

Critical Biological Agents: Disease Reporting as a Tool for Determining Bioterrorism Preparedness

Heather H. Horton, James J. Misrahi,
Gene W. Matthews, and Paula L. Kocher

Before September 11, 2001, a mass-casualty terrorist attack on American soil was generally considered a remote possibility. Similarly, before October 4, 2001 — the first confirmed case of anthrax caused by intentional release — widespread bioterrorism seemed implausible.¹ Among the arguments that such a biological attack was unlikely included: the lack of a historical precedent; the technological and organizational challenges to acquiring and weaponizing a biological agent; and the almost universal moral opprobrium that would certainly accompany the use by terrorists of such a weapon.² In the wake of September 11th and October 4th, however, many are reconsidering the likelihood of a large-scale bioterrorist attack against civilians.

The Centers for Disease Control and Prevention (CDC) defines “bioterrorism” as the intentional release of viruses, bacteria, or toxins for the purpose of harming or killing civilians.³ One measurement of the public health system’s level of bioterrorism preparedness is the quality and distribution of laws mandating the reporting of diseases caused by certain biological agents. In fact, the timely and accurate reporting of such diseases would likely be the triggering event for investigating and responding to a bioterrorism event.

In order to assess the nation’s bioterrorism preparedness, as measured by its disease reporting laws, CDC’s Bioterrorism Preparedness and Response Program commissioned a study of state and local laws requiring the reporting of diseases caused by specific biological agents. This article discusses the background, methods, and results of the study and suggests that states and localities would benefit from examining their existing disease reporting laws in light of bioterrorism concerns.

The CDC’s strategic plan for bioterrorism has focused on the following five areas: preparedness and prevention; detection and surveillance; diagnosis and characterization of biological and chemical agents; response; and communication.⁴ The strategic plan has included, among other things: distance learning programs for health-care workers; the creation of a multilevel laboratory response network for bioterrorism; a national pharmaceutical stockpile of medical supplies to be used in an emergency; and a national electronic infrastructure to improve the exchange of emergency health information.⁵ While these efforts are an essential part of a coordinated federal response to a bioterrorist event, they are necessarily dependent on a strong and flexible public health system at the state and local level. Advanced laboratory tests and caches of medical supplies are useful only if public health officials are aware that a suspected release of a biological agent has occurred. It is therefore important not only that health-care providers be able to identify unusual patterns of disease or injury, but also that they report such unusual occurrences to appropriate public health officials to ensure a timely response.

CDC’s study of disease reporting laws examined the reporting requirements for twenty-four biological agents (or the diseases caused by these agents): anthrax; botulism;⁶ brucellosis; cholera; *Cryptosporidium*; *E. coli*;⁷ glanders; hantavirus; melioidosis; mycotoxins; plague; psittacosis; Q fever; ricin poisoning; *Salmonella*; *Shigella*; smallpox; staphylococcal enterotoxin B; toxic syndromes;⁸ tularemia; typhus fever; *Vibrio cholerae*;⁹ viral encephalitis; and viral hemorrhagic fevers. These particular agents are regarded as “critical biological agents” because of their potential to harm the public health if used in a terrorist act. In determining which biological agents were most critical, CDC sought the counsel of federal agencies, infectious disease experts, national public health experts, civilian and military experts,

and law enforcement officials.¹⁰ The following factors were considered in developing the list of agents:

- morbidity and mortality;
- potential for distributing the agent population-wide based on the stability of the agent, ability to mass produce and distribute a virulent agent, and the possibility for person-to-person transmission of the agent;
- potential for public fear and potential civil disruption; and

- special public health preparedness needs based on stockpile requirements, enhanced surveillance, or diagnostic needs.¹¹

The resulting list of critical biological agents was divided into three categories (Category A, B, and C), based on the level of public health importance.¹² Terrorism experts are most concerned with Category A agents because they have the greatest potential for harm if used in a bioterrorist attack. These agents can be easily disseminated or transmitted person-to-person; cause high mortality; severely affect

TABLE 1. SYMPTOMS AND TREATMENT FOR CATEGORY A DISEASES.

CATEGORY A DISEASES	COMMON SYMPTOMS	TREATMENT/PREVENTION
Anthrax¹	Initially resembles common cold; progresses to severe breathing problems and shock.	Treatable if antibiotics taken very soon after exposure; limited supply of investigational vaccine exists.
Botulism²	Blurred vision, difficulty swallowing and speaking, and muscle paralysis.	Treatable if assistance with breathing is provided; antitoxin is effective if administered early in course of disease.
Plague (pneumonic)³	Fever, headache, weakness, and cough; may cause shock.	Early treatment with antibiotics can be effective; there is currently no vaccine available for use in the United States.
Smallpox⁴	Fever, headache, nausea, and rash leading to hard blisters.	Routine vaccinations ended in the United States by 1972; no proven treatment.
Tularemia⁵	Fever, chills, body aches, and weakness; inflammation and hemorrhaging of airways.	Vaccine is under review by the Food and Drug Administration; early treatment with antibiotics can be effective.
Viral Hemorrhagic Fevers⁶	Fever, fatigue, dizziness, muscle aches, exhaustion, and diarrhea; severe cases include bleeding under the skin, in internal organs, or from body orifices.	With few exceptions, there is no cure or established drug treatment; care is supportive in nature.

1. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Facts about Anthrax, at <<http://www.bt.cdc.gov/DocumentsApp/FactSheet/Anthrax/about.asp>> (last visited March 20, 2002).

2. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Facts about Botulism, at <<http://www.bt.cdc.gov/DocumentsApp/FactSheet/Botulism/about.asp>> (last visited March 20, 2002).

3. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Facts about Pneumonic Plague, at <<http://www.bt.cdc.gov/DocumentsApp/FactSheet/Plague/About.asp>> (last visited March 20, 2002).

4. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Facts about Smallpox, at <<http://www.bt.cdc.gov/DocumentsApp/FactSheet/SmallPox/About.asp>> (last visited March 20, 2002).

5. The Working Group on Civilian Biodefense, "Tularemia as a Biological Weapon," JAMA, 285, no. 21 (2001): 2763-73.

6. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Viral Hemorrhagic Fevers: Fact Sheets, at <<http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/vhf.htm>> (last visited March 20, 2002).

the public health; might cause public panic and social disruption; and require special action for public health preparedness. Six diseases are caused by Category A agents: anthrax; botulism; plague; smallpox; tularemia; and viral hemorrhagic fevers.¹³ Each of these are analyzed in terms of their symptoms and known treatment in Table 1.

Category B agents are less of an immediate bioterrorism concern because they are only moderately easy to disseminate and cause moderate morbidity and low mortality.¹⁴ Nonetheless, there are recent examples of terrorists using Category B agents in the United States. In 1984, the Rajneeshee religious cult used *Salmonella* to contaminate restaurant salad bars, which sickened hundreds of people in Oregon.¹⁵ Similarly, in the 1990s, members of an anti-government group (the Patriots Council) reportedly used ricin in an attempt to assassinate law enforcement agents in Minnesota.¹⁶ Accordingly, Category B agents are important for bioterrorism preparedness and require enhancements of diagnostic capacity and disease surveillance.¹⁷

Category C agents include emerging pathogens that could be engineered for mass dissemination in the future, but are not presently likely to be used as a bioterrorist weapon.¹⁸ These agents result in such diseases as hantavirus, typhus fever, and viral encephalitis.¹⁹ Preparedness for Category C agents includes continued research to enhance disease surveillance, diagnosis, and treatment.²⁰

METHODS

The CDC study's primary purpose was to determine for fifty-four participating jurisdictions which of twenty-four critical biological agents (or the diseases caused by those agents) are explicitly reportable by law and the timeframe for reporting these agents or diseases. Additionally, the study ascertained for each jurisdiction the persons or institutions mandated to report; to whom disease reports should be made; and the sources of disease reporting laws (i.e., statute or administrative code). The participating jurisdictions included the fifty states, Chicago, Los Angeles County, New York City, and Washington, D.C. These jurisdictions were chosen because they had agreed, in cooperation with CDC, to develop preparedness and response plans specifically related to bioterrorism.²¹

To obtain preliminary results, CDC searched electronic legal databases for laws mandating that diseases caused by specific critical biological agents be reported. While electronic databases provided the necessary information for many of the jurisdictions, information for the remaining jurisdictions was obtained from health department websites or by directly contacting state or local health departments. Preliminary results were presented in fifty-four charts, representing each of the jurisdictions surveyed. The chief epidemiologist or other health department representative from each jurisdiction reviewed, verified, amended, or updated

these preliminary findings. The fifty-four charts were then finalized; they reflect the status of disease reporting laws as of March 31, 2001, when the study was completed.

FINDINGS

Table 2 indicates the number and percentage of the fifty-four jurisdictions surveyed that require (as of March 31, 2001) the reporting of particular diseases caused by critical biological agents.

The study found that three of the six Category A agents — anthrax, botulism, and plague — are “reportable immediately” in the vast majority (89 percent, 96 percent, and 89 percent, respectively) of jurisdictions surveyed. Conversely, the other three Category A agents — smallpox, tularemia, and viral hemorrhagic fevers — are “reportable immediately” in less than half (39 percent, 46 percent, and 26 percent, respectively) of these jurisdictions.

The Category B agents cholera, *Salmonella*, and *Shigella* are “reportable immediately” or “explicitly reportable” in 100 percent of the jurisdictions surveyed. In contrast, glanders, melioidosis, mycotoxins, ricin poisoning, and staphylococcal enterotoxin B are “reportable immediately” or “explicitly reportable” in only a small percentage (6 percent, 4 percent, 4 percent, 9 percent, and 20 percent, respectively) of jurisdictions. The remaining Category B agents (brucellosis, *Cryptosporidium*, *E. coli*, psittacosis, Q Fever, toxic syndromes, and *Vibrio cholerae*) and all Category C agents (hantavirus, typhus fever, and viral encephalitis) are “reportable immediately” or “explicitly reportable” in a majority of the jurisdictions surveyed.

The study further showed that persons who have a mandatory duty to report diseases caused by critical biological agents usually are physicians and other health-care providers, laboratory directors, and hospital administrators. In addition, some jurisdictions mandate reporting by school principals (e.g., New Mexico), child care centers (e.g., South Dakota), nursing home administrators (e.g., Alabama), heads of families (e.g., Kentucky), personnel of food establishments (e.g., North Carolina), or anyone with knowledge of a case of a reportable disease (e.g., Montana). The entities to which persons must report are generally state, county, or local health agencies or other health authorities.

Disease reporting requirements, in most cases, can be found in state administrative codes, but may also be located in state statutes, rules and regulations of local boards of health, and municipal regulations. Furthermore, laws requiring the reporting of diseases caused by critical biological agents tend to be scattered among other disease-specific reporting laws, such as those requiring the reporting of measles or tuberculosis. Although this study did not systematically review penalty provisions, it was noted in a number of jurisdictions that non-compliance with disease reporting laws constitutes a misdemeanor punishable by fine or imprisonment.²²

TABLE 2. SUMMARY OF DISEASE REPORTING REQUIREMENTS OF THE 50 STATES, THE DISTRICT OF COLUMBIA, CHICAGO, NEW YORK CITY, AND LOS ANGELES COUNTY AS OF MARCH 31, 2001.

CRITICAL BIOLOGICAL AGENT OR COMMUNICABLE DISEASE ASSOCIATED WITH BIOTERRORISM	REPORTABLE IMMEDIATELY*	EXPLICITLY REPORTABLE**	NOT EXPLICITLY REPORTABLE***
Category A			
Anthrax	48 (89%)	5 (9%)	1 (2%)
Botulism	52 (96%)	2 (4%)	0 (0%)
Plague	48 (89%)	4 (7%)	2 (4%)
Smallpox	21 (39%)	1 (2%)	32 (59%)
Tularemia	25 (46%)	22 (41%)	7 (13%)
Viral Hemorrhagic Fevers	14 (26%)	1 (2%)	39 (72%)
Category B			
Brucellosis	23 (42%)	29 (54%)	2 (4%)
Cholera	49 (91%)	5 (9%)	0 (0%)
<i>Cryptosporidium</i>	12 (22%)	40 (74%)	2 (4%)
<i>E. Coli</i>	28 (52%)	24 (44%)	2 (4%)
Glanders	3 (6%)	0 (0%)	51 (94%)
Melioidosis	2 (4%)	0 (0%)	52 (96%)
Mycotoxins	2 (4%)	0 (0%)	52 (96%)
Psittacosis	13 (24%)	37 (69%)	4 (7%)
Q Fever	17 (31.5%)	20 (37%)	17 (31.5%)
Ricin Poisoning	5 (9%)	0 (0%)	49 (91%)
<i>Salmonella</i>	15 (28%)	39 (72%)	0 (0%)
<i>Shigella</i>	15 (28%)	39 (72%)	0 (0%)
Staphylococcal Enterotoxin B	8 (15%)	3 (5%)	43 (80%)
Toxic Syndromes	8 (15%)	30 (55%)	16 (30%)
<i>Vibrio Cholerae</i>	30 (56%)	11 (20%)	13 (24%)
Category C			
Hantavirus	25 (46%)	19 (35%)	10 (19%)
Typhus Fever	15 (28%)	19 (35%)	20 (37%)
Viral Encephalitis	20 (37%)	31 (57%)	3 (6%)

*Must be reported immediately or within 24 hours. **Must be reported either within a timeframe beyond 24 hours (i.e., within 48 hours, within 72 hours, or within 7 days) or within no specified timeframe. ***Law does not specifically provide that the particular disease must be reported.

DISCUSSION

Disease reporting laws may not only serve as an educational tool in highlighting what diseases society considers of national importance, but may also provide incentives for health-care providers to obtain the training and skills to diagnose and respond to those diseases. This study yielded important information about the status (as of March 31, 2001) of laws mandating the reporting of specific diseases associated with bioterrorism.

Because such laws, however, may raise practical and legal concerns for the public, patient, and physician, further research may be required in the following areas:

- the administrative burden in reporting diseases;

- penalties for non-compliance with the law;
- privacy rights affected by disease; and
- procedures for effective implementation of disease reporting requirements.

Since the study's completion, and especially in response to the 2001 anthrax attacks, some jurisdictions may have revised their disease reporting laws to include critical biological agents. Nonetheless, considering the study's findings, jurisdictions that have not already done so may wish to review their disease reporting laws in light of bioterrorism concerns. If existing laws do not require the reporting of diseases caused by critical biological agents, states may choose to revise or expand their disease reporting requirements to

include such bioterrorism-associated diseases. In particular, states may decide to require the immediate reporting of diseases caused by Category A critical biological agents because of the extreme risk to public health that these agents pose if used as a bioterrorist weapon.

States considering revising their disease reporting laws may find useful the draft Model State Emergency Health Powers Act, a legislative template developed in 2001 by the Center for Law and the Public's Health at Georgetown and Johns Hopkins Universities.²³ This draft model law, among other things, provides one example of a method to address which diseases or health conditions should be reported; who should be legally obligated to report; the manner and timeframe in which a disease should be reported; and the enforcement of disease reporting laws.²⁴

CONCLUSION

The events of September 11 and the subsequent anthrax mailings have elevated protecting the public's health to the status of a national security issue. Thus, this study of laws mandating the reporting of specific diseases caused by critical biological agents may be considered one measurement of the nation's level of bioterrorism preparedness. In preparing the nation to respond to a potential bioterrorist event, disease reporting is a key element. Inadequate disease reporting requirements may lead to such harmful consequences as delayed recognition of a possible bioterrorism event, confusion over whether a particular disease is reportable, and an untimely and ineffective response to bioterrorism or other public health emergency. Accordingly, disease reporting laws are a crucial element in an overall plan for bioterrorism preparedness.

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Biological Weapons (Cambridge: MIT Press, 2000): at 116–37.

3. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, *The Public Health Response to Biological and Chemical Terrorism, Interim Planning Guidance for State Public Health Officials* (July 2001), available at <<http://www.bt.cdc.gov/Documents/Planning/PlanningGuidance.PDF>>.

4. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, "Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response," *Morbidity and Mortality Weekly Report, Recommendations and Reports*, 49, no. 4 (Apr. 21, 2000): 1–14, at 8.

5. *Id.* at 12–13.

6. The study did not specify *foodborne* botulism (as opposed to infant or non-foodborne botulism), but jurisdictions appear to have assumed, correctly, that the study was most interested in foodborne botulism since it is the type most associated with bioterrorism.

7. Although the study did not specify *E. coli* O157:H7, it appears that jurisdictions assumed, correctly, that the study was interested in the harmful *E. coli* O157:H7 and not in the benign varieties of *E. coli*.

8. Some jurisdictions assumed that "toxic syndromes" referred to toxic shock syndrome only, which is often reportable but not associated with bioterrorism. The survey attempted to gather information on the reporting requirements for toxic syndromes generally (e.g., Epsilon) associated with bioterrorism.

9. The study listed both cholera and *Vibrio cholerae*. *Vibrio cholerae* is the agent that causes the disease cholera. While the study intended that cholera and *Vibrio cholerae* be treated the same for disease-reporting purposes, some jurisdictions assumed that *Vibrio cholerae* represented vibrio infections generally, which are often not reportable.

10. L.D. Rotz et al., "Public Health Assessment of Potential Biological Terrorism Agent," *Emerging Infectious Diseases*, 8, no. 2 (2002), available at <<http://www.cdc.gov/ncidod/eid/vol8no2/01-0164.htm>>.

11. *Id.*

12. *Id.*

13. *Id.*

14. Centers for Disease Control and Prevention, *supra* note 4, at 6.

15. Tucker, *supra* note 2, at 181.

16. *Id.* at 115.

17. Centers for Disease Control and Prevention, *supra* note 4, at 6.

18. *Id.*

19. *Id.*

20. *Id.*

21. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, *National Bioterrorism Preparedness and Response Initiative*, at <<http://www.bt.cdc.gov/documents/RegMeetingSlides/Overview.pdf>> (updated May 8, 2000).

22. See, e.g., Conn. Gen. Stat. Ann. § 19a-215(e) (West 2001) ("Any person who violates any reporting ... provision of this section shall be fined not more than five hundred dollars.")

23. Model State Emergency Health Powers Act (December 21, 2001), available at <<http://www.publichealthlaw.net/MSEHPA/MSEHPA2.pdf>>.

24. *Id.*