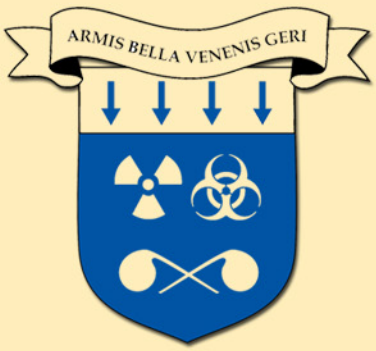
Lest We Forget: A Critical Analysis of Bioterrorist Incidents,National Exercises, and U.S. Prevention, Response and Recovery Strategies

Lieutenant Colonel Tasha L. Pravecek, USAF



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50

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By

Lt Col Tasha L. Pravecek, USAF, BSC

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Air University
Maxwell Air Force Base, Alabama

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Abstract

Current U.S. deterrence and prevention strategies are incapable of completely negating the multiple means a terrorist has to obtain and disseminate biological agents in order to create a catastrophic U.S. incident. However, a thorough analysis of previous biological attacks or incidents, and national bioterror exercises may provide insights to where most effective deterrence and prevention strategies should be focused to prevent or mitigate a highly successful, large-scale biological terrorist attack, or how to respond and recover should an attack occur.

This paper reviews and analyzes biological incidents which have occurred over the past 30 years, including the Rajneesh Cult salmonella poisoning, Larry Wayne Harris' purchase of plague bacteria, the Aum Shinrikyo cult anthrax dissemination and the Anthrax Letter attacks of 2001.

Additionally, National Exercises which involve simulated bioterrorist events are analyzed: TOPOFF 1, 2, and 3, and *Dark Winter*. Next, current U.S. strategies and policies aimed to prevent a biological weapons attack are examined to determine the focus which will achieve the best effect in light of lessons learned from the recent biological incidents and exercises detailed.

Based on examination of both real-world events and National Exercises, the following are key points of focus which the U.S. policy makers should consider more carefully: (1) improve the detection of bio-attacks, and (2) prepare against biological contingencies, respond effectively, recover quickly and capably, and gather biological-weapon forensics information so decision-makers may attribute the attack correctly.

Preface

This paper grew from stray thoughts I had while working on *Bio-Defense Now: 56 Suggestions for Immediate Improvements* with Col (ret) Jim Davis. I wondered as we worked on the project in 2004 and 2005 at the USAF Counterproliferation Center, Maxwell Air Force Base, what lessons we had learned from the exercise and incidents we had experienced in the recent past. I had the opportunity while attending my Air Force Fellowship at Argonne National Laboratory to investigate in depth the National Exercises and bioterrorism incidents of recent history to determine any noteworthy lessons we could garner from our experience.

I fear that often times, someone enacts guidance that a group must exercise some aspect of chemical, biological, or radiological response readiness, and we simply go through the motions of checking that block to complete said exercise without much thought into what benefit we can gain. I have seen through my Air Force career that we "play" in an exercise according to prescribed rules to pass an inspection; but then at times in real life we "play" a completely different way to get the job done more effectively. We have "hot-washes" following exercises or inspections to determine how to fix those areas we failed, but in my experience, those fixes do not always transfer to the most efficient actions in real-world events. Similarly, I found in researching the TOPOFF and *Dark Winter* exercises that we learned a great deal from them; but could not find in the literature that this valuable information was consistently passed to other states or responders. These National Exercises were simply a check in the block fulfilling guidance which said "you must conduct this exercise." Nationwide changes were not made following the exercises as evidenced by the similar problems and shortfalls noted in the National Exercises year after year.

I would not have been able to conduct this research without the support of many around me. I very much appreciate the support and excellent workspace provided by Dr. Harold Myron, the director of Argonne's Division of Educational Program and my sponsor for the Air Force Fellows Program at Argonne. Next, thanks to Dr. Dan Schabacker who allowed me to work in his laboratory and learn in great detail the importance of microbial forensics in the attribution of a bioterror crime.

And finally, and most importantly, I give my most sincere appreciation to Dr. Barry Schneider, my advisor regarding this paper. He provided exceptional editorial comments and insight into the difference between deterrence and prevention, and generally made this paper clear and to the point.

I am thankful to have been given the opportunity to participate in the USAF Fellows program and hope that you enjoy reading this paper.

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Chapter 1

Introduction

Armed with a single vial of a biological agent…small groups of fanatics, or failing states, could gain the power to threaten great nations, threaten the world peace. America, and the entire civilized world, will face this threat for decades to come. We must confront the danger with open eyes and unbending purpose.

—President George W. Bush

Biological terrorism has occurred on U.S. soil. Most newsworthy was the 2001 anthrax letter mailings, which came to be known as "Amerithrax." More significant events involve the 1984 salmonella poisoning by the Rajneesh Puram in Oregon and Larry Harris' 1998 arrest for possession of plague bacteria in Chicago, addressed later in this paper. The United States is not immune to attack.

A large-scale biological weapons attack by a terrorist organization is probably not a matter of "if" but a matter of "when." Terrorist groups in the past and present, for example Al Qaeda, have expressed interest or demonstrated steps in planning for a biological weapons attack. The National Strategy for Countering Biological Threats, published in November 2009, reports, "in 2001, while engaging the Taliban in Afghanistan, coalition forces came into possession of a significant body of evidence that Al Qaeda was seeking to develop the capability to conduct biological weapons attacks. Although Al Qaeda has lost many of the resources it had

compiled prior to September 2001, it is prudent to assume its intent to pursue biological weapons still exists."[1]

To facilitate this desire to use biological weapons, "how to" instructions are readily available. One book currently available for sale on Amazon.com is *Silent Death* written by Uncle Fester.[2] In this book, the author details the means of production and dissemination of various plant poisons, botulism and ricin toxin.[3] Many other individuals and groups have published books and websites detailing how to effectively develop biological weapons, contributing to the ease of proliferation.

Current U.S. deterrence and prevention strategies are incapable of completely negating the multiple means a terrorist has to obtain and disseminate biological agents in order to create a catastrophic U.S. incident. However, a thorough analysis and assessment of previous successful or partially successful biological attacks and national bioterror exercises may provide valuable insights to where most effective deterrence and prevention strategies should be focused in order to prevent or mitigate a highly successful, large-scale biological terrorist attack, or respond and recover should an attack occur.

This paper reviews and analyzes biological incidents which have occurred over the past 30 years and national exercises which involve simulated bioterrorist events. Next, a brief summary of current U.S. deterrence and prevention strategies and policies to prevent a biological weapons attack is provided. Additionally, U.S. strategies and current programs are examined to determine the focus which will achieve the best effect in light of lessons learned from the recent biological incidents and exercises detailed. Finally, the paper provides some recommendations to bolster future biological weapons deterrence strategies.

Chapter 2

Recent History of Terrorist Biological Attacks and Noteworthy Incidents

Choosing the right poison for the job is like calling the right play in football.
It requires knowledge of the subject and use of psychology to make the right choice.

−Uncle Fester

The proliferation and use of biological weapons are significant concerns to the United States. While biological terrorists have not attacked since World War II,[4] three incidents in the United States and one attack on U.S. interests overseas, demonstrate attacks are not only possible, but can and do easily occur. Additionally, examination of these attacks and the response to them can provide indication of potential areas of improvement in deterrence strategy. It is important to note the similar shortcomings experienced in these events, such as the need for biological agent forensics, clear public communication, and training of first responders and healthcare workers.

This chapter will detail two partially successful biological agent attacks on the United States: the Rajneesh cult dissemination of salmonella in Oregon and the anthrax letter mailings in 2001. Additionally, the events surrounding the arrest of Larry Harris will be described to demonstrate why and how the United States has taken some action to strengthen U.S. capability to deter a biological attack. Finally, the biological weapons program of the Japanese Aum Shinrikyo cult will be highlighted to demonstrate potential weaknesses in any country's deterrence strategies.

Rajneesh Cult

"For the first time ever, all of Mid-Columbia's 125 beds were filled; some patients had to be kept in the corridors."[5] This sounds like the scene from a Hollywood film. In reality, this mass casualty event occurred in The Dalles, Ore., during September and October 1984. By the end of the attack, 45 people were hospitalized and over 750 fell ill suffering from salmonella poisoning. This attack was the act of a religious cult residing in the United States.

Cult Overview

"In 1981, followers of the Bhagwan Shree Rajneesh had paid $5.75 million for a remote 64,000-acre ranch in Wasco County, a two-hour drive from The Dalles, the county seat. Their plan was to build a 'Buddhafield,' an agricultural commune in which they could celebrate their "enlightened master's" credo of beauty, love and guiltless sex."[6] Followers of the Bhagwan moved to the neighboring town of Antelope in 1982. They created a separate city within the ranch called Rajneeshpuram. Relations between the cult and the county officials deteriorated over time due to land-use issues and the cult's desires to expand.[7] The cult intended to use biological agents to win control of the county government by preventing non-cult voters from participating in the November 1984 elections.

Biological Agent Acquisition and Dissemination

The chief of the cult's biological warfare program was 38-year-old Ma Anand Puja (aka Diane Ivonne Onang), an American nurse of Philippine origin. Puja joined the cult in 1979 in Poona, India.[8] Under her direction, the Rajneesh cult experimented with poisons, chemicals and bacteria. The cult ordered and received many biological agents from the American Type Culture Collection (ATCC), including *Salmonella typhi* (causes typhoid fever), *Fancisella tularensis* (causes tularemia), *Salmonella typhimurium* (causes gastrointestinal illness).[9] The cult's Rajneeshee Medical Corporation and pharmacy also legally obtained biological agents, an incubator the size of an apartment refrigerator, and a quick-freeze dryer for agent preparation from medical-supply companies.[10] In late 1983 or early 1984, Puja purchased a set

of "bactrol disks" containing *Salmonella typhimurium* (ATCC 14028) from VWR Scientific, a medical supply company in Seattle, Wash.[11]

In the summer of 1983, two Wasco county commissioners conducted a mandatory inspection of the Rajneesh ranch prior to its annual summer festival. The Rajneeshees gave the two commissioners water laced with *Salmonella typhimurium* while they waited for their car's mysteriously flat tire to be repaired. Eight hours later, both men became ill, and one was hospitalized. Both suspected the Rajneeshees had put something in the water, but neither had evidence, thus no charges were filed.[12]

Approximately one year later on Sept. 9, 1984, the famed salmonella attack of The Dalles began. This attack was suspected to be a practice run for the primary attack planned in November with the goal to affect participation by local voters in the county elections. In 10 restaurants and a grocery store, the cult members sprinkled salmonella over fruits and vegetables, milk, coffee creamers and blue-cheese dressing. The first reports of gastroenteritis to the Wasco-Sherman Public Health Department occurred on Sept. 17, 1984. By Sept. 21, the county was overwhelmed with sick and frightened people.[13] That same day, the Oregon State Public Health Laboratory in Portland confirmed the culprit was *Salmonella typhimurium*, only four days after the initial reported case.[14]

Two attacks apparently resulted in two waves of illness, Sept. 9-18 and Sept. 19-Oct. 10, 1984. The final reported count was 751 cases. However, the actual number of victims was likely higher due to the number of out-of-state travelers who consumed contaminated food products.[15]

Despite the apparent success of the covert attack, the Rajneesh cult abandoned the planned attack in November. A year later the salmonella illnesses were discovered to be intentional. Oddly, the Bhagwan Shree himself, in accusing one of his followers who had defected, admitted to the cult's role in the salmonella poisoning.[16] Only two cult members, including Puja, were tried for these attacks. Both served less than four years in federal prison and fled to Europe upon release to avoid further prosecution by the state of Oregon.[17]

Items of Interest—Where our Prevention and Response Actions Failed

State public health officials and the Centers for Disease Control (CDC) investigated the salmonella outbreaks in The Dalles. They measured salad-bar temperatures, inspected food-handling procedures, tested cows, raw milk,

water, vegetables and food distributors, and found no contamination and no common source for the food.[18] Despite the apparent randomness, both inspection agencies concluded there was no evidence of deliberate contamination. Instead, they blamed the food handlers at the 10 restaurants impacted by the bacterium. The most senior state epidemiologist went so far as to conclude the contamination "could have occurred where food handlers failed to wash their hands adequately after bowel movements and then touched raw foods."[19] In retrospect, this simultaneous coincidence in 10 restaurants seems implausible and clearly demonstrates the lack of forensic detection capabilities or awareness.

In order to prevent future accidental or intentional outbreaks of salmonella contamination or to induce change to prevent such outbreaks, it is usual practice to publish an incident report. In this event, a report was not published. The public health officials realized how easily the Rajneeshees spread the disease and did not want to encourage copycats.[20] A published report would have highlighted clues that a biological agent manufacture capability existed on the ranch, including an incubator and freeze dryer. Additionally, the report would have identified the need to register all medical laboratories in the state, regardless of the size. Finally, and most critically, the report would have underscored the ease with which Puja acquired pathogens from the ATCC and medical supply vendors. More than 10 years later, Larry Harris' arrest prompted the CDC to take measures through the Select Agent Program to safeguard specific infectious agents and toxins.

Larry Wayne Harris

Larry Harris was a neo-Nazi sympathizer and trained microbiologist.[21] In 1998, Larry Harris bought three vials of plague bacteria from the ATCC for approximately $300. He pled guilty to wire fraud, the most serious charge possible at the time.[22]

Harris Overview

Harris says he first became interested in biological warfare while enlisted in the Army. He was a wheeled vehicle mechanic, but he claims to have spent time in a microbiology laboratory at Aberdeen Proving Ground, an assertion of which the Army has no record. He also asserts to have spent time

working on biological weapon defenses in various laboratories, including Battelle and the Central Intelligence Agency (CIA), although no organization has record of his employment. In 1993, while attending Ohio State University to take microbiology courses, Harris alleges to have interacted with a woman by the name of Mariam Arif. Arif purportedly told Harris of small groups of Iraqi women who smuggle lethal biological agents into the United States with plans to disseminate them in the future. Harris informed the CIA, CDC and Federal Bureau of Investigation (FBI) of these Iraqi plans. "Since then, it has been Harris' self-appointed mission to warn Americans about Iraq's nefarious plans and to teach citizens how to protect themselves in the event of a biological attack."[23]

Arrest Record

On May 3, 1995, Harris telephoned the ATCC to set up an account to order *Yersinia pestis*. He had previously told co-workers he wanted the pestis to carry out defensive research. He used a state laboratory license number of a scientific company where he worked and a homemade letterhead on which to print the request.[24] On May 5, 1995, Harris ordered three vials of *Yersinia pestis*. On May 9, the vials were shipped. But on May 10, Harris grew impatient and called the ATCC. The astute technician at the ATCC sensed something unusual about Harris' mannerisms and notified the CDC. The CDC contacted Harris who stated "he was conducting biomedical research using rats to counteract an imminent invasion from Iraq of supergerm-carrying rats."[25] The ATCC contacted Ohio public health officials who contacted the police. Harris was arrested and the *Yersinia pestis* retrieved. Harris pled guilty to one count of wire fraud since no laws existed concerning illegal acquisition of biological agents at the time. While the maximum penalty was six months incarceration and a $25,000 fine, Judge Joseph Kinneary placed Harris on probation for 18 months, ordered to him complete 200 hours community service and fined him $50.[26]

In February 1998, Harris' probation officer granted him permission to take a trip to Las Vegas to promote his book and video. Harris also wanted to test a device purportedly capable of destroying bacteria and viruses in and outside of the human body made by another unorthodox researcher. Upon arrival, Harris told this researcher he intended to test the device using military-grade anthrax. The unorthodox researcher got uneasy and notified the FBI.[27]

On Feb. 18, 1998, federal agents arrested Harris because he claimed he had enough military-grade anthrax to wipe out all of Las Vegas. Further analysis determined the vaccine to be a harmless strain.[28] A judge found probable cause that Harris threatened to possess a biological agent and misrepresented his credentials by claiming CIA affiliation. While Harris could have been sentenced to nine months in jail, Judge Kinneary was once again lenient and simply extended Harris' probation by five months and added 50 hours community service. Harris repeated "his only purpose in both the 1995 and 1998 cases had been to protect America against the threat of biological terrorism."[29]

Items of Interest—Where our Prevention and Response Actions Failed

Today many of our first responders have the capability and training to rapidly analyze certain biological agents on-site. However, in 1995 and 1998, this technology and training was not readily available. For example, in response to the 1995 *Yersinia pestis* incident:

Public health officials involved in the case claim that it made them realize how poorly prepared they were for a bioterrorist incident. The Lancaster Fire Department had no equipment for dealing with hazardous materials, so the Columbus Fire Department had to be called in. Yet the firefighters were trained to deal only with industrial hazards, not terrorist incidents. Biological terrorism seemed so improbable at the time that one public health official had difficulty persuading a colleague that his call reporting the incident was not a joke.[30]

Additionally, during the Las Vegas incident caused by Harris, the Las Vegas Fire Department Hazardous Materials (HAZMAT) Team, and the FBI Weapons-of-Mass-Destruction team, the Nellis AFB Explosive Ordnance Disposal Unit, and the U.S. Army Biological Team from Dugway Proving Ground were all summoned to the scene. The mass of experts proceeded to secure all materials possibly containing suspected anthrax, including a Mercedes wrapped completely in saran wrap, and transport them to Nellis AFB where they were shipped to U.S. Army Medical Research Institute of Infectious Disease (USAMRIID), Fort Detrick, Md., for analysis.[31] This incident demonstrates the dire need for training in appropriate HAZMAT response, forensic evidence collection, and the requirement for on-the-spot, immediate biological agent identification.

Due to the ease in which he acquired *Yersinia pestis*, Larry Wayne Harris was also the motivation behind establishment of the Select Agent Program to control the distribution of 24 infectious agents and 12 toxins. The details of this program are discussed further in Chapter Four of this paper.

Finally, Larry Harris' arrests and subsequent lax punishments demonstrate the need for more severe laws to deter those who may consider such actions. The laxity in the legal system regarding biological agent possession was further strengthened by the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act (USA PATRIOT Act) of 2001, which is also further described in Chapter Four of this paper. However, these Select Agent Program controls and USA PATRIOT Act legal penalties may not be as global as necessary to prevent acquisition and use of biological agents by groups who desire to harm our troops stationed overseas, as demonstrated by the Aum Shinrikyo and their attack on U.S. Navy installations at Yokohama and the headquarters of the Navy's Seventh Fleet at Yokosuka.

Aum Shinrikyo

On March 20, 1995, the Aum Shinrikyo Japanese religious cult gained world recognition with its sarin gas attack on a Tokyo subway. The Tokyo attack killed 12 and caused over 5,000 to seek medical attention.[32] Japanese authorities estimate of these 5,000 victims, 73.9 percent were "worried well," showing no evidence of actual nerve exposure.[33] Prior to this attack, the Aum Shinrikyo tried several unsuccessful attacks on several locations, including U.S. installations overseas, using biological agents.

Cult Overview

Shoko Asahara (aka, Chizuo Matsumoto), a Buddhist and self-proclaimed messiah, established the Aum Shinrikyo cult between 1984 and 1987.[34] The cult was founded on the belief Armageddon was inevitable and only devout believers in Aum Shinrikyo would survive.[35] The cult grew to an organization of 40,000 people worldwide,[36] with dozens in the United States, acquiring assets estimated by some at over one billion dollars.[37] While the cult sought multiple means to ultimately achieve Armageddon by

prompting a war between the United States and Russia, one near-term goal was the disruption of the Japanese government.

Recruitment of highly skilled, well educated people into the cult was not a difficult task. "Many of those attracted to Asahara's promise of spiritual enlightenment were scientists, medical doctors and engineers from Japan's top schools. A surprising number of highly educated young people were enthralled by Aum's dramatic claims to supernatural power, its vision of an apocalyptic future, and its esoteric spiritualism."[38] Asahara also recruited heavily and obtained many of his weapons and scientific assistance from Russia.[39] Thus, Asahara obtained the potential technical capability to manufacture both chemical and biological weapons for his terrorist activities.

Biological Agent Acquisition and Dissemination

Dr. Seiichi Endo was the lead Aum microbiologist and bioweapon specialist. At the age of 28, he left Kyoto University with a Ph.D. in molecular biology to join the Aum cult. He had considerable background in genetic engineering.[40] This man was the primary biological agent subject matter expert for Aum Shinrikyo.

Dr. Endo established the facilities and infrastructure needed to conduct in-depth research and development of biological weapons. He downloaded the entire Protein Data Bank from the Brookhaven National Laboratory in New York. This databank has information on more than 3,000 proteins, some useful in developing biological agents for weaponization.[41] The cult also obtained much of its millions of dollars worth of equipment and supplies from the United States through a Silicon Valley shipping agent.[42]

Dr. Endo led the cult to obtain, develop and experiment with the dissemination of multiple agents, including anthrax, botulinum, Q-fever and Ebola. "A large Aum medical mission to Zaire in 1992, purportedly to help treat Ebola victims, led investigators to suspect the cult was attempting to obtain Ebola virus for culturing in Japan."[43] Additionally, cult members prepared large quantities of *Clostridium difficile* bacterial spores they obtained through the mail from an advertisement in a Japanese medical journal.[44,45] This type of botulism produces a toxin which causes diarrhea and inflammation of the colon. The related Botulinus toxin A is a highly poisonous neurotoxin and can kill a person within 18-36 hours after sufficient exposure.[46]

The cult also produced anthrax spores distributed by means of a steam generator at the top of the Aum Shinrikyo building in Tokyo in June 1993. The cult attempted 10 times between 1990 and 1995 to spread botulinum toxin and anthrax in Tokyo and Yokohama.[47,48] These attacks included the U.S. Navy installation at Yokohama and the headquarters of the Navy's Seventh Fleet at Yokosuka.[49]

Despite possessing the resources and apparent technical knowledge to produce deadly biological weapons, Aum Shinrikyo failed to sicken or kill thousands because the strains of agents used were non-lethal or their dissemination techniques were ineffective.[50] Botulinum toxins are extremely difficult to purify, are unstable in pure form, and degrade rapidly when exposed to air and sunlight. "These factors led scientists in the U.S. biological weapons program to discard botulinum toxins from their arsenal."[51] Additionally, Dr. Endo attempted to isolate his botulinum bacteria from soil. His training was as a molecular biologist, not a microbiologist, and thus he may not have understood the extreme difficulties in enriching an environmental sample of botulinum bacteria.[52]

The Aum's attacks may have also failed due to inadequacy of dissemination methods and hostile atmospheric conditions. Dr. Endo settled on a liquid slurry to disseminate anthrax, versus a more difficult to obtain, yet potentially more stable, powder form. His ineffectiveness in distribution of the slurry may have been related to the material settling to the bottom of the sprayer. Additionally, sunlight may have destroyed the viable bacteria or degraded the toxin. Finally, wind conditions may have caused the aerosols to disintegrate or simply not disperse the biological material. Since many of the attacks occurred during Tokyo's warm spring and summer months with strong sunlight, the environment may play some blame in the failure in Aum Shinrikyo's attacks.

Items of Interest—Where our Prevention Failed

In April 1990, cult personnel used a vehicle equipped with a sprayer to disperse botulism toxin near the Yokosuka naval base and the headquarters of the U.S. Navy's Seventh Fleet. According to open source literature, this attack was not detected. While it is likely the toxin degraded before contact and had no effect on the intended target, it is not published whether the Naval installations maintained stand-off detectors for perimeter monitoring of low levels of airborne toxins, chemicals or biological agents which may have

impacted our overseas personnel. Nevertheless, this event highlights the need for perimeter monitoring, even in seemingly peaceful locations.

The experience of the Aum Shinrikyo cult demonstrates, despite excellent technical expertise, suitable laboratory equipment, and seemingly limitless funding, large scale biological weapon dissemination is not a simple task. However, dissemination of biological agents inside a closed space targeting smaller numbers of people can be achieved by even one well-trained individual, as was demonstrated by the 2001 anthrax letter attacks.

2001Anthrax Letters

"Amerithrax"

The New York Times reported Oct. 5, 2001, "A 63-year-old Florida man has contracted pulmonary anthrax and has been hospitalized with the infection, health officials said yesterday. But, the officials said, there is no evidence that the man's disease was caused by a terrorist attack and there is no public health risk. 'It is an isolated case…'"[53] This man died on Oct. 6, 2001, five days after being hospitalized for the disease. At the time, it was assumed he had been exposed to anthrax through natural causes.

Event Description

In the initial attack on Sept. 18, 2001, letters are believed to have been mailed to four New York City addresses at ABC News, CBS News, NBC News, and the New York Post, as well as to the *National Enquirer* at American Media in Boca Raton, Fla. Only the letters sent to the *New York Post* and Tom Brokaw (NBC) were recovered. In the second attack on Oct. 9, 2001, two additional letters were sent to Senators Tom Daschle and Patrick Leahy in Washington D.C. The Daschle and Leahy letters contained a more potent form of anthrax. The anthrax mailings contaminated the Hamilton, N.J., postal facility and the Brentwood postal facility in Washington D.C., the latter resulting in suspected contamination of many government offices. The anthrax letters caused 22 people to contract the disease and five deaths.[54]

Based on the properties of the anthrax, the FBI and others believed these spores to be of weapons grade. Anthrax prepared for weaponized

dissemination is coated with silica to prevent clumping, enhance aerosolization and thus improve the efficiency of attack. "Homeland Security Director Tom Ridge in a White House press conference on Nov. 7, 2001, told reporters tests indicated a binding agent had been used in making the anthrax. Later, the FBI claimed a 'lone individual' could have weaponized anthrax spores for as little as $2,500, using a makeshift basement laboratory."[55]

Dr. Paul Keim, a geneticist at Northern Arizona University, was called in by the FBI to produce a genetic fingerprint of the anthrax used in the attack, in an attempt to determine the origin. Dr. Keim examined short pieces of repetitive deoxyribonucleic acid (DNA) sequences to compare one strain of anthrax to another. He looked for variable-number tandem repeats (VNTRs) or regions in which a short stretch of DNA repeated, a sort of genetic fingerprint. Scientists then could classify anthrax strains into five different groups.[56]

The anthrax used in the letter attacks appeared to lack a uniform genetic makeup, complicating a match to one of the genetic "fingerprints." Thus, further research over the years following the attack culminated in 2008, with the identification of four specific mutations in the original *B. anthracis* Ames strain found in the letters. Tests were developed to sample for these four, very specific mutations. Over 1,000 samples of *B. anthracis* collected from government and university laboratories across the United States, Canada, Sweden and the United Kingdom were run against these tests. Only eight samples showed all four mutations.[57] All eight of these samples "were directly related to a large flask of spores, identified as RMR-1029, which [Bruce] Ivins had created in 1997 and of which he was the sole custodian."[58]

Bruce Ivins was a microbiologist at USAMRIID for 28 years. In 2000, production problems plagued the Army's anthrax vaccine program, and thus Ivins began to experience high levels of stress. He became emotionally distraught and engaged in group counseling. Following the 2001 September 11th attacks, he was reported to be "an absolute manic basket case" by co-workers.[59] Laboratory records show that in September and October of 2001, Ivins worked much later than usual.

Following the Anthrax letter attacks, the USAMRIID laboratory received a surge of resources. Ivins enthusiastically assisted the Army's anthrax vaccine program to put back on track. And, as the investigation into the letter incident continued, Ivins provided samples and support as requested.

On July 29, 2008, Bruce E. Ivins committed suicide. He had been notified federal authorities were preparing to file criminal charges against him in connection with the 2001 anthrax letter attacks. [60] Some suspect Ivins, who was a co-inventor and patent holder for an anthrax vaccine, would have realized significant financial gains with the rise in vaccinations and interest in anthrax research following the anthrax attacks.[61]

Items of Interest—Where our Prevention and Response Actions Failed

As the nation reacted to this event, people timidly retrieved mail from mailboxes, and frequently discarded it unopened or called fire departments and other emergency response teams fearing what may be inside. Hundreds of "suspicious letters" were painstakingly analyzed and found to be harmless. First responders and others spent countless hours and resources responding to the hysteria following these attacks, demonstrating the severe lack of transparent communication of the potential danger and sensitivity of the American people to terrorist action. The extensive and long-term consequence management activities which were undertaken in the months to years following the initial incident demonstrate both adequate and inadequate response, detection and decontamination capabilities.

While hospital personnel were able to rapidly distribute treatment and prophylaxis and clean-up crews were able to successfully decontaminate buildings, it could be argued future response to a similar incident should realize dramatic improvement. The financial costs were very high, one FBI report estimating damages over $1 billion. The Brentwood facility alone cost $130 million and took 26 months to clean up, and many other government buildings required decontamination. It was over three years after the attack before the American Media building began decontamination activities.[62] Despite these shortcomings, the Anthrax letter incident spurred additional emergency response training and the passage of the Project Bioshield Act to supply vaccine and drug treatment to protect against future bio-terrorist actions (discussed further in Chapter Five).

This event also demonstrates the dire need for enhanced forensic detection capabilities. It took almost seven years before evidence clearly pointed the finger at Bruce Ivins. However, some believe the real perpetrator of the 2001 Anthrax letter attacks is yet to be found. Dr. Ivins' lawyer and others claim that the FBI's constant harassment drove Ivins into a deep depression, which resulted in his suicide.[63] It is also unclear why or how the

FBI ruled out the other eight laboratories where the same anthrax was found.[64] Finally, the FBI failed to present any physical evidence directly implicating Bruce Ivins. Clearly, forensic techniques to determine the source of highly complex biological agents need to be enhanced if perpetrators of future biological agent attacks are to be quickly identified.

In 2005, the *Washington Post* stated, "The anthrax attacks killed five people, infected several others, paralyzed the United States with fear and shaped the nation's bioterrorism policy."[65] In order to determine what valuable insights were gained from these events, points of focus to influence prevention, recovery, and response strategies and policies will be examined in Chapter 5.

Chapter 3

National Exercise Program and Lessons Learned 2000 - 2005

There are no failures—just experiences and your reactions to them.
Tom Krause
International Motivational Speaker

"I was honored to play the part of the President in the exercise *Dark Winter*… You often don't know what you don't know until you've been tested. And it's a lucky thing for the United States that… 'this is just a test, this is not a real emergency.' But Mr. Chairman, our lack of preparation is a real emergency." This is a quote from the Honorable Sam Nunn in his testimony before the House Government Reform Committee, Subcommittee on National Security, July 23, 2001, following his participation in *Dark Winter*, an exercise testing the national response to a simulated biological weapons attack.[66] Exercises serve as a training venue, a test of local capabilities, and an opportunity to examine preparedness, status of appropriate resources and abilities of personnel. National exercises engage government officials and agencies, and test strategic level changes in our national emergency response structure and capability.

There have been five National Exercises since 2000, however only three of these exercises included a simulated release of a biological agent. These National Exercises are referred to as "Top Official" or "TOPOFF" exercises because they engage participation from all levels of government. In addition to these three National Exercises, *Dark Winter* was an exercise that tested strategic level responses. *Dark Winter* was not considered a National Exercise, but did test the predicted response of the National Security Council reaction to a smallpox attack on the United States.

The participants and observers of these National Exercises recorded lessons learned to enable everyone, including the top officials, the emergency

management workers and the hospital employees, to gain information and improve future emergency response and consequence-management activities. It is important to note each of the four exercises elucidated similar shortcomings in the areas of treatment distribution plans, information storage and dissemination, public communication, and overwhelmed hospitals and emergency response staff. What follows in this chapter is a very brief description of the exercise followed by lessons learned from the response actions taken to each biological agent.

TOPOFF 1
May 2000, Denver, Colo.

TOPOFF 1 was the first National Exercise which involved a response to a simulated chemical attack in Portsmouth, N.H., and a simulated biological attack in Denver, Colo. This exercise was conducted by the Department of Justice, the Department of State and the Federal Emergency Management Agency (note: the Department of Homeland Security did not exist at this time).[67]

Exercise Description

The event began with a simulated aerosol release of *Yersinia pestis*, or plague bacteria, on the city of Denver, Colo., on May 17, 2000. Exercise play began on May 20, as 500 sick people inundated local hospitals. Players in this exercise included the state and county health agencies, the Centers for Disease Control (CDC), the Office of Emergency Preparedness, elements of the Public Health Service and three hospitals in the Denver area. By the end of the exercise on day four, hospitals are understaffed, there are insufficient antibiotics and beds for the demand, and there are an estimated 3,700 cases of pneumonic plague with 950 deaths.[68]

Items of Interest—Lessons Learned

Leadership and Role of Authorities. Leadership and roles during the exercise were uncertain. Because the Colorado governor did not actually participate, decisions were made by the governor's Emergency Epidemic Response Committee. It was suspected some decisions made by the committee would have been different if political ramifications had been considered. For instance, the committee discussed closing the state borders

and engaging quarantine without appropriate analysis of the consequences, like how to feed the quarantined population.[69]

First Meeting by Emergency Response Organizations. The exercise was the first venue of which many personnel met from emergency response organizations in Colorado. While it would have been optimal for these organizations to have had contact and planning meetings previously, the TOPOFF exercise at the very least provided an opportunity to meet and further demonstrated the need to meet frequently. The first time a real-world event occurs should not be the first time the lead of one organization meets the lead of another. During this TOPOFF exercise, "the roles, authorities, and even the identities of those participating in the calls, as well as the leadership of and agendas for the calls, were unclear."[70] Had prior meetings occurred during "peacetime," many of these difficulties would have been resolved.

Poor Flow of Information. During the exercise, injects were provided detailing the number of sick and dead at each of the hospitals. It was widely agreed that with the databases and communication capability at the time, it was unlikely such efficient communication among hospitals and health departments would have been possible, especially tracking epidemiological information. "Without rapid access to this information and other data, decision-makers would have been even more ill positioned to make important decisions, such as how and when to distribute antibiotics, make recommendations for containment measures, or communicate public education messages."[71]

Disease Identification. Laboratory diagnostics were not actually accomplished during the exercise. A photo of the plague bacilli was provided to a laboratory technician, who sent information to the state laboratory.[72] During the exercise, disease identification occurred much more rapidly and accurately than would likely have been the case in a real-world situation. Rapid and accurate disease identification is important with regards to treatment options and predicting the rate of spread of the disease.

Lack of Treatment Distribution Plan. This exercise demonstrated the need for a pre-established therapeutic priority and distribution plan. No plan to distribute limited medications, and no plan for who should get it first was

in place, thus complicated decisions had to be made on the fly. Additionally, material from the National Pharmaceutical Stockpile (NPS, later called the Strategic National Stockpile) was requested and delivered. However, because the state had little prior experience with an NPS shipment, a single individual was given the responsibility for counting individual pills for each of the simulated 16 hospitals expecting antibiotics. Finally, after deciding to distribute antibiotics through "points of distribution" or PODs, the exercise participants quickly realized they had no logistical plans or sufficient personnel to support the PODs or means of tracking drug distribution. This inefficiency resulted in an abysmal rate of 140 people treated per hour… for a city of 1 million.[73]

Disease Containment and Quarantine. During the exercise, it was decided containment measures should be taken to control the spread of the disease. Initially only patient isolation, then travel restrictions were enacted. Later, the governor's Emergency Epidemic Response Committee discussed closing the state borders and the Denver International Airport, and enacting quarantine. No consideration was made to the issue of feeding the population, nor how this quarantine would be enforced.[74]

Public Communication. Much time was spent during the exercise determining how to craft a message for the public. Discussions centered on what information should be provided concerning the disease, potential terrorist actions, and number of sick and dead. It was unclear to the participants the legal rights of the public, the impact public communication would have on inducing or reducing panic, or how clear communication would influence the control of the epidemic.[75] This confusion demonstrates the need for prepared information, leaflets or handouts, concerning each major bioterrorist disease-causing agent, and a thorough discussion by top officials as to what should be communicated and when.

TOPOFF 2
May 2003, Chicago, Ill.

TOPOFF 2 was the first major exercise led by the newly formed Department of Homeland Security (DHS) following the events of Sept. 11, 2001 and the Amerithrax attacks that followed. This exercise was the first opportunity for DHS to exercise the Homeland Security Advisory System (HSAS) and included a radiological dispersal device attack on Seattle and a plague release in Chicago.[76]

Exercise Description

On May 12, 2003, Chicago hospitals reported an increase in common illness. During the exercise, 64 hospitals in Illinois participated, the largest mass casualty exercise ever undertaken. The exercise progressed for three days. In the end, exhausted and over-extended staff at hospitals and the State Department of Health demonstrated the limits on adequate functioning and ability to provide services over an extended period of time.[77]

Items of Interest—Lessons Learned

Lack of Treatment Distribution Plan. As noted in TOPOFF 1, there was no established prophylaxis distribution plan in place. Inconsistent information was provided to the public as to who should seek treatments, when and where.[78] Additionally, there was confusion as to who had the authority in the state to request supplies from the Strategic National Stockpile (SNS) which resulted in a bureaucratic delay in vital medical supply delivery.[79]

Communication Difficulties. The lack of a robust communications infrastructure was apparent during the exercise. At one location, the participants relied on HAM radio operators for connectivity.

Collection of Information to Common Database. "Information was often copied manually to a form. The form was then faxed (in some cases degrading its readability) to a collection point, where it was manually tabulated on another form, and then entered into an information system for transmission."[80] This exercise highlighted the need for a centralized database for rapid and accurate information collection.

Public Communication. Similar to TOPOFF 1, no consistent message was crafted prior to the exercise regarding terrorist dispersal of the plague bacteria. The exercise evaluators commented that a consistent message to the public from the command structure, public health and medical responders is critical to general public education.[81]

TOPOFF 3
April 2005, New Jersey

TOPOFF 3 was the first test of the National Response Plan (NRP) and National Incident Management System (NIMS). This exercise included a chemical attack in Connecticut and a biological attack in New Jersey.[82]

Exercise Description

TOPOFF 3 was a totally scripted exercise in which the participants were alerted to the biological agent to be employed more than a week before the exercise began. Some criticize that this resulted in a "laser-like" reaction and response, and lacked a sense of true chaos.[83] Nevertheless, in the scenario it was stated that a vehicle traveling through Union and Middlesex Counties released aerosolized pneumonic plague, and a few days later, hospitals were inundated with the sick. The primary test of this exercise was the operability of the Points of Dispensing (PODs) in three New Jersey counties: Middlesex, Monmouth and Union. The principle purpose of a POD was to dispense medications, educational materials, and to support the "worried well" and those who may actually have been infected.

Items of Interest—Lessons Learned

Lack of Prior Planning for POD Activities. In general, activities in two of the PODs, Middlesex and Union, were not well thought-out. Issues such as what protective mask should be worn by workers, what security was needed, manpower requirements, and what records should be kept, plagued the operations of the PODs. The Union County POD could only distribute about 1,000 drugs dosages in a four-hour period, and Middlesex County, officials could treat only about 500 people. However, in Monmouth County, the POD was able to provide medications to 67,000 people, 10 percent of the

county, in four hours. The Monmouth County POD adopted a "Point of Distribution" model in which it provided medication to a few people who then went out to redistribute these medications to others. It used a preprogrammed database to aid distribution activities. And, the team was well trained and well equipped for the exercise.[84] This exercise was beneficial in providing clear proof that a Point of Distribution model of a POD is far more effective that a single Point of Dispensing.

Inefficiency in Record Keeping. Exercise evaluators commented that attempts to maintain records at two PODs resulted in major inefficiencies and recommended records not be kept. However, at the Monmouth POD, most of the potential recipient's information was preprogrammed in a computerized records system, resulting in highly efficient drug distribution. Evaluators criticized this preprogramming, stating "during a real event, this type of command and control would not be possible, unless there was a consistently updated list or lists of people who are in the computer database."[85] However, the results of this exercise demonstrated that, with some effort, it is possible to maintain a current database of residents. While this may appear to some as a "big brother watching us" sort of database, some of our privacy may have to be given up in order to ensure the most rapid distribution of treatment in the event of a bioterrorist incident.

Pre-printed Information. Apparently, the week's advanced notice gave volunteers at the PODs an opportunity to prepare information in a clear, concise and detailed manner. Exercise evaluators criticized the use of pre-printed, professionally designed, information for public distribution. But, shouldn't this be how we run real-world events? The military takes great pains to develop Concept Plans or Contingency Plans (CONPLAN) and puts them on the shelf, only to be brushed off in the event the specific contingency arises. Similarly, POD operators should have CONPLANs written with supporting documentation prepared, printed and shelved for the most likely bioterrorist or natural events which may occur in their jurisdiction.

Public Communication—Giuliani Model. During the recovery in New York City following the Sept. 11, 2001, attacks, former Mayor Rudy Giuliani demonstrated what some say was heroic leadership. Mayor Giuliani was visible, composed and vocal during all of his frequent communication

with the public. He was consistently reassuring and communicated specific plans for orderly and safe evacuation and recovery.[86]

During the TOPOFF 3 exercise, a Virtual News Network (VNN) provided public communication. The VNN simply provided interviews with VNN reporters in the field, with little sense of urgency or information regarding the crisis. "Providing timely, relevant and accurate information to the public can reduce confusion, provide good reasons for specific courses of action taken by the federal and state government, and provide the public with an explanation of the nature of the release, where to obtain needed medications and how to use them."[87] The exercise examiners recommended employing the "Giuliani model" of telling the public exactly what is happening, how bad the situation is, what the government is doing about it and what the public should do.[88] Essentially, a more well-informed public is a more resilient public.

Dark Winter
June 2001, Andrews AFB, Md.

Dark Winter was a table-top exercise which involved a covert smallpox attack in three shopping malls in Oklahoma City, Philadelphia and Atlanta. The exercise aimed to examine the challenges faced by senior leaders in the event of a wide-spread bioterrorist incident.[89] The senior leaders had to respond to a scenario which involved an initial infection of 3,000 people, followed by the subsequent infection of thousands of others.

Exercise Description

The *Dark Winter* exercise progressed as a series of power-point charts, incorporating decisions made into the evolving exercise. The 12 participants portrayed members of the National Security Council, each of whom either currently serves or had served in a high-level government or military position.

Items of Interest—Lessons Learned

Government Organizational Structure Ineffective. Exercise evaluators noted major "fault lines" among local, state, and federal government organizations which impeded situational awareness and emergency response actions.[90] Additionally, senior leaders were unfamiliar with the character of biological agents, their policy options and the potential consequences of actions taken in response to the bioterrorist incident.[91]

No Surge Capacity in Healthcare and Public Health System. Exercise evaluators predicted that the limited surge capability would result in hospitals being overwhelmed quickly, reducing or causing them to become inoperable.[92] Additionally, it was noted there is no capacity or plan to deal with the "worried well" who will inundate the hospitals.[93]

No Surge Capacity in Pharmaceutical and Vaccine Industry. The ability to quickly respond to an epidemic and provide the necessary therapeutics is thought to limit the ability to respond and curb the spread of disease.[94] Thus, other options in the pharmaceutical and vaccine industry should be examined to determine stop-gap measures in the event of a bioterrorist attack.

Lack of Treatment Distribution Plan. This lack of surge capacity also forces decisions to be made as to who gets vaccinated, and, more importantly, who does not. During the exercise, participants realized there was no treatment distribution plan appropriate for the event. This exercise confirmed the need for the federal government to develop clear guidelines as to how to balance local, state, military, and other national pharmaceutical and vaccination priorities.[95]

Collection of Information to a Common Database. Decision-makers required information to clarify uncertainties during the exercise… and found this information was not always immediately at hand. Information such as the location of attacks, predicted size of an epidemic, the number of people exposed and ill, and the number of people vaccinated was not readily available.[96] The exercise demonstrated a centralized database is needed for improved information flow across states during a national bioterrorist event.

Public Communication. "The president and other leaders in *Dark Winter* recognized the importance of persuading their constituents that there was a fairness in the distribution of vaccine and other scarce resources, that the disease-containment measures were for the general good of society."[97] As with the TOPPFF exercises, a pre-prepared, clear, concise message to be provided to the public is essential in maintaining trust and confidence during a chaotic event.

Examination of the lessons learned from these National Exercises allows us to gain additional valuable insights into planning, preparation, response and recovery areas which should be addressed in biological weapon deterrence strategies.

Chapter 4

Points of Focus to Prevent, Respond to, and Recover from Biological Attack

The beaten path is secure and logical,
but most opportunities lie in the deep, dark woods.

—Unknown

Resources and time which can be focused on prevention, response and recovery from a biological attack are not infinite. How can we best assure our limited resources are used appropriately? Through reflection on lessons learned from past incidents and exercises, and consideration of the processes required to achieve a successful biological attack, the points of focus to deter a biological attack with the most "bang for our buck" can be elucidated.

Operational prevention, response and recovery strategies should include both long-term and short-term goals. The long-term goals include the ultimate objective—international prevention of aggressive biological agent use. The short-term goals include the "stop-gap" measures to reduce vulnerabilities and make American society more resilient, while steps are taken toward the long-term goal. Both long-term and short-term goals require national resolve, planning, resources and time to achieve their objectives.

There are multiple steps in the process to conduct a successful biological weapons attack. Figure 1 displays a notional and logical progression from the formation of a terrorist organization through the attack, including post-event effects or consequences. Between each step of this progression lies an arrow leading to the next step. At these arrows, efforts should be focused to prevent a terrorist from reaching the next step.

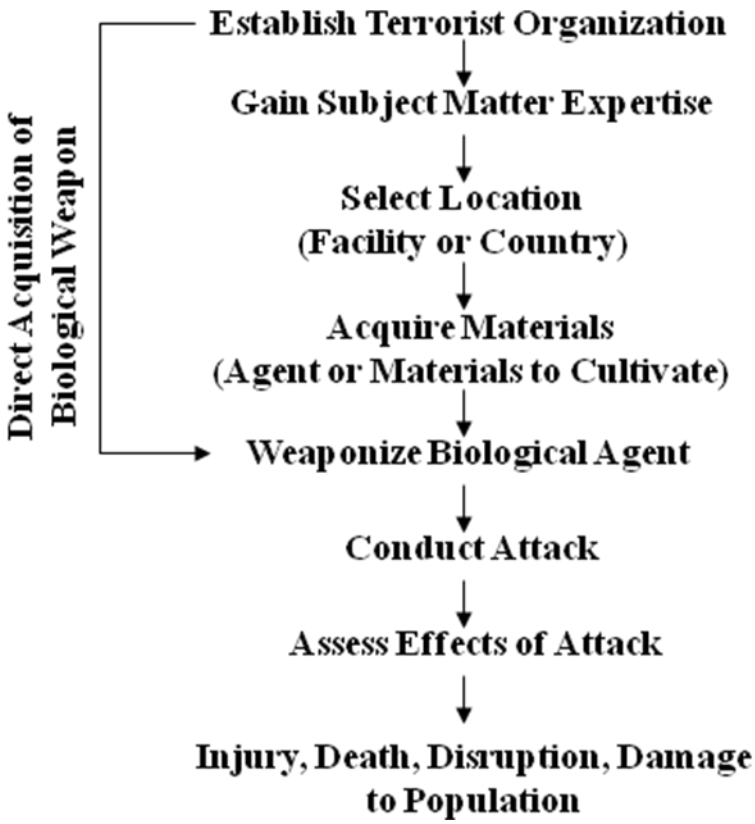

Figure 1 Notional Progression of Biological Attack

For instance, in order to manufacture or cultivate and weaponize a biological agent, a terrorist organization must seek subject matter experts who have the knowledge and ability to select not only an appropriate facility to conduct operations, but also to choose a country that will accept and turn a blind eye to, or be oblivious to a covert biological weapon production activity. From the case studies in Chapter 2, it is apparent that the Rajneesh Cult found an effective subject matter expert in Puja, who was able to successfully culture and disseminate salmonella. Conversely, the Aum Shinrikyo cult was not able to attract an expert with the essential scientific

training to achieve the ends. An effective U.S. prevention strategy might focus on preventing subject matter experts from being hired by the highest terrorist bidder by offering those experts alternate, more profitable, employment opportunities.

Next, this subject matter expert must know where and how to obtain the necessary supplies, materials, protective equipment, vaccines, antibiotics and biological agents. In all of the case studies examined in Chapter 2, the principal biological agent engineer was able to easily acquire the equipment and supplies required. A preventive strategy might focus on identifying who is purchasing these materials and supplies, enact tighter international controls, and thereby help prevent terrorists from obtaining the capability to manufacture biological agents.

It is not enough to have an agent to have an effective attack. Most biological agents are sensitive to environmental conditions and mistreatment, as demonstrated by the failures of the Aum Shinrikyo cult. In order to ensure viability and adequate dispersal, attention to the weaponization of the biological agent must be considered by the terrorist-hired expert. Again, a counter-terrorist strategy could target hiring these biological weapons experts for better uses while, at the same time, providing constant close supervision of all work done in national laboratories.

The arrow running along the left side of Figure 1 shows a "short-cut" to bypass the need for an expert, and enable the terrorist organization to obtain a fully weaponized, ready-to-install, biological warfare agent. For example, Larry Harris obtained *Yersinia pestis* and the Rajneeshees obtained a few other pathogens from the ATCC by means of a simple fax and phone call. Regardless of whether a subject matter expert is employed through the entire weapons development continuum or if an agent is acquired directly, preventive measures can be developed to detect and/or prevent acquisition of these agents by terrorist groups.

If a terrorist group is able to successfully acquire and culture a biological weapon, and disperse it with effective viability, the consequences of such an event can be dramatically reduced by early detection and quick responses. For instance, if the Aum Shinrikyo dispersal of an agent near naval facilities in Japan had been detected, even though non-viable, this would have provided a wake-up call, and subsequent Aum Shinrikyo experimentation and potential attacks perhaps could have been prevented. Additionally, if sensors had been placed in the Brentwood mail distribution facility and had detected

low levels of anthrax spores in October 2001, the subsequent exposure to hundreds of people and the contamination of other buildings may have been prevented. Thus, early detection can mitigate or eliminate devastation due to an attack, and may also assist emergency responders engaged in consequence management activities by letting them know early what biological agent they are dealing with.

After the attack, there are two concerns. First, responders like firemen, police and special response teams will be involved in the initial recovery and potentially long-term consequence-management activities. Second, the terrorist organization must assess whether goals for the attack have been achieved. In both concerns, U.S. activities to prepare, respond and recover may act as a deterrent to terrorist organizations considering a biological weapons attack on the United States. If the attack is ineffective due to the superior preparedness and resilience of the American people to withstand such an attack, then the terrorist's goals will not be met. Yet, in all of the case studies presented (Aum Shinrikyo, Rajneesh, and Larry Wayne Harris) and the TOPOFF 1, 2, 3, and Dark Winter exercises, planning, response and recovery lacked the robustness needed to be an effective prevention strategy.

Finally, effective forensic techniques can be especially beneficial if they could rapidly determine the perpetrator of an attack (attribution). Again, the recent case studies of biological incidents, especially the anthrax letters attacks, demonstrate the current absence and need for the development of adequate forensic techniques and capabilities concerning biological agents.

Figure 1 pictures a notional progression from the formation of a terrorist organization through execution of a biological attack. At a number of places in this progression, strategies to interrupt and prevent biological weapon acquisition and use by adversaries can be focused. Figure 2 displays a sampling of suggested points of focus.

These suggested points of focus include methods to achieve both long-term and short-term goals. The first three points of focus on Figure 2 are activities which should be accomplished at the national level through international agreements and global strategies. Action in these three points of focus will move us toward achieving our long-term biological weapon prevention strategies. The second two points of focus must be guided by national strategy, but include actions the states and local communities must undertake in order to achieve the short-term goals. In the following chapter, the corresponding initiatives to both these long-term and short-term goals

present in the national and military strategies and programs driven by these strategies will be discussed.

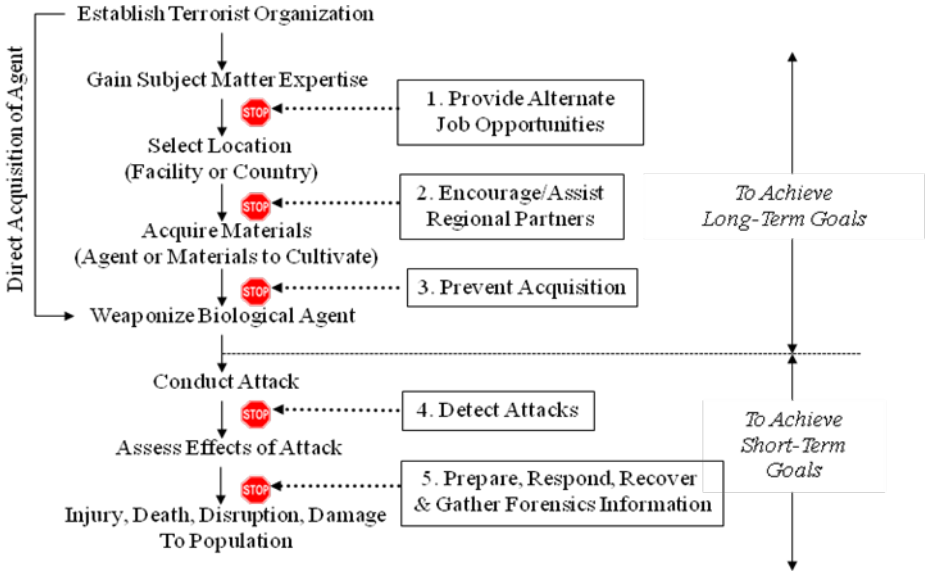

Figure 2 Points of Focus

Chapter 5

Evaluation of U.S. Policy

The Obama administration's new strategy for countering biological threats—both natural and man-made—rests upon the main principle of the Biological Weapons Convention: that the use of biological weapons is "repugnant to the conscience of mankind."

— Undersecretary of State Ellen O. Tauscher

Since the attacks at the World Trade Center (1993), Khobar Towers (1996), U.S. Embassies in East Africa (1998), the USS *Cole* (2000) and the Pentagon and World Trade Centers (2001), the United States has progressively reshaped national security and national military strategies. The most current *National Security Strategy* (*NSS*) was published in March 2006. Supporting this strategy are the *National Strategy for Homeland Security* (October 2007), *National Strategy to Combat Weapons of Mass Destruction* (December 2002), *National Strategy for Combating Terrorism* (September 2006) and the *National Defense Strategy* (June 2008).

The *National Defense Strategy*, June 2008, describes the military support to accomplish the plans set forth in the various national strategies. The military, too, has developed strategies to complement the overarching defense strategy of 2008. The *National Military Strategy*, 2004, the *National Military Strategy to Combat Weapons of Mass Destruction*, Feb. 13, 2006, and the *National Military Strategic Plan for the War on Terrorism*, Feb. 1, 2006, detail the methods the military will use to enable the national security deterrence strategy.

Specifically related to bioterrorism, President George W. Bush signed the *Biodefense for the 21st Century* Presidential Directive (Homeland Security Presidential Directive (HSPD)-10) in 2004.[98] "President Bush has made strengthening the nation's defenses against biological weapons a critical national priority from the outset of the administration -- investing over $10

billion since 2001. While significant progress has been made to protect America, President Bush instructed federal departments and agencies to review their efforts and find new and better ways to secure America from bioattacks."[99] Most recently, President Barack Obama published the *National Strategy for Countering Biological Threats*, November 2009, reaffirming the concern the government still holds toward this threat. Each of these strategies provides a strategic plan for the United States to protect and defend against the nation's enemies and attacks they may perpetrate against us.

An examination of the biological incidents and attacks of the Rajneesh Cult, Aum Shinrikyo Cult, perpetrator of the anthrax letters and of Larry Wayne Harris may provide insight as to what aspects of the *NSS* and *National Defense Strategy*, and their supporting strategies, will provide as effective deterrents to prevent biological weapons attacks. The Figure 1 presented in Chapter 4 pictured a notional progression from the formation of a terrorist organization through execution of a biological attack. At a number of places in this progression deterrence strategies can be focused. Figure 2 also presented in Chapter 4 displayed a sampling of suggested points of focus. In this chapter, the initiatives presented in the national and military strategies related to each of the six points of focus will be discussed:

1. Provide Alternate Job Opportunities
2. Encourage or Assist Regional Partners
3. Prevent or Detect Acquisition
4. Detect Attacks
5. Prepare, Respond, Recover and Gather Forensics Information

Current U.S. Policies and Initiatives

The number of policies and initiatives regarding weapons of mass destruction and terrorism is vast. However, when considering only the biological agent aspect of these policies, the list of the deterrence measures narrows. Table 1 presents the location in each strategy document which addresses the suggested points of focus identified in Figure 2. Page numbers are provided for reference. The paragraphs following Table 1 address some of the current national and military strategies and related initiatives corresponding to each point of focus.

Table 1. Points of Focus in National and Military Strategies

	NSS 2006	NSHS 2007	NS CbtWMD 2002	NS Cbt Terror 2006	NS Vs Bio Threats 2009	NDS 2008	NMS 2004	NMSP 2006	NMS CbtWMD 2006
Provide Alternate Job Opportunities					8-9, 19-20				
Encourage/Assist Regional Partners	8, 18-23		2 4 6	9-11	6-7, 19-20	10-11 15-16	2, 20	23 24	6-7, 21
Prevent Acquisition	12, 18-23	15	2 5	13-14	13-14 16	14-15	10, 20	7, 23	16-19 23-24
Detect Attacks	12, 18-23	6, 15, 29	6	14	6, 11	15	10	7	20
Prepare, Respond, Recover & Gather Forensics Info	12, 18-23	6, 29-40	2 5	14-15	6-7, 15-17	7, 15	18	7	16-19 26

Abbreviations: NSS – *National Security Strategy*, NSHS – *National Strategy for Homeland Security*, NS CbtWMD – *National Strategy to Combat Weapons of Mass Destruction*, NS Cbt Terror – *National Strategy for Combating Terrorism*, NS Vs Bio Threats – *National Strategy for Countering Biological Threats*, NDS – *National Defense Strategy*, NMS – *National Military Strategy*, NMSP – *National Military Strategic Plan for the War on Terrorism*, NMS CbtWMD – *National Military Strategy for Combating Weapons of Mass Destruction.*

Provide Alternate Job Opportunities

"Anecdotal reports persist of former Soviet scientists, especially those in Central Asia and the Caucasus, being approached by officials from proliferant states. Further, a 2003 survey of Russian scientists with weapons expertise found that 20 percent of respondents would consider working in North Korea, Syria, Iran or Iraq for a year or more."[100] In each of the four incidents described in Chapter 2, the lead subject matter expert was critical in the development of an attack plan, determining the biological agent to be used, obtaining the necessary supplies, and manufacturing the organism for dissemination. If the subject matter experts were enticed to take peaceful positions of employment, it would make it more difficult for terrorists to use biological agents as weapons.

In 2006, the U.S. Department of State and the U.S. Agency for International Development published their fiscal year summary, which addressed the challenge of redirecting former Weapons of Mass Destruction (WMD) scientists to more peaceful programs. The report highlighted activities in the Office of Cooperative Threat Reduction of the U.S. Department of State regarding Iraqi and Libyan scientists through what is currently called the "Iraq Scientist Engagement Program" and the "Libya Scientist Engagement Program."[101] These programs enable the redirection of former WMD scientists to civilian activities through the enhancement of scientific and economic development.[102]

Currently, the Nonproliferation of WMD Expertise (NWMDE), which consists of the Science Centers program, the Bio-Chem Redirection program, and the Bio Industry Initiative, aim to redirect former WMD scientists in order to reduce or eliminate this aspect of the bioterrorist continuum. The Science Centers program supports two international science and technology centers: The International Science and Technology Center (ISTC) in Moscow[103] and the Science and Technology Center in Ukraine.[104] Both centers provide peaceful and sustainable employment opportunities to Russian and Commonwealth of Independent States (CIS) scientists possessing WMD knowledge and skills.

The *National Strategy for Countering Biological Threats* recognizes the efforts to redirect former WMD scientists through cooperative international

partnerships, re-affirming the level of importance at which the current administration holds these programs. However, to attempt to control or hire all of the individuals with appropriate knowledge to conduct a biological weapons attack would be impossible. It is unclear if the United States really knows how many scientists and related technical people from former Iraqi WMD programs it should be concerned about, much more nebulous are the numbers of WMD-related scientists from Russia and the other former Soviet states.[105] Thus, although this is an attractive means to halt or prevent an attack, it is not the most likely or efficient means.

Encourage/Assist Regional Partners

The 2006 *National Security Strategy* states that "meeting WMD proliferation challenges also requires effective international action – and the international community is most engaged in such action when the United States leads."[106] According to unclassified sources, approximately 20 countries have the capability to manufacture biological weapons, including North Korea, China, Russia, Iran, Syria, Libya, India, Pakistan and the United States.[107] Because most equipment, technology and materials for biological agent production are dual-use, for peace and war purposes, it is difficult to distinguish between offensive weapons research and development, and more peaceful intentions. Biological weapon proliferation is a global issue. Thus, it is vital for the United States to engage with the international community to prevent terrorist activities, including those that involve biological agents.

A keystone to this involvement centers on the *Biological and Toxin Weapons Convention*. Engagement in this convention is highlighted in the 2002 *National Strategy to Combat WMD*.[108] The 1972 *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction*, also known as the *Biological and Toxin Weapons Convention*, went into effect March 1975. It included 103 co-signing nations, and 140 nations have now signed and ratified the convention. However, it contains no provisions for verification or enforcement.[109] The United States has many programs countering proliferation of weapons of mass destruction, in general. However, countering the proliferation of biological warfare agents is problematic.

The 2002 *National Strategy for Combating WMD* also highlights the need to enhance traditional nonproliferation measures, such as diplomacy, arms control, multilateral agreements, threat reduction assistance and export controls in order to reduce the threat of attack with WMD.[110] Additionally, the 2006 *National Military Strategy* for Combating WMD details "Strategic Enablers," including deterrence, intelligence, partnership capacity and strategic communication support, which enhance the effectiveness of military capabilities for combating WMD.[111] "The United States alone cannot eliminate this threat, nor can any other single institution or sector. Defeating the threat will take a concerted, collaborative and integrated international approach involving allied governments; law enforcement; the military; and the academic, medical, and scientific communities."[112]

Encouraging or assisting regional partners may help to deter adversary biological agent production. However it will not completely solve problems presented by the terrorist use of biological agents. While it is a challenge to entice a country to give up or never obtain a biological weapon capability, it is even more difficult to identify and prevent a terrorist group from developing the same capability on a smaller scale. The Rajneesh cult, Larry Harris and likely the perpetrator of the anthrax letters did not use U.S. regional partners to develop their biological weapons. Thus, a focus on regional partners and engagement to develop stronger nonproliferation relationships is an important deterrent in a strategic policy, but may not be the most effective at deterring a small-scale terrorist use of biological agents in the United States. However, it is possible to prevent some terrorist groups from acquiring materials and expertise to develop biological weapons through international programs to eliminate national WMD expertise, materials and arms.

Prevent Acquisition

After Larry Harris' arrest, the CDC took measures to safeguard 24 infectious agents and 12 toxins which pose a significant risk to human health. Prior to this incident, the Rajneesh cult obtained the agents on which it experimented, and Iraq obtained some of its lethal strains of anthrax, tularemia and Venezuelan equine encephalitis from the ATCC. Shippers and receivers of these identified agents must now register with the CDC.[113] The safeguarding measures, known as the Select Agent Program, became law on June 12, 2002, when President Bush signed the "Public Health Security and

Bioterrorism Preparedness Response Act of 2002."[114] The Select Agent Program requires registration of facilities including government agencies, universities, research institutions and commercial entities that possess biological agents or toxins deemed a threat to public, animal or plant health.[115] While this program makes agents more difficult to obtain, some may still seek them… and risk more severe penalties than in the past.

When Larry Harris was arrested, the most severe punishment for his possession and expressed desire to use a biological agent as a weapon was wire fraud. The USA PATRIOT Act of 2001 was the first law to put restrictions on persons who possess select agents and provides criminal penalties for possessing such agents not justified for peaceful purposes. In addition, violation of the Public Health Security and Bioterrorism Preparedness Response Act can result in civil fines of $250,000 for individual or $500,000 for an entity and imprisonment of up to five years.

Further legal actions are addressed in the 2007 *National Strategy for Homeland Security*, the Intelligence Reform and Terrorism Prevention Act of 2004 and the Protect America Act of 2007 which promote security and implement portions of both the 9/11 Commission and the WMD Commission recommendations.[116]

Also, the *National Security Strategy* mentions the United States led the passage of the 2004 United Nations Security Council (UNSC) Resolution 1540, which requires nations to criminalize WMD proliferation and institute effective export controls.[117] Finally, the Military Commissions Act of 2006, allows captured terrorists to be tried for war crimes. The more severe penalties may prevent an individual or group from considering these agents as a weapon.

The Select Agent Program has taken the necessary steps to eliminate the ease with which the Rajneesh cult, Iraq and Larry Harris obtained their biological agents, and the USA PATRIOT Act, and subsequent acts, have strengthened punishment against those who attempt to obtain biological materials for adverse acts. These two types of policy must be adopted by other countries in order to prevent and deter easy acquisition world-wide. However, if a terrorist group intends to use biological agents, many can be easily obtained and cultivated from natural sources. The growth and development of biological agents require specialized equipment and supplies and thus provide another indicator of an active biological program.

The Aum Shinrikyo cult used a U.S. company to obtain and ship equipment and supplies. It was also assumed the cult had a chemical program based on the numbers of atropine injectors the cult had ordered.[118] An integrated U.S. and international intelligence network which gathers data and tracks certain equipment and supply purchases may provide an early indication of the intentions of a terrorist group or cult. For instance, if a group or individual purchases a large amount of antibiotics or vaccines, intelligence efforts should have the capability to easily track and report these transactions for further examination.

The nation's nerve center for information sharing and domestic incident management is the Homeland Security Operations Center (HSOC). The HSOC collects and fuses information to deter, detect and prevent terrorist acts. The HSOC is divided into two halves: Intelligence and Law Enforcement. "The 'Intelligence Side' focuses on pieces of highly classified intelligence and how the information contributes to the current threat picture for any given area. The 'Law Enforcement Side' is dedicated to tracking the different enforcement activities across the country that may have a terrorist nexus."[119] The HSOC provides real-time situational awareness and monitoring, coordinates incident-response activities, and issues advisories and bulletins concerning threats to the United States[120]

Preventing acquisition and integrated intelligence are important foci of deterrence. While some critical steps have been taken in the United States to prevent acquisition of agents, more action should be taken worldwide. Additionally, more focus and funding should be provided to the intelligence agencies to enable them to better collect, integrate and interpret information to obtain a clear picture of biological weapon development and the intent of terrorist groups and others.

Detect Attacks

Detection of a bioterrorist attack should occur at the strategic and tactical levels. At the strategic level, detection of a terrorist organization's plan and developing capability to use biological agents is a key to preventing such an event. At the tactical level, detection of the agent release is vital to rapid and effective response and consequence management activities.

On the strategic level, Argonne National Laboratory[121] has developed two computer-based capabilities to aid in the identification of terrorist organizations and prediction of future actions. The *Joint Threat Anticipation*

Center (*JTAC*) anticipates long-term threats to U.S. national security by integrating social science and technology. *JTAC* conducts research in areas of terrorist strategy and tactics, failed states, socio-cultural process and precursors to terrorism, and language studies.[122]

Complementary to the *JTAC* is *NetBreaker*. *NetBreaker* uses dynamic social network analysis and agent-based modeling with social network formation rules to find and model terrorist networks. *Netbreaker*'s simulation determines what a terrorist group can do, how it interacts and the probable threats from its network.[123]

On the tactical level, detection of the release of an agent is critical to a rapid response to negate the harm done by a bioterrorist's action. Aum Shinrikyo attempted biological attacks on Tokyo a number of times, yet these went undetected. If only one of these unsuccessful attacks had been detected, then appropriate antibiotics could have been administered (although in this case, they were not necessary) and actions could have been taken to prevent a future successful attack. Homeland Security Presidential Directive-21, *Public Health and Medical Preparedness*, states, "The United States must develop a nationwide, robust and integrated biosurveillance capability, with connections to international disease surveillance systems, in order to provide early warning and ongoing characterization of disease outbreaks in near real-time."[124] In order to accomplish this edict, BioWatch is a Department of Homeland Security program, assisted by CDC and the Environmental Protection Agency (EPA), which performs 24x7 environmental surveillance using the existing EPA and Department of Energy air quality monitoring systems. Air samples are tested as an early warning indicator of biological attacks.[125] The BioWatch system has been successfully operating in more than 30 urban centers since early 2003.[126]

The *Biological Warning and Incident Characterization* (*BWIC*) is a support system integral to the DHS' BioWatch program. *BWIC* integrates a number of diverse computer modeling programs and provides a common view of an event to emergency responders and critical agencies involved. *BWIC* includes Geographic Information System (GIS) maps, air dispersion models, population information, epidemiological tools, subway and facility models, and links to public health surveillance information. [127]

The BioWatch system is an example of "detect to treat" defensive system. People have already been exposed to an agent when the system provides an alarm and triggers a response. A better capability is a "detect to

warn" alarm system which would enable people to take shelter to avoid exposure. While many organizations conduct research in the area of biological detection, more attention should be focused on accurate and rapid detection. If an enemy cannot infect the desired target, there is no point to a biological attack—an effective deterrence-by-denial system.

However, if an enemy is successful in releasing an agent, enhanced situational awareness may be improved by another system under development at Argonne National Laboratory, the *Integrated Chemical, Biological, Radiological, Nuclear and Explosives* (*ICBRNE*) Detection System, is supported by the Department of Homeland Security's Science and Technology Directorate. This integrates CBRNE sensor systems and supports regional capabilities to enable information sharing, enhance CBRNE detection, and improve situational awareness. The first phase of the program extends coverage to Chicago, Seattle, New York, Los Angeles and Boston.[128]

The 2006 *National Security Strategy* recognizes some bioterrorist events will not be detected through capabilities such as BioWatch, *BWIC* and *ICBRNE*; but instead may be discovered through epidemiological surveillance activities following people's exposure to a biological agent. As the 2006 document states, "countering the spread of biological weapons requires a strategy focused on improving our capacity to detect and respond to biological attacks …. The United States is working with partner nations and institutions to strengthen global biosurveillance capabilities for early detection of suspicious outbreaks of disease."[129] To this end, the U.S. military utilizes the Electronic System for the Early Notification of Community-based Epidemics (ESSENCE). ESSENCE is a near-real-time global monitoring system to detect infectious disease outbreaks. ESSENCE monitors outpatient and pharmacy data on over 9.2 million military beneficiaries and reports alerts to local and state public health officials, the World Health Organization (WHO) and the CDC BioSense System.

Also, in accordance with HSPD-21, *Public Health and Medical Preparedness*, the CDC BioSense System was established as an epidemiologic surveillance system for human health. This system allows for two-way information flow among federal, state, and local government public and clinical health care providers.[130] The CDC BioSense System tracks patients' health complaints and symptoms to identify trends that may indicate an increase in disease rates, indicating a bioterrorist event.

Emergency response personnel can then use the BioSense System to detect, track and respond more rapidly to disease outbreaks and enhance emergency response and consequence management activities.[131] However, this BioSense System has not yet been tested in a National Exercise to determine if it is capable of rapidly providing necessary information to decision-makers. Additionally no common database exists which can be shared within and across states to aid in response actions, drug distribution and public awareness.

Prepare, Respond, Recover and Gather Forensic Information

The 2006 *National Security Strategy* recognizes we may deter or dissuade terrorists from using biological agents if convinced they cannot achieve their goals. Thus, robust preparations to ensure a rapid and focused response may prevent any future need to use such a capability. With this in mind, the Department of Homeland Security was tasked by both the 2006 *National Strategy to Combating WMD* and HSPD-5 to develop a plan to prepare, respond and recover from a WMD attack (Figure 3). Specifically, HSPD-5 directs the former Homeland Security Council to develop and administer a National Response Plan (NRP). "This plan shall integrate Federal Government domestic prevention, preparedness, response, and recovery plans into one all-discipline, all-hazards plan."[132]

The National Response Plan was published in 2004 and revised in 2006. In January 2008, the Department of Homeland Security published the National Response Framework (NRF) which supersedes the corresponding sections of the previously published National Response Plans.[133] Chapter 3 of the NRF details specific response actions to respond to incidents, which includes three phases of effective response: prepare, respond and recover. This remainder of this section will describe these phases and discuss the additional need for forensics activities as they relate to the lessons learned from National Exercises and the four bioterrorist incidents described in Chapter 2 and 3 of this paper.

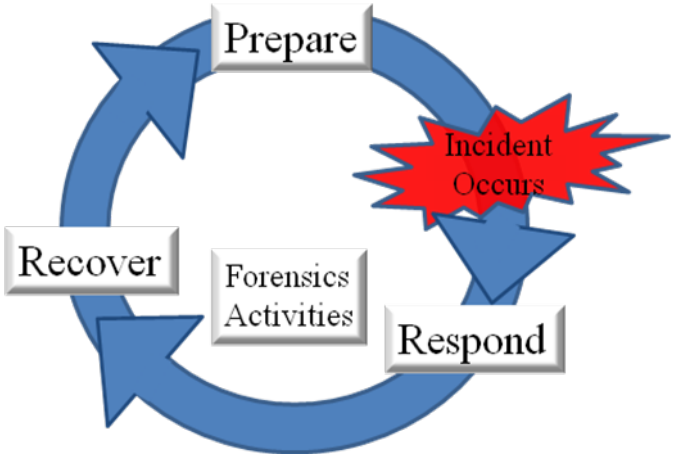

Figure 3 Phases of Effective Response Actions

Prepare. The NRF describes the six essential activities encompassing preparedness: plan, organize, train, equip, exercise, evaluate and improve.[134] These activities are displayed in the "Preparedness Cycle," Figure 4.

Figure 4 The Preparedness Cycle[135]

Plan. The review of the TOPOFF exercises commented inadequate plans existed regarding distribution of limited medications. In TOPOFF 3, Points of Distribution (PODs) were established, however there were incomplete logistical or manpower plans for distribution of the medication. Planning "includes the collection and analysis of intelligence and information, as well as the development of policies, plans, procedures, mutual aid and assistance agreements, strategies, and other arrangements to perform missions and tasks. Planning also improves effectiveness by clearly defining required capabilities, shortening the time required to gain control of an incident and facilitating the rapid exchange of information about a situation."[136] The Integrated Planning System is the national system used to develop interagency and governmental plans. However, local emergency personnel must engage and develop plans which incorporate specific capabilities and resources to respond to a biological incident.

Plans and the action of planning can be extremely complex undertakings. Thus, Argonne National Laboratory has developed a number of computer-based products to assist with the planning process. The first is the *Synchronization Matrix Planning Process*, a systems-based and problem-solving approach to emergency planning used to integrate emergency response plans across jurisdictions.[137] The *Matrix* is an interactive planning tool that allows the user to see a broad view of a response, visualizing the interactions that occur as the event progresses over time. The *Matrix* allows emergency managers to plan and practice interactions among agencies resulting in a more effective and coordinated emergency response.

The second Argonne program to aid in the planning process is the *Special Population Planner*, or *SPP*.[138] The *SPP* uses geographic information systems (GIS)-based software to aid in mapping communities, facilities and households where special-needs populations reside. Then the registry can be integrated in emergency response planning models to facilitate assistance of special needs individuals. The *SPP* is in use in six Alabama counties, enhancing emergency preparedness for 4,500 persons with special needs.

Planners should also consider the effects on the environment and potential alternate routes of biological agent distribution, such as drinking water distribution systems. Argonne's *Threat Ensemble Vulnerability*

Assessment (*TEVA*) simulates threats to drinking-water distribution infrastructure in order to analyze vulnerabilities, measure public health impacts, and aid in the design of threat-mitigation and emergency response strategies.[139]

Finally, Argonne's *Fort Future* is a virtual installation which provides information to aid in the analysis of deployment requirements and the impact of disruptive events, such as a biological attack.[140] *Fort Future* integrates DTRA's Hazard Prediction and Analysis Capability models to determine the contamination levels infiltrating buildings, thus enabling informed decision-making by commanders. *Fort Future* was developed for military applications; however it could be modified to model a local town or city to aid emergency managers in planning.

Organize. "Organizing to execute response activities includes developing an overall organizational structure, strengthening leadership at each level, and assembling well-qualified teams of paid and volunteer staff for essential response and recovery tasks. The *National Incident Management System* (*NIMS*) provides standard command and management structures that apply to response. This common system enables responders from different jurisdictions and disciplines to work together to respond to incidents."[141] The concept of organizing is especially important when a prolonged situation causes healthcare workers and first responders to be over-extended. By considering the expected organization in a plan, potential shortages can be determined and plans modified accordingly.

Train. In 1995, when public health officials and fire department personnel responded to Larry Harris' *Yersinia pestis,* few had trained or been educated regarding any biological agents. "Building essential response capabilities nationwide requires a systematic program to train individual teams and organizations – to include governmental, nongovernmental, private-sector, and voluntary organizations – to meet a common baseline of performance and certification standards."[142] Since Sept. 11, almost $3 billion in federal bioterrorism preparedness funding has been funneled to states.[143] In 2002, the Department of Health and Human Services announced more than $1 billion in Federal bioterrorism preparedness grants. [144] These grants and funding opportunities, in

combination with local and national exercises, have provided increased training and improved the skills of first responders and other hospital personnel.

Equip. After the covert attack conducted by Rajneesh cult members, Oregon hospitals were overwhelmed with sick and frightened people. A future terrorist may be even more successful in generating a mass casualty attack which taxes emergency responders, hospitals, and stockpiles of vaccines and antibiotics. "Effective preparedness requires jurisdictions to identify and have strategies to obtain and deploy major equipment, supplies, facilities and systems in sufficient quantities to perform assigned missions and tasks."[145]

In 2004, President Bush signed legislation called Project BioShield as a new bioterrorism countermeasure. BioShield committed $5.593 billion over 10 years.[146] BioShield is a comprehensive effort to develop, stockpile and make available drugs and vaccines to protect against biological and chemical weapons attacks.[147] The 2006 *National Security Strategy* and the 2007 *National Strategy for Homeland Security* reaffirmed these initiatives to speed development of new vaccines and medical countermeasures against bioterrorist threats.[148] In short, BioShield provides incentives to pharmaceutical makers and biotechnology companies for development of medicines and vaccines to treat people exposed to bioterrorist agents. BioShield should strengthen research and development and enhance the ability to counter bioterrorism.

In addition to vaccines and medical countermeasures, first responders also need protective gear, detection equipment and decontamination equipment in a quantity extensive enough for a predicted attack. These equipment requirements are called for in the 2007 *National Strategy for Homeland Security*.[149] Additionally, HSPD-8, *National Preparedness*, requires caches of equipment be maintained at such levels as to meet the national preparedness goal.[150] While it is of great benefit to possess these resources, they are of little use if personnel are not trained and experienced in their use. Exercises offer excellent opportunities to gain proficiency with novel bio-hazard response equipment.

Exercise. The 2007 *National Strategy for Homeland Security* identified the establishment of the National Exercise Program to increase

preparedness to respond to the consequences of terrorist attacks.[151] "Exercises provide opportunities to test plans and improve proficiency in a risk-free environment. Exercises assess and validate proficiency levels. They also clarify and familiarize personnel with roles and responsibilities. Well-designed exercises improve interagency coordination and communications, highlight capability gaps and identify opportunities for improvement."[152]

The National Exercises detailed in Chapter 3 clearly show the capability gaps which exist, especially concerning the distribution of medical countermeasures. To assist Point of Dispensing operations in the future, the *Community Vaccination and Mass Dispensing Model* (*CVMDM*) developed by Argonne may prove useful in the execution of exercises to verify maturing plans. *EpiPOD* or *CVMDM* helps local public health agencies develop and test mass vaccination and prophylaxis dispensing plans. It is configured for response to a pandemic influenza outbreak; however it can be customized for other infectious diseases. EpiPOD is consistent with the National Incident Management System and Incident Command System (NIMS/ICS) standards.[153]

Evaluate and Improve. "Evaluation and continual process improvement are cornerstones of effective preparedness. Upon concluding an exercise, jurisdictions should evaluate performance against relevant capability objectives, identify deficits and institute corrective action plans. Improvement planning should develop specific recommendations for changes in practice, timelines for implementation and assignments for completion."[154] This aspect of the preparedness cycle is lacking at the national level in the United States. While there have been four National Exercises, there is little publicly available literature to indicate the exercise reviews completed were incorporated in future planning. This shortfall is also clearly shown by the consistently similar list of lessons learned from each of the National Exercises: lack of a treatment distribution plan, insufficient public communication, failure to adequately collect needed information and workers overwhelmed by the deluge of patients and problems.

Respond. An adequate response involves the execution of emergency plans. An effective response should save lives, protect property and protect the environment. From the NRF, "Four key actions typically occur in support of a response: (1) gain and maintain situational awareness; (2) activate and deploy key resources and capabilities; (3) effectively coordinate response actions; then, as the situation permits, (4) demobilize."[155] These response actions are shown in Figure 5.

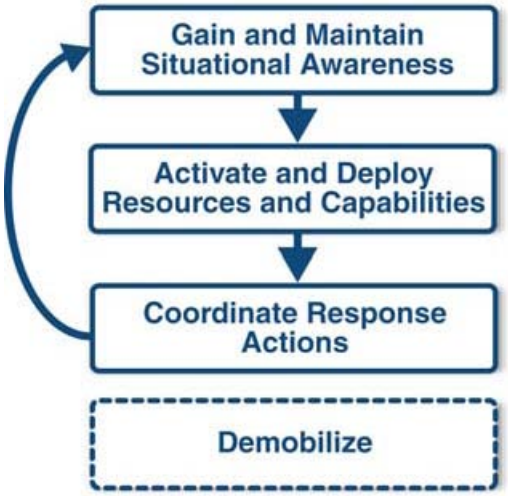

Figure 5 The Response Process[156]

Situational Awareness. "Providing the right information at the right time."[157] As stated previously, HSPD-21 directed the establishment of the CDC BioSense System as an epidemiologic surveillance system for human health. This is one of many systems that enhances the common operating picture needed by officials directing response and recovery operations. However, as the National Exercises demonstrated, further development and training with the tools that enhance situational awareness is needed.

Deploy Resources. In each real-world incident described in Chapter 2 and the National Exercises of Chapter 3, a "first responder" began initial actions to save lives and prevent further damage. First responders are

defined in HSPD-8, *National Preparedness*, as "those individuals who in the early stages of an incident are responsible for the protection and preservation of life, property, evidence and the environment … as well as emergency management, public health, clinical care, public works, and other skilled support personnel (such as equipment operators) that provide immediate support services during prevention, response and recovery operations."[158] During an incident response, first responders "assess the situation, identify and prioritize requirements, and activate available resources and capabilities to save lives, protect property and the environment, and meet basic human needs."[159] These actions are critical to ensuring success in a bioterrorist response.

However, the National Exercises elucidated a shortfall in our hospital and POD staffing, which has also been noted in HSPD-21, *Public Health and Medical Preparedness*:

> *Mass Casualty Care*: The structure and operating principles of our day-to-day public health and medical systems cannot meet the needs created by a catastrophic health event. Collectively, our Nation must develop a disaster medical capability that can immediately re-orient and coordinate existing resources within all sectors to satisfy the needs of the population during a catastrophic health event. Mass casualty care response must be (1) rapid, (2) flexible, (3) scalable, (4) sustainable, (5) exhaustive (drawing upon all national resources), (6) comprehensive (addressing needs from acute to chronic care and including mental health and special needs populations), (7) integrated and coordinated, and (8) appropriate (delivering the correct treatment in the most ethical manner with available capabilities).[160]

In order to affect this flexible and scalable response, the military is tasked with a major role in support to civil authorities. The 2008 *National Defense Strategy* requires the military to maintain the capacity to support civil authorities in times of national emergencies, such as a large-scale bioterrorist event. "The Department will continue to maintain consequence management capabilities and plan for their use to support government agencies."[161]

An additional aid to bioterrorism response is the Strategic National Stockpile (SNS), formerly known as the National Pharmaceutical Stockpile, which provides a re-supply of large quantities of essential medical materiel to states and communities during an emergency. The SNS is managed jointly by the DHS and Health and Human Services. The SNS is a repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IVs, airway management supplies and medical/surgical items. The first line of support from the SNS arrives within 12 hours as "Push Packages." The Push Packages are strategically pre-positioned in various locations in the United States to meet the 12-hour window.[162] During TOPOFF 1 and 2, resources from the SNS were required. However, officials were unfamiliar with the administrative and logistical aspects of acquiring this support. Thus, deployment of these resources was delayed, reinforcing the need for further intense, hands-on training, experience and coordination with this SNS resource.

Coordinate. Specific response actions will be based on the incident, agent, priorities and resources available. The NRF describes coordination of emergency functions, actions, support, resources, and capabilities and information.[163] Coordination depends primarily on complete situational awareness. As discussed previously, the National Exercises reiterate the need for a common database, with accurate information to enhance the flow of information.

Recover. Recovery occurs, at times, simultaneous to response actions. "Once immediate lifesaving activities are complete, the focus shifts to assisting individuals, households, critical infrastructure and businesses in meeting basic needs and returning to self-sufficiency."[164] The National Exercises ceased prior to recovery-type actions. However, the anthrax letters incidents and subsequent decontamination activities speak to the cost in time and resources for years following the bioterrorist incident. In a future, wide-scale incident, issues such as burial of contaminated remains; decontamination of hospitals, homes, and public meeting places; and dealing with and mitigating economic losses will be only a few of the major recovery concerns to be addressed.

Gather Forensic Information

The anthrax letters incidents draw attention to the gaping hole in our forensic detection capability. If the perpetrator of the letter attack desired, he could have periodically sent other anthrax contaminated letters in the mail to random recipients during the seven years it took investigators to gather enough evidence to point a finger. Imagine the impact to the mail system as the death toll continued to rise over the seven years. President Obama recognizes this shortfall in our deterrence in the 2009 *National Strategy for Countering Biological Threats*: "The primary objectives of any investigation into the alleged use, intended use or development of a biological weapon are to prevent casualties, protect the public health and attribute the activity to its perpetrator."[165] The strategy calls for establishing a national-level research and development strategy for microbial forensics. Additionally, the strategy reaffirms the need to maintain the National Biological Forensics Analysis Center as the lead federal facility for forensic analysis of biological material.[166]

The National Biological Forensics Analysis Center is part of the National Biodefense Analysis and Countermeasure Center (NBACC).[167] NBACC is located on the new National Interagency Biodefense Campus at Fort Detrick, Md. The mission of the NBACC is to "support national security, law enforcement and medical communities by improving our understanding of potential bioterrorism pathogens that may be weaponized, transported and disseminated against U.S. targets for the purpose of improving our protection of human health and agriculture against biological terrorism, and sustaining homeland security through knowledge of the threat, prevention of surprise and attribution of use."[168] The NBACC is expected to employ a staff of 150 with an annual operations budget of $50 million.[169]

In order to develop tools to aid biological agent forensics, scientists at Argonne National Laboratory, with Loyola University, have developed the use of a proteomic biochip for identifying biomarkers or signatures indicative of specific growth conditions for *Bacillus anthracis*. By growing anthrax under different conditions and observing changes in the protein and sugar content of the spore coat, a sort of fingerprint can be developed. This fingerprint, or detailed signature, may provide investigators of an attack clues to determine how an agent was produced, what equipment was employed, and the level of technical expertise of the

operator. Thus, this information may aid investigators in a rapid identification of the perpetrator of an attack.

All of the programs and initiatives described in this chapter are a solid foundation toward building a credible prevention and response to a biological weapon attack. If the response to an attack is efficient and recovery happens quickly, then the attack may not have the consequences desired by the terrorists. If they realize this, they may choose not to strike with biological weapons. They may be deterred. In building a more resilient nation, we will continue to improve our ability to defend against and deter such a biological attack.

Chapter 6

Summary, Recommendations, and Conclusions

The greatest glory in living is not never failing, but rising every time you fall.

—Nelson Mandela

As the U.S. *National Defense Strategy* states , "Deterrence is key to preventing conflict and enhancing security. It requires influencing the political and military choices of an adversary, dissuading it from taking an action by making its leaders understand that either the cost of the action is too great, is of no use, or unnecessary. Deterrence also is based upon credibility: the ability to prevent attack, respond decisively to any attack so as to discourage even contemplating an attack upon us, and strike accurately when necessary."[170] A terrorist attack involving a biological agent will have significant consequences. However, a well-defined and robust defense, deterrence and prevention program centered on the most critical steps in preventing a terrorist biological attack from either occurring or succeeding may mitigate or eliminate those consequences. Additionally, a well-planned and practiced response and recovery capability will lessen the adverse impact of an attack.

This paper examined four recent international events concerning adversary acquisition and use of biological agents as weapons and four National Exercises testing U.S. consequence management capabilities following a simulated bioterrorist event. Several key points of focus were identified and examined in relation to current U.S. defense, deterrence, response and recovery initiatives. A few of these points of focus should be emphasized as critical steps in deterring or mitigating terrorist attacks with biological agents.

If the long-term goal of international prevention of aggressive biological agent use is the primary outcome desired from a deterrence action, then current programs and initiatives should be continued, regularly reviewed and

improved as world events dictate. The specific areas of focus identified in this paper which will enable this long-term goal are: (1) provide alternate job opportunities to potential bio-weaponeers, (2) encourage and assist regional partners in preparing biodefenses, and (3) prevent acquisition of biological weapon agents and technology by potential rivals. While the programs and initiatives to accomplish these areas of focus are extremely important, more ground can be gained by focusing on the short-term goals of reducing vulnerabilities and establishing a more resilient American society.

To reach this short-term goal, focus should be primarily on actions which bolster the U.S. ability to detect an attack as early as possible in order to allow for the most rapid and effective of response and recovery operations. Based on examination of both real-world events and National Exercises, the following are key points of focus which the U.S. policy makers should consider more carefully: (1) improve the detection of bio-attacks, and (2) prepare against biological contingencies, respond effectively, recover quickly and capably and gather biological weapon forensics information to allow decision-makers to attribute the attack correctly to the initiators. In each of these areas, the previously discussed U.S. biological incidents and National Exercises highlight further specific areas of concern, which will be addressed next.

Detect Attacks

Attacks can be detected by both equipment and healthcare workers. In the event of a biological agent release, depending on the incubation time of the agent, it is possible that patients with symptoms will arrive in hospitals before samples are analyzed on equipment such as those found in the BioWatch sensors. This highlights the need for continual improvement in our stand-off detection equipment to be rapid and reach a more "real-time" reporting capability. Thus, continuous improvement of BioWatch sensors is important and will realize improvement in years to come.

However, detection of an agent release by healthcare workers can be improved *now* with a few simple actions. Healthcare workers and first responders should be immediately trained on the epidemiological clues that indicate a bioterrorist event is unfolding or has occurred. From the Anthrax Letters and Rajneesh incidents, there were clear signs, epidemiological clues, which healthcare workers should have recognized to raise their suspicion of a

potential attack. Below is a list of events that give strong indication of a bioterrorist event. This list was taken from select aspects of the American College of Physicians—American Society of Internal Medicine (ACP/ASIM) Guide to Bioterrorism Identification,[171] Public Health Reports' Epidemiologic Clues to Bioterrorism,[172] Chapter 3 of Epidemiology of Biowarfare and Bioterrorism[173] and the California Hospital Bioterrorism Response Planning Guide.[174] Parenthesis indicate the National Exercise or real-world event which demonstrates the usefulness of that epidemiological clue.

1. Large epidemic, with large numbers of casualties (*all National Exercises and Rajneesh*);
2. Large epidemic in a discrete population, or point source outbreak (*all TOPOFF exercises*), or discrete population like people who went to a shopping mall (*Dark Winter*), or ate at a specific restaurant (*Rajneesh*) or who live, work or recreate in a common geographical area;
3. Single case of disease caused by an uncommon agent without adequate epidemiologic explanation (*Anthrax Letters, first victim*);
4. Multiple epidemics (*Dark Winter and Aum Shinrikyo if they had been successful*);
5. A disease that is outside its normal transmission season, or is impossible to transmit naturally in the absence of its normal vector (*Anthrax Letters, first victim; plague in TOPOFF exercises*);
6. Uncommon disease, such as anthrax, pneumonic plague, or smallpox (*all events and National Exercises*);
7. A rapid increase in the number of previously healthy persons with similar symptoms (*Rajneesh, Anthrax Letters, all National Exercises*);
8. Direct evidence such as when a terrorist group announces an attack has occurred (*Rajneesh, Harris*)

Healthcare workers should be provided with examples of what these epidemiological clues would look like for each of the major bioterrorist agent threats we should expect. For instance, use of salmonella, anthrax and plague appeared in both the National Exercise scenarios and in actual incidents.

Prepare, Respond, Recover and Gather Forensics Information

Training and Recognition

Common in all incidents and events was the lack of education and training of first responders and healthcare workers to recognize and react to biological agent induced illnesses. In addition to understanding epidemiological clues to a bioterrorist event, emergency responders and healthcare workers should be trained on the real hazards of agents and be provided with quick reference guides on the most likely illnesses to be expected. Training concerning "real hazards" includes a clear understanding of the real transmissibility of disease. For instance, in the National Exercise, reviewers noted that the disease spread more rapidly and effectively than would normally occur in nature. While it is possible that a genetically engineered bio-weapon could enhance its transmissibility, it is more likely that normal *Yersinia pestis* bacteria will be used than one that is enhanced. By completely understanding the hazards of an agent and how to prevent transmission, fear can be eliminated and thus reactions will be quicker and more focused on the actual problem at hand.

To facilitate understanding or quickly refresh a worker's memory of the training they received, there should be quick reference guides posted in all healthcare facilities, fire and police departments, to remind first responders what they should look for. Many examples of these quick reference guides are readily available on the internet. However, a standardized format should be adopted nationally to aid standardized training regarding the greatest potential bioterror threats. Examples of these guides are available at Appendix B.

Resources

As part of training and preparation for an incident, civilian healthcare managers should consider means to offer the flexible, scalable, sustainable and exhaustive mass casualty care capability demanded in HSPD-21. This surge capacity should come from a combination of the military, other non-affected states and pre-established contracts with companies such as Walgreens and CVS pharmacy.

As detailed in this paper, the military should serve a role in assisting a civil response, when necessary. However, during the National Exercises,

when resources were clearly stressed, the players did not engage military resources for medical response or security in PODs. In future National Exercises, the military should be engaged and included in the exercise as they would in a real-world event.

Non-affected states can also serve as additional resources. If a plague event is experienced in Colorado, it is likely that this plague will not immediately spread to more distant states, such as Alaska, Washington, Maine or Florida. Hence, healthcare workers could be "shipped in" to the affected state to assist. Interstate agreements should be established such that predicted aid is identified and included in response plans. Then, during National Exercises, these interstate agreements should be practiced, when possible.

Finally, local pharmacies can offer additional manpower during a national emergency. In many Walgreens and CVS drug stores, there are small clinics staffed by Family Nurse Practitioners and Physicians Assistants, called "Take Care Clinics" or "Minute Clinics," respectively. These clinics offer a wide range of healthcare services from minor cuts, to vaccines, to treatment for routine infections (bladder, eye, ear, etc.). States, regions or local hospitals could establish contracts with these pharmacies to provide similar services to those seen in Point of Dispensing operations during the TOPOFF exercises. With some minor training, and periodic refresher training, these skilled healthcare workers can serve as the "surge capacity" needed in the event of a bioterrorist emergency. Additionally, these drug stores have already established a partial database of local residents through their pharmacy customer lists. Wherever the additional personnel resources come from, it is vital that these intra- and inter-state agreements and contracts be exercised regularly.

Emergency Response Plans

The National Exercises highlighted the need for prepared treatment distribution plans tailored to each biological agent. Who should be the first to acquire treatment for each bio-threat agent? How should vaccines or therapeutics be distributed? Should a Point of Dispensing or Point of Distribution concept be adopted? Should Walgreens and CVS clinics be incorporated into these Point of Dispensing plans? Should a pre-prepared list or database of the people in the local community be maintained? These are only a few of the many questions that should be considered in each regional

response plan. Again, once agent-specific plans are established, they should be exercised and practiced on a regular basis.

Within the emergency response plans should be the expected method of information exchange. A common, universally accessible database will enhance the flow of information and provide officials with a clear picture of the state of the response and extent of disease impact. It is essential that the database be populated with basic information concerning local residents; and personnel and time resources be allocated to ensure these are updated annually. Additionally, this database should be used in every exercise so that first responders, emergency managers and healthcare workers are familiar with its operation and use.

Public Communication

Public Communication is vital in building a resilient population. Understanding how to craft the message in order to get pertinent information to people, with multiple levels of education and understanding, while alleviating fear and providing a sense of empowerment is a highly complex task. However, time invested in crafting this public communication will dramatically reduce the number of worried-well who appear at clinics and hospitals. Additionally, a population who understands a disease and transmission may be more amenable to participating in quarantine, if required to stem the spread of a disease.

Government officials should consider a public advertisement campaign in "peacetime" to make discussion of "what to do during a bioterrorist event" similar to the discussions we have regarding where you should go during a tornado or how to evacuate during a hurricane. While these events do not happen daily, people do not typically sit at home consumed with fear over what they will do when they hear the tornado siren. Because they have been educated regarding potential danger of a tornado, and have put some thought into where in their house is the safest location, their fear is alleviated… not eliminated, but put into its proper perspective. The resolve of a knowledgeable American people will offer the best deterrent.

Evaluation and Continual Process Improvement

We must rise every time we fall. The National Exercises and recent incidents involving biological agents prove that the U.S. strategy, policies and initiatives should realize frequent evaluation and continual process

improvement. While the United States has not experienced a mass casualty event due to a bioterrorist attack, the exceptional medical response to natural disasters such as hurricane Katrina or the earthquake in Haiti clearly demonstrate the capability to respond when forced to do so. But, we can do better. The Rajneesh, Aum Shinrikyo, Larry Harris and Anthrax Letters bioterror incidents and National Exercises should be thoroughly examined, a concise list of areas of improvement be developed, and a clear strategy to engage in continual process improvement should be enacted on nationally.

Current U.S. biodefense and deterrence strategies are an excellent beginning to an effective plan. However, because of the wide-spread proliferation and ease of production of biological agents, more work needs to be accomplished to strengthen such defense, deterrence and prevention. By focusing on the whole process of terrorist acquisition and use of biological agents, key steps can be targeted in hopes of preventing an attack altogether. If it becomes impossible or unprofitable to a terrorist to use biological agents, that threat perhaps can be avoided. But, as one Nobel-prize winning biologist has concluded, "It would seem to me both foolish and arrogant to assume that our goodwill alone, without concrete arrangements, will serve to forestall the further development, proliferation and possible eventual recourse to what surely is one of the most ghastly methods of warfare imaginable."[175]

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