002.

¹³ Center for Disease Control. "Facts about Plague". Available from <<http://www.bt.cdc.gov/agent/plague>>; Internet. Accessed 16 March 2002.

¹⁴ Starr, "The Bubonic Plague".

¹⁵ Center for Disease Control, "Facts about Plague".

¹⁶ Fawal, Hala, and Lynn Steele. "Emerging Infectious Diseases: Can We Meet the Challenge?" American Journal of Infection Control. Vol.26, No.2, April 1998, 215-216.

¹⁷ Joseph E. McDade and David Franz, "Bioterrorism as a Public Health Threat", Emerging Infectious Diseases, Vol. 4, No. 3, July-September 1998. Available from <<http://www.cdc.gov/ncidod/eid/vol4no3/mcdade>>; Internet. Accessed 20 December 2001.

¹⁸ Eckstien, M. "The Medical Response to Modern Terrorism: Why the 'Rules of Engagement' Have Changed". Annals of Emergency Medicine. Vol. 34, No2, August 1999. 219-221.

¹⁹ Mario Schootman, and Craig Zwerling, Elizabeth R. Miller, James C. Torner, Laurence Fuortes, Charles Lynch, James Merchant, and Timothy Peterson, "Method to Electronically Collect Emergency Department Data", Annals of Emergency Medicine, Vol. 28, No. 2, August 1996, pp. 213-219.

²⁰ General Accounting Office, "Combating Terrorism: Threat and Risk Assessments Can Help Prioritize and Target Program Investments", Report GAO/NSIAD-98-74: to Congressional Requesters, (Washington D.C.:U.S. General Accounting Office, April 1998). Available from <<http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=60138330828+0+2+0&WAIAction=retrieve>>; Internet. Accessed from 16 November 2001.

²¹ Joseph E. McDade, "Addressing the Potential Threat of Bioterrorism – Value Added to An Improved Public Health Infrastructure", Emerging Infectious Diseases, Vol.5, No. 4, July-August 1999. Available from <<http://www.cdc.gov/ncidod/eid/vol4no3/mcdade>>; Internet. Accessed 20 December 2001.

²² Thomas V. Inglesby, Rita Grossman, and Tara O'Toole "A Plague on Your City: Observations from TOPOFF," Received 5 October 2000: electronically published 29 January 2001; Donald A. Henderson, Thomas V. Inglesby, Jr., and Tara O'Toole, Section Editors; available from <<http://www.bt.cdc.gov/>>; Internet; accessed 16 March 2002.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid.

²⁶ Henderson, D.A. "Nation is Perilously Unprepared for Bioterrorism." The Minneapolis Star Tribune. 9 August 2000, 14A.

²⁷ Thomas B. Cole, "When a Bioweapon Strikes, Who Will Be in Charge?" Journal of the American Medical Association, Vol. 284, No. 8, 23-30 August 2000.

²⁸ Quadrennial Defense Review Report (Washington D.C.: U.S. Government Printing Office, September 2001). p. 28.

²⁹ Ibid. pp. 18-19.

³⁰ Dale Eisman, "Local Command Overseeing Homeland Defense For Now," Norfolk Virginian-Pilot, 30 January 2002. p.17.

³¹ Ibid.

³² Ceci Connolly, "Bush Promotes Plans to Fight Bioterrorism", Washington Post, 6 February 2002, p.3.

³³ Ibid.

³⁴ "Bioterrorism in the United States: Threat, Preparedness, and Response", Biological Terrorism in the United States: Threat, Preparedness, and Response Final Report. Chemical and Biological Arms Control Institute, Contract No. 200*1999*00132, November 2000. Available from < <http://www.cbaci.org/>>; Internet. Accessed from 2 November 2001.

³⁵ Lange, "Civilian–Military Cooperation and Humanitarian Assistance," p106.

³⁶ Quadrennial Defense Review Report, p.18.

³⁷ Thomas B. Cole, "When a Bioweapon Strikes, Who Will Be in Charge?" Journal of the American Medical Association, Vol. 284, No. 8, 23-30 August 2000.

³⁸ "Bioterrorism in the United States", Chemical and Biological Arms Control Institute. Available from < <http://www.cbaci.org/>>; Internet. Accessed from 2 November 2001.

³⁹ Major Mitchell E. Brew, "A Business Case," Logistics Management Institute, DoD and CDC Partnership, March 2001. pp.7-8.

⁴⁰ "Bioterrorism in the United States", Chemical and Biological Arms Control Institute. Available from < <http://www.cbaci.org/>>; Internet. Accessed from 2 November 2001.

⁴¹ Department of Defense, Joint Doctrine for Nuclear, Biological and Chemical (NBC) Defense, Joint Pub 3-11, 10 July 1995.

⁴² Cohen, William S. "Security in a Grave New World." Office of the Assistant Secretary of Defense (Public Affairs), 14 September 1998. Available from <<http://www.defenselink.mil/cgibin/dlprint>>; Internet. Accessed 16 November 2001.

⁴³ Inglesby, "A Plague on Your City: Observations from TOPOFF".

⁴⁴ G.J. Noordergraaf, and J.H. Bouman, E.J. Van Den Brink, C. Van De Pompe, and T.J.F. Savelkoul, "Development of Computer-Assisted Patient Control for Use in Hospital Setting During Mas Casualty Incidents", American Journal of Emergency Medicine, Vol. 14, No. 3, May 1996, pp.257-261.

⁴⁵ General Accounting Office, "West Nile Virus Outbreak: Lessons for Public Health Preparedness," Report GAO/HEHS-00-180, Report to Congressional Requesters, (Washington D.C.: U.S. General Accounting Office, September 2000). Available from <<http://frwebgate1.access.gpo.gov/cgi->

[bin/waisgate.cgi?WAISdocID=60134527631+0+2+0&WAISaction=retrieve](http://www.dtic.mil/execution/adr2000/chap7.html)>; Internet. Accessed 6 November 2001.

⁴⁶ Cohen, William S, "Managing the Consequences of Domestic Weapons of Mass Destruction Incidents." Chapter 7, Annual Report to the President and Congress, 2000. Available from <<http://www.dtic.mil/execution/adr2000/chap7.html>>; Internet. Accessed 16 November 2001.

⁴⁷ Gary A. Johnson, "Prehospital Triage and Communication Performance in Small Mass Casualty Incidents: A Gauge for Disaster Preparedness", American Journal of Emergency Medicine, Vol. 17, No. 2, March 1999. p.93.

⁴⁸ The Gilmore Commission. "First Annual Report to the President and the Congress of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction." 15 December 1999. Available from <<http://www.rand.org/organization/nmsrd/terrpan>>; Internet. Accessed 16 November 2001.

⁴⁹ General Accounting Office, "Combating Terrorism: Observations on Federal Spending to Combat Terrorism", Report GAO/T-NSAID-99-107, to National Security, Veterans Affairs, and International Relations, Committee on Government Reform, House of Representatives, (Washington D.C.: U.S. General Accounting Office March 1999). Available from <<http://frwebgate3.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=60098826180+0+2+0&WAISaction=retrieve>>; Internet. Accessed from 5 December 2001.

⁵⁰ Christopher Chyba, "Improving Surveillance for Biological Terrorism", Report for the White House Office of Science and Technology Policy, (Washington D.C., 27 March 1998). p.73.

⁵¹ William Scheckler, "Surveillance, Foundation for the Future: A Historical Overview and Evolution of Methodologies", American Journal of Infection Control, Vol.25, No.2, April 1997. Available from <<http://www.harcourthealth.com/scripts/om.dll/serve?action=searchDB&searchDBfor=iss&id=jic970252&target=>>>; Internet. Accessed from 3 December 2001.

⁵² W. Seth Carus, "Bioterrorism and Biocrimes: The Illicit Use of Biological Agents Since 1900," Working Paper, Center for Counterproliferation Research, National Defense University, (Washington, D.C., August 1998 (February 2001 Revision)). Available from <http://www.ndu.edu/centercounter/Full_Doc.pdf>; Internet. Accessed from 4 November 2001.

⁵³ David R. Franz and Russ Zajtchuk, "Biological Terrorism: Understanding the Threat, Preparation, and Medical Response", Disease of the Month, Vol.46, No.2 February 2000, pp. 129-190.

⁵⁴ General Accounting Office, "Combating Terrorism: Opportunities to Improve Domestic Preparedness Program Focus and Efficiency", Report GAO/NSAID-99-3, to Congressional Requesters, (Washington D.C.: U.S. General Accounting Office November 1998). Available from <<http://frwebgate5.access.gpo.gov/cgi->

bin/waisgate.cgi?WAISdocID=60069424483+0+2+0&WAISaction=retrieve; Internet. Accessed 16 November 2001.

⁵⁵ Vladimir Kvetan, "Critical Care Medicine, Terrorism and Disasters: Are We Ready?", Critical Care Medicine, Vol. 27, No. 5 pp. 873-874.

⁵⁶ David L. Butler and Peter S. Anderson, "The Use of Wide Area Computer Networks in Disaster Management and the Implications for Hospital/Medical Networks", Annals of the New York Academy of Sciences, Vol.670, December 1992, pp.202-210.

⁵⁷ "U.S. Officials Plan Budget for Bioterrorism Response." Baltimore Sun, 24 January 2002

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ Joshua Lederberg, "Infectious Disease and Biological Weapons: Prophylaxis and Mitigation", Journal of the American Medical Association, Vol. 278, No. 5, 6 August 1997, pp.435-436.

⁶¹ Judith Sedgewick, "Computerized Surveillance", Nursing Times, Vol. 91, No. 10, 8 April 1995, pp.59-61.

⁶² Richard Luger, "Witness Endorse Nunn-Luger-Domenici Program", News Release, 22 April 1998.

⁶³ Gerace, R.V., "Role of Medical Teams in a Community Disaster Plan." CMA Journal 21 April 1979, pp. 923-928.

⁶⁴ Linda Spice, and Lori Holly, "Drill to Test Emergency Response to Bioterrorism," Milwaukee Journal Sentinel, 22 October 1999, p.1.

⁶⁵ Terrie B. Lee and Ona Baker, James Lee, William Scheckler, Lynn Steele and Christopher Laxton, "Recommended Practices for Surveillance", American Journal of Infection Control, Vol.26, No. 3, June 1998, pp. 277-288.

⁶⁶ Jonathan D. Silver, "Local Doctors Fail Their Test on Diagnosing Germ Terrorism", The Pittsburgh Post-Gazette, 13 February 2000.

⁶⁷ "Balms for the Poor," Economist, (14 August 1999), p.65.

⁶⁸ Quadrennial Defense Review Report. p.19.

⁶⁹ Joshua Lederberg, "Infectious Disease and Biological Weapons: Prophylaxis and Mitigation", Journal of the American Medical Association, Vol. 278, No. 5, 6 August 1997, pp.435-436.

BIBLIOGRAPHY

- "Anthrax Information." Center for Disease Control. Available from <http://www.bt.cdc.gov/agent/anthrax>; Internet. Accessed 16 March 2002.
- "Anthrax." Center for Disease Control. Available from <http://www.bt.cdc.gov/agent/anthrax>; Internet. Accessed 16 March 2002.
- "Balms for the Poor." Economist, (14 August 1999): 65.
- Barnaby, Wendy. The Plague Makers: The Secret World of Biological Warfare. London: Vision 1997.
- "Biological Weapons: Efforts to Reduce Former Soviet Threat Offers Benefits, Poses New Risks." General Accounting Office. Report GAO/NSIAD-00-138: to Congressional Requesters, Washington D.C.:U.S. General Accounting Office, April 2000. Available from <http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAIIdocID=6015594477+0+2+0&WAIAction=retrieve>; Internet. Accessed from 3 December 2001.
- "Bioterrorism in the United States: Threat, Preparedness, and Response." Biological Terrorism in the United States: Threat, Preparedness, and Response Final Report. Chemical and Biological Arms Control Institute, Contract No. 200*1999*00132, November 2000. Available from <http://www.cbaci.org/>; Internet. Accessed from 2 November 2001.
- Brew, Mitchell E. Major. "A Business Case." Logistics Management Institute, DoD and CDC Partnership, (March 2001).
- Butler David L. and Peter S. Anderson. "The Use of Wide Area Computer Networks in Disaster Management and the Implications for Hospital/Medical Networks." Annals of the New York Academy of Sciences 670, (December 1992): 202-210.
- Chyba, Christopher. "Improving Surveillance for Biological Terrorism." Report for the White House Office of Science and Technology Policy. Washington D.C. (27 March 1998).
- Cohen, William S. "Managing the Consequences of Domestic Weapons of Mass Destruction Incidents." Annual Report to the President and Congress, Chapter 7, 2000. Available from <http://www.dtic.mil/execsec/adr2000/chap7.html>. Internet. Accessed 16 November 2001.
- Cohen, William S. "Security in a Grave New World." Office of the Assistant Secretary of Defense (Public Affairs), 14 September 1998. Available from <http://www.defenselink.mil/cgi-bin/dlprint>. Internet. Accessed 16 November 2001.
- Cole, Thomas B. "When a Bioweapon Strikes, Who Will Be in Charge?." Journal of the American Medical Association 284, no. 8, (23-30 August 2000).
- "Combating Terrorism: Observations on Federal Spending to Combat Terrorism." General Accounting Office, Report GAO/T-NSAID-99-107, to National Security, Veterans Affairs,

and International Relations, Committee on Government Reform, House of Representatives. Washington D.C.: U.S. General Accounting Office March 1999. Available from <<http://frwebgate3.access.gpo.gov/cgi-bin/waisgate.cgi?WAIStdocID=60098826180+0+2+0&WAIStaction=retrieve>>. Internet. Accessed from 5 December 2001.

"Combating Terrorism: Opportunities to Improve Domestic Preparedness Program Focus and Efficiency." General Accounting Office, Report GAO/NSAID-99-3, to Congressional Requesters. Washington D.C.: U.S. General Accounting Office November 1998. Available from <<http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAIStdocID=60069424483+0+2+0&WAIStaction=retrieve>>; Internet. Accessed 16 November 2001.

"Combating Terrorism: Threat and Risk Assessments Can Help Prioritize and Target Program Investments." General Accounting Office, Report GAO/NSIAD-98-74: to Congressional Requesters, Washington D.C.: U.S. General Accounting Office, April 1998. Available from <<http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAIStdocID=60138330828+0+2+0&WAIStaction=retrieve>>; Internet. Accessed from 16 November 2001.

Connolly, Ceci. "Bush Promotes Plans to Fight Bioterrorism." Washington Post. 6 February 2002, p.3.

David R. Franz and Russ Zajtchuk, "Biological Terrorism: Understanding the Threat, Preparation, and Medical Response." Disease of the Month 46, no.2 (February 2000): 129-190.

Eckstien, M. "The Medical Response to Modern Terrorism: Why the 'Rules of Engagement' Have Changed." Annals of Emergency Medicine 34, no. 2 (August 1999): 219-221.

Eisman, Dale. "Local Command Overseeing Homeland Defense For Now." Norfolk Virginian-Pilot, 30 January 2002.

"Facts about Anthrax." Center for Disease Control. Available from <<http://www.bt.cdc.gov/agent/anthrax>>; Internet. Accessed 16 March 2002.

"Facts about Plague." Center for Disease Control. Available from <<http://www.bt.cdc.gov/agent/plague>>; Internet. Accessed 16 March 2002.

"First Annual Report to the President and the Congress of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction." The Gilmore Commission. 15 December 1999. Available from <<http://www.rand.org/organization/nmsrd/terrpan>>. Internet. Accessed 16 November 2001.

Gerace, R.V. "Role of Medical Teams in a Community Disaster Plan." CMA Journal. (21 April 1979): 923-928.

Hala, Fawal, and Lynn Steele. "Emerging Infectious Diseases: Can We Meet the Challenge?." American Journal of Infection Control 26, no.2 (April 1998): 215-216.

- "Health and Medical Services Support Plan for the Federal Response to Acts of Chemical/Biological (C/B) Terrorism." Health and Human Services, (21 June 1996).
- "Health and Medical Services Support Plan for the Federal Response to Acts of Chemical/Biological (C/B) Terrorism." Health and Human Services, 21 June 1996.
- Henderson, D.A. "Nation is Perilously Unprepared for Bioterrorism." The Minneapolis Star Tribune, 9 August 2000, sec A, p.14.
- Inglesby, Thomas V., Rita Grossman, and Tara O'Toole. "A Plague on Your City: Observations from TOPOFF." Received 5 October 2000; electronically published 29 January 2001; Donald A. Henderson, Thomas V. Inglesby, Jr., and Tara O'Toole, Section Editors; available from <<http://www.bt.cdc.gov/>>; Internet; accessed 16 March 2002.
- Johnson, Gary A. "Prehospital Triage and Communication Performance in Small Mass Casualty Incidents: A Gauge for Disaster Preparedness." American Journal of Emergency Medicine 17, no. 2, (March 1999).
- "Joint Doctrine for Nuclear, Biological and Chemical (NBC) Defense." Department of Defense, Joint Pub 3-11, 10 July 1995.
- Joshua Lederberg, "Infectious Disease and Biological Weapons: Prophylaxis and Mitigation", Journal of the American Medical Association 278, no. 5, (6 August 1997): 435-436.
- Kvetan, Vladimir. "Critical Care Medicine, Terrorism and Disasters: Are We Ready?." Critical Care Medicine 27, no. 5: 873-874.
- Lange, Civilian-Military Cooperation and Humanitarian Assistance. p106.
- Lee, Terrie B. and Ona Baker, James Lee, William Scheckler, Lynn Steele and Christopher Laxton. "Recommended Practices for Surveillance." American Journal of Infection Control 26, no. 3, (June 1998) 277-288.
- Luger, Richard. "Witness Endorse Nunn-Luger-Domenici Program." News Release. (22 April 1998).
- McDade, Joseph E. "Addressing the Potential Threat of Bioterrorism – Value Added to An Improved Public Health Infrastructure." Emerging Infectious Diseases 5, no. 4 (July-August 1999). Available from <<http://www.cdc.gov/ncidod/eid/vol4no3/mcdade>>; Internet. Accessed 20 December 2001.
- McDade, Joseph E. and David Franz. "Bioterrorism as a Public Health Threat." Emerging Infectious Diseases 4, no. 3 (July-September 1998). Available from <<http://www.cdc.gov/ncidod/eid/vol4no3/mcdade>>; Internet. Accessed 20 December 2001.
- Nocera, Antony and Alan Garner. "An Australian Mass Casualty Incident Triage System for the Future Based upon Triage Mistakes of the Past: The Homebush Triage Standard." Australian and New Zealand Journal of Surgery 69, (1999): 603-608.
- Noordergraaf, G.J. and J.H. Bouman, E.J. Van Den Brink, C. Van De Pompe, and T.J.F. Savelkoul. "Development of Computer-Assisted Patient Control for Use in Hospital

- Setting during Mass Casualty Incidents." American Journal of Emergency Medicine 14, no. 3, (May 1996): 257-261.
- "Plague in Renaissance Europe." Center for Disease Control. Available from <<http://www.jefferson.village.virginia.edu/osheim/>>; Internet. Accessed 16 March 2002.
- Preston, Richard. The Hot Zone. New York: Random House 1994.
- "Quadrennial Defense Review Report." Washington D.C.: U.S. Government Printing Office, September 2001.
- Scheckler, William. "Surveillance, Foundation for the Future: A Historical Overview and Evolution of Methodologies." American Journal of Infection Control 25, no.2 (April 1997). Available from <<http://www.harcourthealth.com/scripts/om.dll/serve?action=searchDB&searchDBfor=iss&id=jic970252&target=>>>; Internet. Accessed from 3 December 2001.
- Schootman, Mario and Craig Zwerling, Elizabeth R. Miller, James C. Torner, Laurence Fuortes, Charles Lynch, James Merchant, and Timothy Peterson. "Method to Electronically Collect Emergency Department Data." Annals of Emergency Medicine 28, no. 2 (August 1996): 213-219.
- Sedgewick, Judith. "Computerized Surveillance." Nursing Times 91, no. 10 (8 April 1995): 59-61.
- Silver, Jonathan D. "Local Doctors Fail Their Test on Diagnosing Germ Terrorism." The Pittsburgh Post-Gazette, 13 February 2000.
- "Smallpox Fact Sheet." Center for Disease Control. Available from <<http://www.hopkins-biodefense.org/pages>>; Internet. Accessed 16 March 2002.
- Spice, Linda and Lori Holly. "Drill to Test Emergency Response to Bioterrorism." Milwaukee Journal Sentinel. (22 October 1999): 1.
- Starr, Bushey., Ginder, Stephanie., O'Sullivan, Katie. "The Bubonic Plague." Available from <<http://www.ecnet.net/users/gemedia3/Plague/PI>>; Internet. Accessed 16 March 2002.
- "Technical Aspects of Biological Weapons Proliferation." Office of Technology Assessment, U.S. Congress. Technologies Underlying Weapons of Mass Destruction, OTA-BP-ISC-115, Washington, DC: U.S. Government Printing Office, December 1993. Available from <<http://www.ota.nap.edu/pdf/data/1993/9344.PDF>>; Internet. Accessed from 16 December 2001.
- "U.S. Officials Plan Budget for Bioterrorism Response." Baltimore Sun, 24 January 2002.
- "Unmasking Bioterror." Newsweek, 8 October 2001, CXXXVIII, no. 15, 21-26.
- W. Seth Carus, "Bioterrorism and Biocrimes: The Illicit Use of Biological Agents Since 1900," Working Paper, Center for Counterproliferation Research, National Defense University, (Washington, D.C., August 1998 (February 2001 Revision)). Available from

<http://www.ndu.edu/centercounter/Full_Doc.pdf>; Internet. Accessed from 4 November 2001.

West Nile Virus Outbreak: Lessons for Public Health Preparedness." General Accounting Office, Report GAO/HEHS-00-180, Report to Congressional Requesters, Washington D.C.: U.S. General Accounting Office, September 2000. Available from <<http://frwebgate1.access.gpo.gov/cgi-bin/waisgate.cgi?WAIISdocID=60134527631+0+2+0&WAIISaction=retrieve>>; Internet. Accessed 6 November 2001.