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UNDERSTANDING THE BIOTERRORIST THREAT: FACTS & FIGURES

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The September 11 terrorist attacks on the World Trade Center and the Pentagon made starkly clear how vulnerable Americans are to terrorism at home. But as devastating as those attacks were, the likelihood is growing that terrorists may soon decide to use biological agents as weapons to extract even higher death tolls. Evidence of this includes the startling fact that the number of criminal investigations in the United States related to the use of biological materials as weapons of mass destruction more than doubled between 1997 and 1998:

- In 1997, 22 of the 74 criminal investigations—or 30 percent—involved biological materials.
- In 1998, 112 of the 181 criminal investigations—or 62 percent—involved biological materials.[2]

As the facts about possible biological agents and the figures about their potential effects become known, the challenges for terrorists in mounting a biological attack against America may appear daunting, but they are not impossible to meet. Biological warfare is neither new nor theoretical; it has been waged effectively, in fact, since the 14th century.[3]

The most likely targets for bioterrorist attacks on America are people, crops, and livestock. Moreover, some of the agents are relatively easy to obtain: In 1996, an Ohio man was

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1. The authors would like to thank Carrie Satterlee, Research Assistant in the Kathryn and Shelby Cullom Davis Institute for International Studies, for assistance in compiling these facts and figures.
2. Most of these investigations involved threats or hoaxes. See U.S. General Accounting Office, *The Department of Health Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks*, GAO/NSIAD–99–163, September 1999, p. 18.
3. U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), *Medical Defense Against Biological Warfare Agents Course: History of Biological Warfare*, at *http://140.139.42.105/content/BioWarCourse/HISTORY/HISTORY.html*, as cited by the Center for Non-Proliferation Studies, *Chronology of State Use and Biological and Chemical Weapons Control*, at *http://cns.miis.edu/research/cbw/pastuse.htm* (September 1, 2001).

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able to purchase bubonic plague cultures through the mail.[4] And there are various means of delivery. Biological agents can be spread by airborne release; by injection or direct contact; through food, pharmaceutical, and water contamination; or by animal vectors such as fleas and hair. And as recent simulated exercises in various U.S. cities have shown, the United States is still ill-prepared to respond to such attacks.

According to the Centers for Disease Control and Prevention (CDC), biological agents pose a risk to national security because they are easily disseminated; cause high mortality, which would have a major impact on public health systems; cause panic and social disruptions; and require special action and funding to increase public preparedness.[5] As the following facts and figures show, the challenges facing the Bush Administration, the new Office of Homeland Security, and Congress in responding to the growing threat of bioterrorism are immense.

THE USE OF BIOLOGICAL WEAPONS

Biological weapons can be produced from widely available pathogens that are manufactured for legitimate biomedical research or obtained from soil or infected animals and humans. (See Table 1.) In fact, many of the infectious diseases that are associated with biological warfare are endemic to the same countries that are most often suspected of trying to develop biological weapons. And because biological agents may be cheap and easy to obtain, any nation with a basic industry or facility such as a brewery has a de facto capability to produce biological weapons.[6]

Past Bioterrorist Attacks

Since 1346, when the Mongols catapulted corpses contaminated with plague over the walls into Kaffa (Crimea) and forced the besieged Genoans to flee, there have been many documented cases of the use of biological agents against people.[7]

- In 1767, during the French and Indian Wars, the British gave hostile Indians the blankets they had used to wrap British **smallpox** victims. The disease quickly spread among the Indians.[8]
- During World War I, the Germans used **glanders** and other microbial agents to infect draft animals herded into ports within the United States and Argentina en route to the western front.[9]
- From 1932 to 1945, Japanese forces in Manchuria experimented with **plague**-infected fleas, **anthrax**, **cholera**, and several other dis-

4. Daniel J. Dire, "CBRNE–Biological Warfare Agents," *eMedicine Journal*, Vol. 2, No. 7 (July 3, 2001), Section 2.
5. Centers for Disease Control and Prevention, at *http://www.bt.cdc.gov/agent/agentlist.asp*.
6. Center for Defense and International Security Studies, at *http://www.cdiss.org/bw.htm*.
7. USAMRIID, *Medical Defense Against Biological Warfare Agents Course*.
8. USAMRIID, *Encyclopedia of Bioethics*, p. 2545, and *Medical Defense Against Biological Warfare Agents Course*.
9. Abraham D. Sofaer, George D. Wilson, and Sidney D. Dell, *The New Terror: Facing the Threat of Biological and Chemical Weapons* (Stanford, Cal.: Hoover Institution, 1999), pp. 79–81.

eases to use as biological weapons. Japan conducted field trials against Chinese cities in the late 1930s. The agents were sprayed from aircraft and placed in water or food supplies, with mixed results. There were several **plague** outbreaks in Chinese cities. Japan reportedly has killed 1,700 of its own troops through mishaps in developing biological weapons.[10]

- The Bulgarian secret police are known for developing a means to assassinate someone by shooting a pellet enriched with **ricin**, a highly lethal toxin cultivated from a poisonous protein in the castor bean, from the tip of an umbrella into the victim's skin. In September 1978, the Bulgarian secret police used this method to assassinate dissident Georgi Markov in London.[11]
- In 1979, a plume of **anthrax** released in Sverdlovsk, Russia, killed 66 of 77 reported infected people who were downwind from the release point. Livestock 10 to 100 kilometers downwind also died. In 1992, President Boris Yeltsin admitted that the tragedy was due to an accident at a former Soviet biological weapons facility.[12]
- In 1984 in Oregon, the Rajneeshee religious cult contaminated salad bars in local restaurants with **salmonella** bacteria in an effort to prevent people from voting in a local election. Although no one died, 751 people were diagnosed with the food-borne illness.[13]
- In 1986, Tamil guerrillas operating in Sri Lanka **poisoned tea** with potassium cyanide in an effort to cripple the Sri Lankan tea export industry.[14]
- In 1993, Iran reportedly plotted to contaminate **water supplies** in the United States and Europe with an unspecified biological agent, and Israeli Arabs plotted to poison the water in Galilee with an "unidentified powder."[15]
- In 1994, the Aum Shinrikyo cult attempted to release **anthrax** from the tops of buildings in Tokyo.[16] In 1995, the cult placed three briefcases designed to spray **botulinum** toxin in

Did You Know?

- In the past century, **plague-infested fleas, cholera, anthrax,** and biological agents such as **glanders** have been used or field tested by aggressor nations in times of war and hostility.
- Offensive **biological weapons** programs are known to exist in a dozen countries, including Iran, Iraq, Libya, North Korea, and Syria.
- An accident at a Soviet biological weapons facility in 1979 released a plume of **anthrax** that killed 66 people and livestock up to 100 kilometers downwind.
- An airborne release of 250 pounds of **anthrax** spores over Washington, D.C., could cause more deaths than a 1-megaton hydrogen bomb.
- The economic impact of an **anthrax** attack could range from $478 million to $26 billion for every 100,000 people affected.
- A recent war game exercise concluded that, within three months of a terrorist attack in Oklahoma City using **smallpox**, over 3 million people would be infected and over 1 million would die.

10. *Ibid.*, p. 90.
11. *Ibid.*, pp. 78–79.
12. *Ibid.*, p. 91.
13. U.S. General Accounting Office, *The Department of Health Combating Terrorism*, p. 4.
14. Sofaer *et al.*, *The New Terror*, p. 82.
15. *Ibid.*, p. 84.
16. Dire, "CBRNE–Biological Warfare Agents."

Table 1 B1488

Characteristics of Selected Biological Agents

Bacterial agents	Ease to acquire and process	Agent stability	Lethality	Vaccine/ IND*	Treatment	GAO Observations
Inhalation anthrax spores	Difficult to obtain virulent seed stock; difficult to process and disseminate with great success	Very stable; resistant to sun, heat, some disinfectants	Very high	Yes, primate tested. Some view efficacy for inhalation anthrax as question-able	Virtually fatal once symptoms appear. Treatable with very early anti-biotics and therapy	Possible terrorist biological agent; requires sophistication to manufacture and disseminate for mass casualties. Use could indicate state sponsorship. Symptoms mimic flu and might not be quickly identified. Not transmissible from person to person.
Plague	Very difficult to acquire seed stock and to successfully process and disseminate	Can be long-lasting but heat, sun, and disinfectant render harmless	Very high	No	Antibiotics administered very early can be effective; supportive therapy	Possible agent, but not likely. Fairly difficult to acquire suitable strain and difficult to weaponize.
Glanders	Difficult to acquire seed stock; moderately difficult to process	Very stable	Moderate to high	No	Antibiotics (No large therapeutic human trials)	Potential agent, but not easy for a non-state actor to acquire, produce, and successfully disseminate.
Tularemia	Difficult to acquire correct strain; moderately difficult to process	Generally unstable; resists cold, killed by mild heat or disinfectant	Moderate if untreated; low if treated	IND	Antibiotics very effective in early treatment	Possible agent but difficult to stabilize. Low lethality when treated.
Brucellosis	Difficult to acquire seed stock; moderately difficult to produce	Very stable. Long persistence in wet soil or food	Very low	No	Antibiotics moderately effective if given early in infection	May not be a highly likely agent because of difficulty in obtaining virulent strain, long incubation period, and low lethality.
Q Fever (rickettsial organism)	Difficult to acquire seed stock; moderately difficult to process and weaponize	Stable. Can live for months on wood and in sand	Very low if treated	IND; tested in guinea pigs; produces adverse reactions	Self-limited illness without treatment. Antibiotics shorten illness	Not a likely agent. Low lethality

Note: * Investigative New Drug
Source: Based on U.S. General Accounting Office, *The Department of Health Combating Terrorism: Need for a Comprehensive Threat and Risk Assessments of Chemical and Biological Attack*, GAO/NSIAD–99–163, September 1999, p. 30.

Table 1 Cont. B1488

Characteristics of Selected Biological Agents

Viral Agents	Ease to acquire and process	Agent stability	Lethality	Vaccine/ IND*	Treatment	GAO Observations
Hemorrhagic fever (e.g., Ebola)	Very difficult to obtain and process. Unsafe to handle	Relatively unstable	Very high, depending on strain	No	Antiviral drug and aggressive supportive care. But effectiveness of treatment uncertain	Unlikely agent due to difficulty in acquiring pathogen, safety considerations, and relative instability.
Smallpox	Difficult to obtain seed stock and difficult to process. Only confirmed sources are in the United States and Russia.	Very stable	Moderate to high	Yes	One potential antiviral drug; but generally effective chemo-therapy not available	Very high consequence agent, but likelihood of usage questionable due to limited access to the pathogen beyond state actors.
Venezuelan Equine encephalitis	Difficult to obtain seed stock. Easy to process and weaponize	Relatively unstable, destroyed by heat and disinfectant	Low	IND	Supportive therapy, anticonvul-sants. Anti-microbial therapy ineffective	Possible agent if seed stock can be acquired, but unstable with low lethality.

Toxins	Ease to acquire and process	Agent stability	Lethality	Vaccine/ IND*	Treatment	GAO Observations
Ricin	Readily available and moderately easy to process; but tons would be requires for mass casualties	Stable	Very high	No, but candidate vaccines under development	None unless ingested	Not a realistic mass casualty agent
Botulinum (Types A-G)	Widely available but high toxin producers not readily available; not easy to process or weaponize	Stable; lasts weeks in non-moving water and food; deteriorates in bright sun	High without respiratory support	IND; tested in primates. Toxid vaccine against some types (A-E)	Antitoxin (IND) and respiratory support	Difficult to weaponize and not considered a mass casualty agent
Staphylo-coccl enterotoxin	Difficult to acquire high yielding seed stock; moderately to difficult to process	Very stable in dry form	Low	No	No effective antimicrobial treatment. Ventilator support for inhalation exposure, fluids	Lower likelihood due to low lethality, lack of transmissibility.

Note: * Investigative New Drug
Source: Based on U.S. General Accounting Office, *The Department of Health Combating Terrorism: Need for a Comprehensive Threat and Risk Assessments of Chemical and Biological Attack*, GAO/NSIAD–99–163, September 1999, p. 30.

the Tokyo subway in an attack that ultimately failed.[17]

- In 1995, two members of a Minnesota militia, the Patriots Council, were convicted of possessing **ricin** that they planned to use against law-enforcement officers who had served legal papers on members of the group.[18]

Clearly, the threat of biological terrorism is real and growing.

Possible Biological Agents

As Table 1 shows, the menu of biological agents that could inflict massive harm on Americans is broad. The viruses, bacteria, or other toxins can be relatively easy to acquire, process, and disseminate or very difficult and unstable, with many possibilities between those extremes. The likelihood that a terrorist will use one agent over another depends on these factors as well as on how lethal the agent is and whether there is a vaccine or treatment readily available to counter its effects.

Anthrax. The focus on anthrax as a possible biological weapon for a terrorist attack grew significantly following the recent death from anthrax of a man in Florida and the discovery that his coworker has anthrax spores in his nostrils. Anthrax infections can occur either from inhalation of the spores or from skin contact. Inhalation anthrax is almost always fatal once the symptoms—which mimic influenza—appear.

The anthrax bacterium (*Bacillus anthracis*) is most prevalent in agricultural regions, where the spore occurs naturally among animals. These regions include South and Central America, Southern and Eastern Europe, Asia, Africa, the Caribbean, and the Middle East. Outbreaks occur in both wild and domestic cattle, sheep, goats, camels, antelopes, and other herbivores, but they can also occur in humans who have been exposed to infected animals or to tissue from infected animals.[19]

Additional facts affecting its possible use by terrorists include the following:

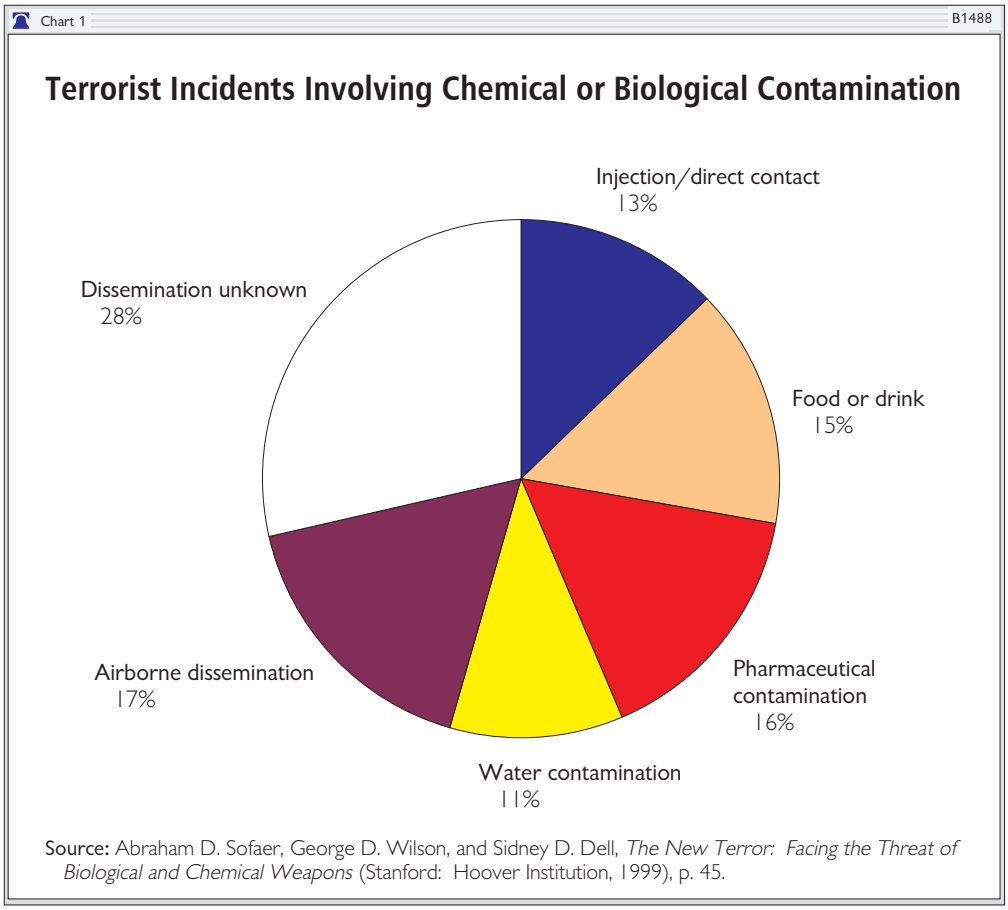
- Anthrax can be cultured from almost any soil that supports livestock. Anthrax seed stock, however, is difficult to process and disseminate with great success.[20] The minimal lethal dose for **inhalation** of anthrax (reportedly 5,000 to 10,000 spores) is high compared with other biological agents.[21]
- Most infections (about 95 percent) occur when the bacterium enters a cut or **skin abrasion**—for example, in unprotected workers handling the wool, hides, leather, or hair products (especially goat hair) of infected animals. Skin infection begins as an itchy bump resembling an insect bite; within two days, it develops into a vesicle and then a painless ulcer, usually 1–3 cm in diameter, with a characteristic black necrotic (dying) area in the center. Lymph glands in the area may swell. About 20 percent of untreated cases of infection through the skin result in death. Deaths are rare with appropriate antimicrobial therapy.[22]
- The **anthrax vaccine** is effective for preventing anthrax infection through the skin. It appears to be effective for some, but not all, strains of inhalation anthrax in some animal species.[23] Testing to determine the effectiveness and possible side effects of this vaccine is ongoing.

17. Sofaer *et al.*, *The New Terror*, p. 86.
18. Lynn F. Fischer, *The Threat of Domestic Terrorism*, Terrorism Research Center, at *http://www.terrorism.com/terrorism/DomesticThreat.shtml* (September 3, 2001).
19. Centers for Disease Control and Prevention, at *http://www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm#*.
20. U.S. General Accounting Office, *The Department of Health Combating Terrorism*.
21. Sofaer *et al.*, *The New Terror*, p. 44.
22. See *http://www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm#*.
23. U.S. General Accounting Office, *The Department of Health Combating Terrorism*, p. 16.

Smallpox. Smallpox is also mentioned frequently as a possible biological weapon. The reasons: The disease is highly infectious and associated with a high mortality rate. Little vaccine is available, and there is no effective treatment for the disease.

Currently, no one under the age of 30 has been vaccinated against smallpox. For physicians, the most difficult aspect of diagnosing the disease is a lack of familiarity with it.[24]

In 1980, the World Health Organization (WHO) declared endemic smallpox eradicated, with the last occurrence in Somalia in 1977. Currently, there are only two WHO-approved and inspected repositories: the Centers for Disease Control and Prevention (CDC) in the United States and Vector Laboratories in Russia. However, clandestine stockpiles may exist.



POTENTIAL MEANS OF DELIVERY

Biological agents can be spread by aerosol sprays, explosives, or the contamination of food or water supplies.[25] The effectiveness of an attack can be affected by the particle size of the agent itself, the stability of the agent under desiccating conditions, exposure to ultraviolet light, wind speed and direction, and atmospheric stability.[26]

In most terrorist incidents that involved chemical or biological contamination, the method of dissemination is unknown. (See Chart 1.) In cases where the method has been identified, the terrorists have relied on airborne dissemination (17 percent); pharmaceutical contamination (16 percent); food or drink contamination (15 percent); injection or direct contact (13 percent); and water contamination (11 percent).[27]

Additional facts regarding delivery of biological weapons that counterterrorism planners must consider include the following:

- **No reliable fixed means exist for detecting biological agents released into the atmo-**

24. Dire, "CBRNE–Biological Warfare Agents," Section 4.

25. *Ibid.*, Section 3.

26. *Ibid.*

27. Sofaer *et al.*, *The New Terror*, p. 45.

sphere over large areas such as cities.[28] Biological attacks are likely to be recognized only after affected people start to become sick. In some cases, this may not occur for weeks after an attack.

- **There are various plausible scenarios for biological and chemical contamination of agricultural products** (similar, for example, to the German practice in World War I). These include infecting livestock with hoof and mouth disease, pigs with African Swine Fever, chicken with the Newcastle disease virus, or crops (such as wheat, corn, rice, or soy beans) with Karnal Bunt, stem rust, or leaf rust.
- **Imported materials could be used by terrorists to introduce pathogens into a country.** These include straw, animal feed, and fertilizer. Imports infected before they leave the country of origin could facilitate multiple outbreaks over large geographic areas in recipient countries, mimicking a natural event (such as the recent outbreak of hoof and mouth disease in Japanese cattle in two widely separated areas).[29]
- **The greatest number of potential casualties involves the airborne release of biological and chemical agents.** Releases within enclosed spaces (such as subways, buildings, domed sports arenas, airports, or train stations) require less of these agents but are likely to be quite lethal because the agent remains concentrated in the confined airspace. Such releases would require less than about 1 gram of biological agents.[30]
- **Open-air release of biological and chemical weapons can affect the broadest area with the highest number of casualties.** Temperature inversions, in particular, could trap these agents close to the ground, substantially increasing the level of surface doses. Rain washes most of these agents out of the air. Some biological and chemical agents may remain harmful in groundwater for a period of time; however, most become harmless.[31]
- **Biological agents may be aerosolized by explosion or by use of a spray nozzle.** Explosive release tends to be inefficient (according to one estimate, leaving approximately 0.1 percent to 1 percent of the agents in the 1 to 5 micron size range), with the heat and shock of the explosion destroying much of the agent.[32] Spray release is more efficient (up to 25 percent efficient for liquid slurries and up to 40 percent for dry biological agents that are ground to the proper size before dispersal).[33]
- **Being indoors during an airborne attack can lessen the exposure depending on the building.** The degree of exposure for people inside a closed building when a biological or chemical plume passes outside is reduced by a factor of two or more for typical American homes and by a factor of as much as 10 or more for hermetically sealed office buildings, depending on the quality of the air filters in the heating, ventilation, and air conditioning system.[34]

28. Dire, "CBRNE–Biological Warfare Agents," Section 3.
29. Mark Wheelis, "Agricultural Biowarfare and Bioterrorism: An Analytical Framework and Recommendations for the Fifth BTWC Review Conference," Federation of American Scientists Chemical and Biological Arms Control Program, at *http://www.fas.org/bwc/index.html*.
30. Sofaer *et al.*, *The New Terror*, p. 85.
31. *Ibid.*, p. 88.
32. *Ibid.*, p. 86.
33. *Ibid.*
34. *Ibid.*, p. 88.

PRODUCERS OF BIOLOGICAL WEAPONS

Offensive biological weapons programs reportedly exist today in a dozen countries, particularly in the Middle East and Asia. Countries currently listed as "proliferation concerns" by the Henry L. Stimson Center, a think tank in Washington, D.C., include China, Egypt, Iran, Iraq, Israel, Libya, North Korea, Syria, and Taiwan.[35]

- China continues to maintain some elements of an offensive biological weapons program that it is believed to have started in the 1950s. It possesses biotechnology infrastructure sufficiently advanced to allow it to develop and produce biological agents. Its munitions industry is sufficient to allow it to weaponize such agents, and it has a variety of means that could be used for delivery.

  China's offensive biological warfare capability is believed to be based on technology developed before its accession in 1984 to the Biological and Toxin Weapons Convention (BWC). Since then, China has claimed that it has never researched, produced, or possessed any biological weapons and would never do so. Nevertheless, its declarations under the BWC guidelines for confidence-building purposes are believed to be inaccurate and incomplete.[36]
- India has many well-qualified scientists, numerous biological and pharmaceutical production facilities, and biocontainment facilities suitable for research and development of dangerous pathogens. At least some of these facilities are being used to support research and development for biological warfare defense work.[37]
- Iran has a growing biotechnology industry, significant pharmaceutical experience, and the overall infrastructure to support a biological warfare program. Tehran has expanded its efforts to seek considerable dual-use biotechnical materials and expertise from entities in Russia and elsewhere, ostensibly for civilian purposes. Outside assistance, which Iran needs, is difficult to prevent because of the dual-use nature of the materials and equipment it seeks and the many legitimate end uses for these items.

  Iran's biological weapons program began during the Iran–Iraq war. Iran is believed to be pursuing offensive biological warfare capabilities, and its effort may have evolved beyond agent research and development to the ability to produce small quantities of agents.[38]
- Libya ratified the BWC but has continued its biological warfare program. The program has not advanced significantly beyond research and development, though it may be capable of producing small quantities of biological agents. It has been hindered by a poor scientific and technological base, equipment shortages, a lack of skilled personnel, and U.N. sanctions from 1992 to 1999.

  Without foreign assistance and technical expertise on dual-use materials, Libya's biological warfare program is not likely to make significant progress. However, with the suspension of U.N. sanctions, Libya's ability to acquire biological-related equipment and expertise will increase.[39]
- North Korea has acceded to the BWC but nonetheless has pursued biological warfare capabilities since the 1960s. Pyongyang's resources include a rudimentary (by Western standards) biotechnical infrastructure that could support the production of infectious biological warfare agents and toxins such as

35. *Ibid.*, p. 51.

36. Anthony H. Cordesman, *Asymmetric and Terrorist Attacks with Biological Weapons* (Washington, D.C.: Center for Strategic and International Studies, 2001), pp. 74–76.

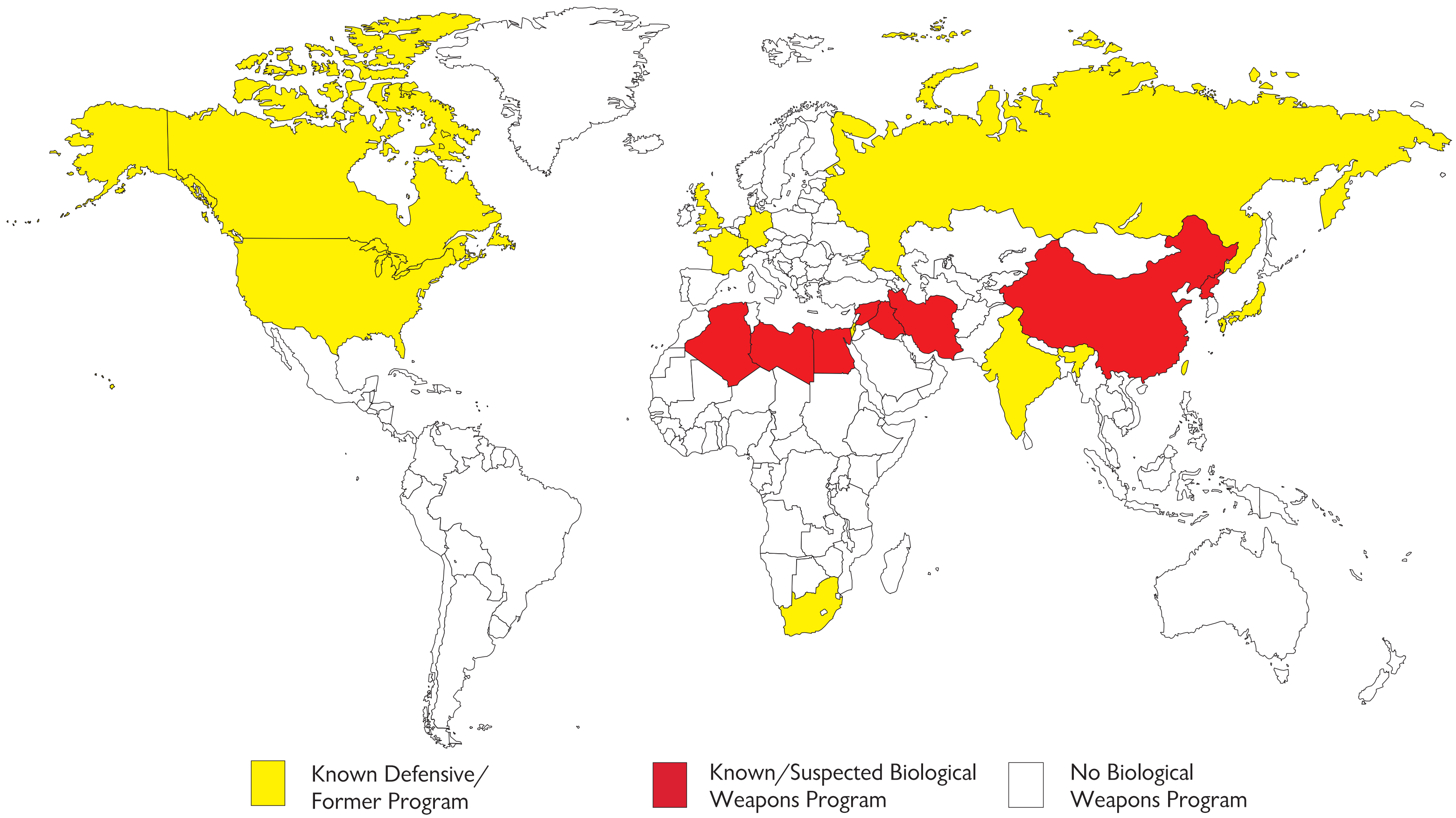
37. *Ibid.*

38. *Ibid.*

39. *Ibid.*

Map 1 B1488

Biological Weapons: Possession and Programs Past and Present



Countries that Ratified the Biological Weapons Convention

	Date of Ratification		Date of Ratification		Date of Ratification
Canada	9/18/72	Iraq	6/19/91	S. Korea	6/25/87
China	11/15/84	Italy	5/30/75	Taiwan	2/9/73
Cuba	4/21/76	Japan	6/8/82	United Kingdom	3/26/75
Ethiopia	5/26/75	Libya	1/19/82	U.S.	3/26/75
France	9/27/84	N. Korea	3/13/87	Vietnam	6/20/80
Germany	11/28/72	Pakistan	9/25/74	Federal Republic of Yugoslavia	10/25/73
India	7/15/74	Russia	3/26/75		
Iran	8/22/73	S. Africa	11/3/75		

Note: China likely maintains an offensive program. Office of the Secretary of Defense, *Proliferation: Threat and Response, http://www.defenselink.mil/pubs/prolif97/index.html.* Russia maintains a defensive research program; some work beyond legitimate defense activities may continue. Office of the Secretary of Defense, *Proliferation: Threat and Response, http://www.defenselink.mil/pubs/prolif97/index.html.*

anthrax, cholera, and plague. North Korea is believed to possess a munitions-production infrastructure that would allow it to weaponize biological warfare agents, and it may have biological weapons available for use.[40]

- **Pakistan** is believed to have the resources and capabilities to support limited biological warfare research and development. It may continue to seek foreign equipment and technology to expand its biotechnical infrastructure. Pakistan has ratified the BWC and participates actively in compliance protocol negotiations.[41]
- **Iraq** is known to have manufactured relatively large quantities of anthrax and botulinum toxins; however, its scientists apparently have had difficulty developing efficient spray nozzles, forcing them to rely on explosive release by Scud missiles equipped with these toxins.[42] Iraq may have produced up to 10 billion doses of anthrax, botulinum toxin, and aflatoxin.[43]

  Under supervision by the U.N. team of inspectors (UNSCOM), 38,537 filled and unfilled munitions, 690 tons of agents, 3,000 tons of chemical precursors to chemical weapons agents, and thousands of pieces of production equipment and analytical instruments were destroyed in **Iraq** before UNSCOM was expelled in December 1998. Since then, no complete accounting of Iraq's chemical weapons program has been possible.[44] Moreover:

  1. Iraq had removed chemical weapons, equipment, and materials from the main site of the al-Muthanna State Establishment before the first UNSCOM inspection team arrived in June 1991; no full accounting of these materials has been forthcoming.
  2. Iraq's claims that it has destroyed 15,620 chemical munitions are unverified. It also has provided no documentation regarding 16,038 chemical munitions it claims to have discarded.
  3. UNSCOM inspectors reportedly were closing in on an Iraqi program for the production of VX, a deadly chemical agent, when the standoff between Iraq and the U.N. Security Council began in the autumn of 1997. In November 1997, the inspectors found new evidence that Iraq had obtained at least 750 tons of VX precursor chemicals. Evidence of VX production was first revealed in 1995.

COMPARATIVE EFFECTS OF DIFFERENT BIOTERRORIST ATTACKS

Various government and defense-related studies on the potential effects of nuclear, chemical, or biological attacks on the United States have been conducted. Much of this information is available to the intelligence and policy communities, as well as the American public and those who would harm them.

In 1993, for example, an expert at the Office of Technology Assessment (OTA), a now-defunct arm of the U.S. Congress, released his assessment of the damage that could be caused in two scenarios based on the method of delivery.

SCENARIO #1: Agents Delivered by Missile Warheads. This scenario assumes that an agent successfully reaches U.S. soil aboard one Scud-sized warhead with a maximum payload of 1,000 kilograms. The study also assumes that the maximum use of this payload capability was not used. It is unclear whether this assumption is realistic.

The effects of such an attack by a missile loaded with a biological, chemical, or nuclear

40. *Ibid.*

41. *Ibid.*

42. Sofaer *et al.*, *The New Terror*, p. 86.

43. Stockholm International Peace Research Institute, "Iraq: The UNSCOM Experience," *Sipri Fact Sheet*.

44. *Ibid.*

warhead can be seen in Table 2.

SCENARIO #2: Agents Delivered by One Aircraft. This scenario assumes that the agents are delivered by one aircraft carrying 1,000 kilograms (kg) of Sarin nerve gas or 100 kg of anthrax spores. It assumes the aircraft flies in a straight line over the target at optimal altitude and dispenses the agent as an aerosol. It also assumes that maximum use of this payload capability was not used. It is unclear whether this last assumption is realistic.

Table 3 shows the effects of such attacks on America.

Table 2 B1488

Scenario 1: Attacking the U.S. with a Scud Missile Carrying Various Warheads

	Area at Risk	Deaths*
Chemical: 300 kilograms (kg) of Sarin nerve gas with a density of 70 milligrams (mg) per cubic meter	0.22 sq. km / .085 sq. mi	60 – 200
Biological: 30 kg of anthrax spores with a density of 0.1 mg per cubic meter	10 sq. km. / 3.86 sq. mi.	30,000 – 100,000
Nuclear: One 12.5 kiloton nuclear device achieving 5 pounds per cubic inch of over-pressure	7.8 sq. km. / 3 sq. mi.	23,000 – 80,000
One 1-megaton hydrogen bomb	190 sq. km. / 73 sq. mi.	570,000 – 1,900,000

Note: *assuming 3,000–10,000 people per square kilometer
Source: Adapted by Anthony H. Cordesman, from "Proliferation of Weapons of Mass Destruction: Assessing the Risks," Office of Technology Assessment, Report for the U.S. Congress, OTA–ISC–559, August 1993, pp. 53–54.

Table 3 B1488

Scenario 2: Attacking the U.S. with Agents Released by One Aircraft

	Area at Risk	Deaths*
Clear sunny day, light breeze		
Sarin nerve gas, 1,000 kg	0.74 sq. km. / 0.28 sq. mi.	30 – 700
Anthrax spores, 100 kg	46 sq. km. / 18 sq. mi.	130,000 – 460,000
Overcast day or night, moderate wind		
Sarin nerve gas, 1,000 kg	0.8 sq. km. / 0.3 sq. mi.	400 – 800
Anthrax spores, 100 kg	140 sq. km. / 54 sq. mi.	420,000 – 1,400,000
Clear, calm night		
Sarin nerve gas, 1,000 kg	7.8 sq. km. / 3 sq. mi.	3,000 – 8,000
Anthrax spores, 100 kg	300 sq. km. / 115 sq. mi.	1,000,000 – 3,000,000

Note: *assuming 3,000–10,000 people per square kilometer
Source: Adapted by Anthony H. Cordesman, from "Proliferation of Weapons of Mass Destruction: Assessing the Risks," Office of Technology Assessment, Report for the U.S. Congress, OTA–ISC–559, August 1993, pp. 53–54.

Economic and Other Effects

Even the mere threat of a bioagricultural attack could have a devastating effect on the economy. For example, an anonymous caller to the U.S. embassy in Santiago, Chile, in 1989 claimed that Chilean grapes destined for U.S. and Japanese markets were contaminated with cyanide. The United States placed a quarantine on Chilean grapes and forced the growers to recall those that had been shipped, causing approximately $333 million in damage to the Chilean grape industry.[45]

Government Estimates of the Impact. Several official reports highlight the risk posed to Americans and the effects such attacks would have on the U.S. economy.

- The CDC has estimated that an **anthrax** attack by a terrorist would result in an economic impact of $477.8 million to $26.2 billion for every 100,000 persons exposed.[46]
- A 1993 OTA report estimated that 250 pounds of **anthrax** spores, spread efficiently over the

45. Sofaer *et al.*, *The New Terror*, p. 82.

Washington, D.C., metropolitan area, could cause up to 3 million deaths, more than from a 1-megaton hydrogen bomb.[47]

- A senior-level war game in June 2001, called **"Dark Winter,"** looked at the national security, intergovernmental, and information challenges of a biological attack on the U.S. homeland. One conclusion of the war game, hosted by the Center for Strategic and International Studies, the Johns Hopkins Center for Civilian Biodefense Studies, the ANSER Institute for Homeland Security, and the Oklahoma National Memorial Institute for the Prevention of Terrorism: *Within three months of a biological attack on Oklahoma City using smallpox, over 3 million Americans could be infected, and over a million would be killed.*[48]

  Moreover, the study concluded:

  > an attack on the United States with biological weapons could threaten vital national security interests. Massive civilian casualties, breakdown in essential institutions, violation of democratic processes, civil disorder, loss of confidence in government and reduced US strategic flexibility abroad are among the ways a biological attack might compromise US security.[49]

- According to a U.S. Army study, a Scud missile (launched at a U.S. city from a ship lying outside U.S. territorial waters[50] carrying a warhead filled with **botulinum** could contaminate an area of 3,700 square km if weather conditions were ideal and an effective dispersal mechanism was available. *This is 16 times greater than the reach of the same warhead filled with Sarin gas.* By the time symptoms began to appear, treatment would have little chance of success; rapid field detection methods for biological warfare agents do not yet exist.[51]

IS THE GOVERNMENT PREPARED?

The President's decision to create an Office of Homeland Security, headed by former Pennsylvania Governor Tom Ridge, is timely. The office is tasked with coordinating government efforts to stop all forms of terrorism, including biological attacks, before they occur and responding to an attack once it does occur.

According to a recent U.S. General Accounting Office (GAO) report, coordination of federal terrorism research, preparedness, and the responsible programs thus far has been fragmented.[52] Several agencies are responsible for coordinating functions, and this both limits accountability and hinders unity of effort. Moreover, several agencies have not been included in bioterrorism-related policy and response planning meetings, and different agencies have developed lists of biological agents as well as disaster response assistance programs for state and local governments. The Federal Emergency Management Agency (FEMA), the Department of Justice, the CDC, and the Office of Emergency Preparedness (OEP), for example, offer separate assistance to state and local governments in planning for emergencies that include bioterrorism.

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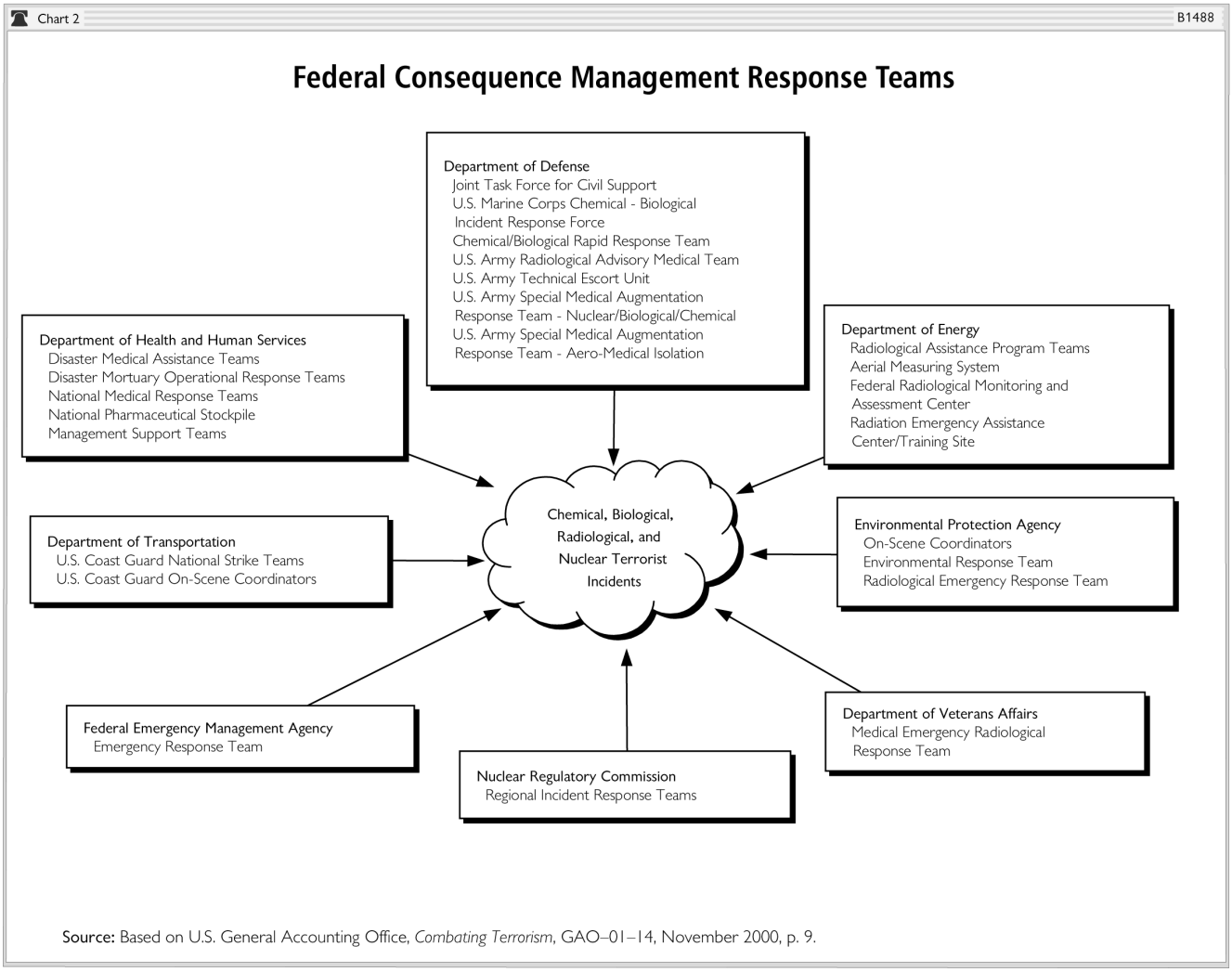
46. Dire, "CBRNE–Biological Warfare Agents," Section 2.
47. U.S. Congress, Office of Technology Assessment, "Proliferation of Weapons of Mass Destruction: Assessing the Risks," OTA–ISC–559, August 1993, pp. 53–53.
48. See exercise details at *http://www.homelandsecurity.org/darkwinter/index.cfm*.
49. *Ibid*.
50. For a discussion of the use of short-range missiles armed with weapons of mass destruction, see National Intelligence Council, *Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015*, September 1999.
51. Center for Defense and International Security Studies, at *http://www.cdiss.org/bw.htm*.
52. U.S. General Accounting Office, *Bioterrorism: Federal Research and Preparedness Activities*, GAO–01–915, September 2001, pp. 15–16.



Source: Based on U.S. General Accounting Office, *Combating Terrorism*, GAO–01–14, November 2000, p. 9.

Evidence that efforts at the federal, state, and local levels need to be coordinated can be found in various reports and government activities.

- The Advisory Committee on Immunization Practices has recommended **anthrax** vaccinations for military personnel who are deployed to high-risk areas.[53]
- An interagency health care group, led by the U.S. Department of Health and Human Services (HHS), chose four biological agents for the CDC to begin developing vaccine stockpiles for civilian populations. These are inhalation **anthrax**, pneumonic **plague**, **smallpox**, and **tularemia,** which have the ability to affect large numbers of people and to tax the medical system should bioterrorism occur.[54]
- The **CDC's bioterrorism program**, which formally began in 1999, did not receive funding until fiscal year 2001 ($9.2 million).[55]

53. The committee consists of 15 experts in fields associated with immunization, selected by the Secretary of Health and Human Services, who are to provide advice and guidance to the Secretary, Assistant Secretary for Health, and the CDC on the most effective means to prevent vaccine-preventable diseases. See *http://www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm*.
54. U.S. General Accounting Office, *Combating Terrorism: Observations on Biological Terrorism and Public Health Initiatives*, GAO/T–NSIAD–99–112, March 16, 1999, pp. 7–8.
55. Ceci Connolly, "Bioterrorism Vulnerability Cited," *The Washington Post*, September 28, 2001, p. A16.

- The CDC established the National Pharmaceutical Stockpile in FY 1999 to maintain "**push packages**"—prepackaged containers comprised of pharmaceuticals, intravenous and airway supplies, emergency medications, bandages and dressings. These are to be delivered to any U.S. location to counter the effects of nerve agents, biological pathogens, and chemical agents within 12 hours of a decision to send them.[56] The packages were deployed for the first time following the September 11 attacks in New York.[57]
- The Clinton Administration's FY 2000 budget request included over $10 billion in non–Department of Defense efforts to combat terrorism. It requested almost $1.4 billion for law enforcement programs to address **terrorist threats** from chemical, biological, radiological, or nuclear weapons. This amount exceeded what the Clinton Administration requested (less than $1 billion) for military programs to counter chemical and biological threats.[58]
- Spending on **HHS's bioterrorism initiative** has increased from $7 million in FY 1996 to $348 million for FY 2002, an 18 percent increase over last year's request.[59] This includes $76.7 million for the CDC to upgrade state and local capacities to identify bioterrorist agents, including the development of diagnostic methods and technology investment.[60]
- The OEP, the Department of Veterans Affairs (VA), and the Marine Corps Chemical and Biological Incident Response Force (CBIRF) have not had basic internal controls to help them manage their **stockpiles of antidotes and antibiotics**. A recent inventory identified a number of items that were stocked below their required levels or that had expired, as well as excesses of other items like sterile gloves. In one location, 1,000 fewer diazepam injectors[61] than the amount required in an emergency were found.[62]
- In May 2001, President Bush ordered Vice President Richard Cheney to conduct an **interagency effort** to correct deficiencies in coordinating a response to an attack with weapons of mass destruction.[63]
- A GAO study released in September 2001 concluded that the Attorney General's Five-Year Interagency Counterterrorism and Technology Crime Plan, issued in December 1998, could serve as the basis for **a national strategy**. According to the GAO, however, it lacks two critical elements: measurable outcomes and identification of state and local government roles in responding to a terrorist incident.[64]

As these reports show, government agencies have begun to look more closely at the threat of biological terrorism, and some have already instituted policies and programs to prevent such

56. U.S. Office of Management and Budget, *Annual Report to Congress on Combating Terrorism*, August 2001, p. 21.
57. U.S. General Accounting Office, *Bioterrorism: Coordination and Preparedness,* Statement of Janet Heinrich, Director, Health Care–Public Health Issues, GAO–02–129T, October 5, 2001, p. 6.
58. U.S. General Accounting Office, *Chemical and Biological Defense: Coordination of Nonmedical Chemical and Biological R&D Programs*, GAO/NSIAD–99–160, August 1999, p. 1.
59. U.S. General Accounting Office, *The Department of Health Combating Terrorism*, p. 1.
60. U.S. Office of Management and Budget, *Annual Report to Congress on Combating Terrorism*, August 2001, p. 20.
61. Diazepam, commonly known as valium, would be administered to calm victims of a biological attack and to control their convulsions.
62. U.S. General Accounting Office, *Combating Terrorism: Chemical and Biological Medical Supplies Are Poorly Managed,* GAO/T–HEHS/AIMD–00–59, March 8, 2000, p. 1.
63. "Statement by the President, Domestic Preparedness Against Weapons of Mass Destruction," The White House, Office of the Press Secretary, May 8, 2001, at *http://www.whitehouse.gov/news/releases/2001/05/20010508.html*.
64. U.S. General Accounting Office, *Combating Terrorism: Select Challenges and Recommendations,* GAO–01–822, September 2001, p. 48.

Table 4 B1488

Total Reported Funding for Preparedness Activities on Bioterrorism and Terrorism by Federal Departments and Agencies, Fiscal Year 2000 and Fiscal Year 2001 (Dollars in millions)

Department or agency	Fiscal year 2000 funding	Fiscal year 2001 funding	Sample activities
USDA– Animal and Plant Health Inspection Service	0	$0.2	Developing educational materials and training programs specifically dealing with bioterrorism
DOD– Joint Task Force for Civil Support	$3.4	$8.7	Planning, and when directed, commanding and controlling DOD 's WMD and high-yield explosive consequence management capabilities in support of FEMA
DOD– National Guard	$70.0	$93.3	Managing response teams that would enter a contaminated area to gather samples for on-site evaluation
DOD– U.S. Army	$29.5	$11.7	Maintaining a repository of information about chemical and biological weapons and agents, detectors, and protection and decontamination equipment
HHS– CDC	$124.9	$147.3	Awarding planning grants to state and local health departments to prepare bioterrorism response plans Improving surveillance methods for detecting disease outbreaks Increasing communication capabilities in order to improve the gathering and exchanging of information related to bioterrorist incidents
HHS– Food and Drug Administration	$0.1	$2.1	Improving capabilities to identify and characterize foodborne pathogens Identifying biological agents using animal studies and microbiological surveillance
HHS– Office of Emergency Preparedness	$35.3	$46.1	Providing contracts to increase local emergency response capabilities Developing and managing response teams that can provide support at the site of a disaster
DOJ– Office of Justice Programs	$7.6	$5.3	Helping prepare state and local emergency responders through training, exercises, technical assistance, and equipment programs Developing a data collection tool to assist states in conducting their threat, risk, and needs assessments, and develop their preparedness strategy for terrorism, including bioterrorism
EPA	$0.1	$2.0	Providing technical assistance in identifying and decontaminating biological agents Conducting assessments of water supply vulnerability to terrorism, including contamination with biological agents
FEMA	$25.1	$30.3	Providing grant assistance and guidance to states for planning and training Maintaining databases of safety precautions for biological, chemical, and nuclear agents

Note: Total reported funding refers to budget data the GAO received from agencies. Agencies reported appropriations, actual or estimated obligations, or actual or estimated expenditures. An agency providing appropriations is not necessarily indicating the level of its commitments (that is, obligations) or expenditures for that year—only the amount of budget authority made available to it by the Congress. Similarly, an agency which provided expenditure information for fiscal year 2000 may have obligated the funds in fiscal year 1999 based on an appropriation for fiscal year 1998.

Source: U.S. General Accounting Office, "Bioterrorism: Federal Research and Preparedness Activities," GAO-01-915, based on information obtained from departments and agencies, September 2001, p. 10

attacks or limit the damage should one occur. However, numerous loopholes still exist. The Achilles' heel of government programs to combat bioterrorism will be a lack of real coordination through a national strategy that outlines the roles of federal, state, and local agencies after an attack. Without such a strategy, the risk for chaos increases as does the likelihood that resources will be squandered by overlapping efforts and insufficient bureaucratic attention.

Governor Ridge's greatest challenge as Assistant to the President for Homeland Security will be to untangle the web of agencies and programs responsible for responding to a biological attack so that he can efficiently coordinate a national response to biological terrorism in the future.

CONCLUSION

Terrorist organizations prey on deficiencies in national infrastructure and planning. The United States lacks a coordinated and tested mechanism for responding to a biological or chemical attack, and this deficiency invites terrorists to develop the means to use these deadly weapons.

President Bush recently took a significant step toward eliminating this problem by creating the Office for Homeland Security. But as these facts and figures show, even though bioterrorists will face difficulties in carrying out a biological attack against America, it is well within their grasp to do so. And as the terrible events of September 11 demonstrate, the United States is far from invulnerable to those who wish it harm.

The Administration and Congress are wise to conduct a war on terrorism while pursuing a homeland defense strategy that will reduce the risk of bioterrorism and limit devastation should an attack occur.

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