Biological and Chemical Terrorism Defense: A View From the "Front Lines" of Public Health

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Since 1996, the United States has embarked on an ambitious counterterrorism program, fueled by bombings in the 1990s at New York's World Trade Center and the federal building in Oklahoma City and by the Aum Shinrikyo sarin attack in Tokyo. Enhanced emergency medical services and the strengthening of hospital disaster-response capability for victims of unconventional weapons are featured components of the domestic preparedness plan,[1] although they represent a very small fraction of its overall budget.[2] In this issue of the Journal, Wetter et al. have provided us with the results of their survey of the preparedness of hospital emergency departments for terrorist incidents involving chemical or biological weapons.[3] They found that, in general, the survey respondents were far less prepared than might be optimal if such an incident were actually to occur. This study replicates the findings of several others that addressed emergency department preparedness for hazardous materials incidents,[4,5] and it adds new data to support the widely held opinion that a biological weapons incident would overwhelm emergency departments (and the rest of our health care system) without specific educational efforts, management plans, and therapeutic inventories targeted to this threat.[6–8]

Recent commentaries on bioterrorism and public health have challenged the wisdom of a robust government-funded bioterrorism defense strategy and, in particular, the partnering of civilian and military medical experts in coordinating domestic preparedness.[9–11] The low probability of a bioterrorist attack, and the high cost of establishing and maintaining readiness, are among the cited concerns, along with the observation, by analogy with the nuclear holocaust scenario, that there really may not be an effective response anyway. In contrast, I believe that terrorism with chemical or biological weapons does indeed pose a serious public health and security threat to our nation, and that with foresight and preparation it will be possible to mitigate the ensuing disaster if such an attack occurs. Further, it strikes me that cooperation among a broad array of government agencies, both military and civilian, as well as with concerned academic and professional organizations, is precisely the correct approach for addressing this potential national catastrophe. Perhaps most important, this strategy will also enhance our public health capabilities to address unintentional toxicologic disasters and new or reemerging natural infectious disease outbreaks, even if, as we all devoutly hope, no such terrorist incident ever occurs. In my view, partnering with the federal mandate to combat terrorism offers enormous potential for advances in the public health infrastructure at a time when funding for public health is otherwise diminishing.

Mitigating Risk

The actual risk of an attack is hard to quantify and is probably very low. There is evidence of recent biological weapons stockpiling, particularly in Iraq[12] and the former Soviet Union.[13] A bioterrorism incident involving the widespread dissemination of a highly lethal agent such as anthrax over a large

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metropolitan area might require the sophistication and resources of state sponsorship and thus be considered a "low-probability, high consequence event."[1] However, many public health, national security, and military authorities consider that even such a low-probability event, given the difficulty in quantifying just how low the probability and its attendant potential for catastrophic consequences, is worthy of preparation.[1,14] Of perhaps greater concern, a smaller-scale attack that might "only" sicken thousands and kill hundreds is far more likely and well within the capacity of "amateur" terrorists or those with access to the expertise of former bioweapons scientists. For example, in 1984 in The Dalles, Ore, 751 people developed salmonellosis, with 44 requiring hospitalization, after the intentional spread of bacteria on salad bars in order to disrupt a local election.[15] An incident with a more lethal agent might have resulted in far greater morbidity, and consequent mortality, as illustrated by the accidental release of airborne anthrax in 1979 in Sverdlovsk, Russia, resulting in at least 66 deaths.[16]

Are we ready to accept even such a "lesser" disaster without attempting to formulate strategies to lessen the potential morbidity and mortality? I believe we can mitigate considerably the severity of such a catastrophe, and certainly its spread in the context of contagious agents, by careful, cost-effective training and consciousness-raising in the emergency medical services and medical communities, both of which have been initiated in hospitals nationwide.[6–8] Early recognition of a terrorist attack, local community-based response plans, and attainable stockpiles of drugs and vaccines can ameliorate some of the impact of an attack. Further advances in early detection and identification of bioagents, and in immunization and therapeutic modalities, will enhance our response capability and have obvious dual-use applications in our approach to ordinary, natural infectious diseases. From this perspective, failure to take these steps would constitute a massive "malpractice" error of omission on the part of public health and medical authorities.

Allocating Funds

It is true that counterterrorism funding to the Department of Health and Human Services and the Department of Defense has increased significantly in the past few years, but these still represent small fractions of the departments' overall budgets. Public health should not be a zero-sum game. When health crises arise (as was the case with the AIDS epidemic), overall funding must be increased within our society's limits. In my view, the potential threat of biological and chemical terrorism to national health interests mandates considerable funding. This in no way suggests a desire to decrease funding for other worthy public health initiatives, such as fighting the reemergence of tuberculosis in our inner cities, expanded childhood vaccination programs, efforts to counteract increasing antibiotic resistance, and enhanced infectious disease surveillance at local and national levels. Indeed, much of the current research for combating bioterrorism would have a positive impact, on the latter initiative particularly.[14] Further refinement of our domestic preparedness planning and budget allocation, including shifting resources from competing federal bureaucracies to favor local emergency medical services and hospital emergency departments on our "front lines" of public health, may also be warranted. According to Smithson, reporting in a recent comprehensive national survey, in the past year $315 million went to emergency medical services personnel—only 22% of the unconventional terrorism program and 3.7% of the overall federal counterterrorism budget.[2]

Other Concerns

Biodefense critics have raised the concern that expanded bioterrorism defensive efforts may contain an inherent potential for covert offensive biological weapons use or research. It is reported that numerous biomedical researchers, including many members of the National Academy of Sciences, recently signed a pledge not to engage in research or teaching that might further the development of chemical or biological weapons.[9] I believe that the broad coalition of medical and public health biodefense proponents would certainly agree with this position, which has been official US policy for over 30 years. Of note, the National Academy of Sciences is now participating vigorously in counterterrorism domestic preparedness efforts. The academy's Institute of Medicine recently released a 279-page committee report that stresses the importance of integrating domestic preparedness for chemical or biological terrorism within existing emergency medical services and public health agencies; it delineated numerous recommendations for high-priority research and development needs to prepare optimally for this threat.[14] The Institute of Medicine committee consisted of 17 national experts drawn primarily from civilian academic and public health institutions, and the report was further reviewed by 8 distinguished independent reviewers. Currently, a second Institute of Medicine committee is meeting to devise evaluation strategies for one component of the domestic preparedness program, involving the development of enhanced local emergency medical services response systems in 72 of our largest cities.[17]

Additional concerns in the biodefense critique reflect in one capacity or another a distrust of "militarism" in the national agenda on bioterrorism. I would offer some differing views on these concerns. Since 1969, the United States has conducted only defensive efforts in the arena of biological weapons.[18] Research at institutions such as the US Army Medical Research Institute of Infectious Diseases (USAMRIID) is conducted under a policy of informed consent and in accordance with the Freedom of Information Act. With the potential threat of terrorist use of biological weapons on civilian populations, it is natural for emergency medical services and public health agencies like the Office of Emergency Preparedness and the Centers for Disease Control and Prevention (CDC) to partner with military medical sources of expertise in planning for potential civilian mass casualty incidents resulting from bioterrorism.

There are ample precedents for the advancement of civilian public health and general medical practice as a consequence of government-funded research and training prompted by national security or defense concerns. The highly regarded Epidemic Intelligence Service of the CDC was organized in the 1950s precisely as a response to our country's then perceived vulnerability to biological warfare attack from Cold War antagonists.[16,19] Many modern emergency medical practices, trauma and burn care, and vaccines are derived from military medicine-based research, as well as battlefield treatment and evacuation experience. Numerous current initiatives enhancing medical and public health practice at the local and regional levels ultimately will add considerably to our ability to respond effectively to natural infectious disease emergencies and unintentional hazardous materials incidents, thanks to training undertaken in the context of biological[6] and chemical[20] terrorism preparedness.

A century ago, army surgeon Walter Reed presented his seminal work on yellow fever to the annual meeting of the American Public Health Association.[21] Today, too, the linkage of national security and public health initiatives can have critical dual-use benefits in protecting our nation from bioterrorism as well as from emerging and reemerging natural infectious outbreaks, and in the process provide a broad base of social and political support for a strengthened national public health infrastructure. □

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References

1. Tucker JB. National health and medical services response to incidents of chemical and biological terrorism. *JAMA.* 1997;278:362–368.
2. Smithson A. Ataxia: the chemical and biological terrorism threat and the US response. The Henry L. Stimson Center; 2000;71–103. Available at: www.stimson.org/cwc/atxtoc.htm. Accessed January 29, 2001.
3. Wetter DC, Daniell WE, Treser CD. Hospital preparedness for victims of chemical or biological terrorism. *Am J Public Health.* 2001; 91:710–716.
4. Burgess JL, Blackmon GM, Brodkin CA, Robertson WO. Hospital preparedness for hazardous materials incidents and treatment of contaminated patients. *West Med J.* 1997;167: 387–391.
5. Cone DC, Davidson SJ. Hazardous materials preparedness in the emergency department. *Prehosp Emerg Care.* 1997;1:85–90.
6. Eitzen EM Jr. Education is the key to defense against bioterrorism. *Ann Emerg Med.* 1999;34: 221–223.
7. Keim M, Kaufmann A. Principles for emergency response to bioterrorism. *Ann Emerg Med.* 1999; 34:177–182.
8. Richards CF, Burstein JL, Waeckerle JL, Hutson HR. Emergency physicians and biological terrorism. *Ann Emerg Med.* 1999;34: 183–190.
9. Cohen HW, Gould RM, Sidel VW. Bioterrorism initiatives: public health in reverse? *Am J Public Health.* 1999;89:1629–1631.
10. Cohen HW, Sidel VW, Gould RM. Prescriptions on bioterrorism have it backwards [letter]. *BMJ.* 2000;320:1211.
11. Vergano D. Bioterrorism defense under fire. *USA Today.* June 21, 2000. Available at: http://www.usatoday.com/life/health/general/lhgen244.htm. Accessed March 2, 2001.
12. Zilinskas RA. Iraq's biological weapons: the past as future? *JAMA.* 1997;278:418–424.
13. Alibek K. *Biohazard.* New York, NY: Random House; 1999.
14. Institute of Medicine-National Research Council. *Chemical and Biological Terrorism: Research and Development to Improve Civilian Medical Response.* Washington, DC: National Academy Press; 1999.
15. Torok TJ, Tauxe RV, Wise RP, et al. A large community outbreak of salmonellosis caused by intentional contamination of restaurant salad bars. *JAMA.* 1997;278:389–395.
16. Franz DR, Jahrling PB, Friedlander AM, et al. Clinical recognition and management of patients exposed to biological warfare agents. *JAMA.* 1997;278:399–411.
17. Evaluation of the Metropolitan Medical Response System Program to enhance local capability to respond to terrorism with weapons of mass destruction. Institute of Medicine, National Academy of Sciences; 2000. Available at: http://www.iom.edu/mmrs. Accessed January 29, 2001.
18. Christopher GW, Cieslak TJ, Pavlin JA, Eitzen EM. Biological warfare: a historical perspective. *JAMA.* 1997;278:412–417.
19. Langmuir AD, Andrews JM. The Epidemic Intelligence Service of the Communicable Disease Center. *Am J Public Health.* 1952;42: 235–238.
20. Brennan RJ, Waeckerle JF, Sharp T, Lillibridge SR. Chemical warfare agents: emergency medical and emergency public health issues. *Ann Emerg Med.* 1999;34:191–204.
21. Reed W, Carroll J, Agramonte A. The etiology of yellow fever: an additional note. *JAMA.* 1901; 36:431–440.