The Threat of Biological Attack: Why Concern Now?

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For a biological attack to occur, three elements must be in place: a vulnerable target, a person or group with the capability to attack, and the intent (by the perpetrator) to carry out such an attack. Much of what can be done to limit the capability and the intent of potential attackers is already on its way to being accomplished. The most work, and the highest return on investment, involve reducing the vulnerability of the United States to both intentional and unintentional pathogen releases.

Vulnerability to Biological Attack

Among weapons of mass destruction, biological weapons are more destructive than chemical weapons, including nerve gas. In certain circumstances, biological weapons can be as devastating as nuclear ones—a few kilograms of anthrax can kill as many people as a Hiroshima-size nuclear weapon (Figure).

The United States is unprepared to deal with a biological attack. Over the past several years, preparedness strides have been made, especially in the largest cities. However, much of the needed equipment is not available. Pathogen sensors are not in place to detect that a biological attack has taken place. New medicines are needed. In combating terrorist attacks, treatment is a more practical approach than prevention; yet many biological agents are extremely difficult to treat with existing medicines once the symptoms appear. In addition, many of the most important prophylactic drugs have limited shelf lives and cannot be stockpiled. Moreover, their effectiveness could be compromised by a sophisticated attacker.

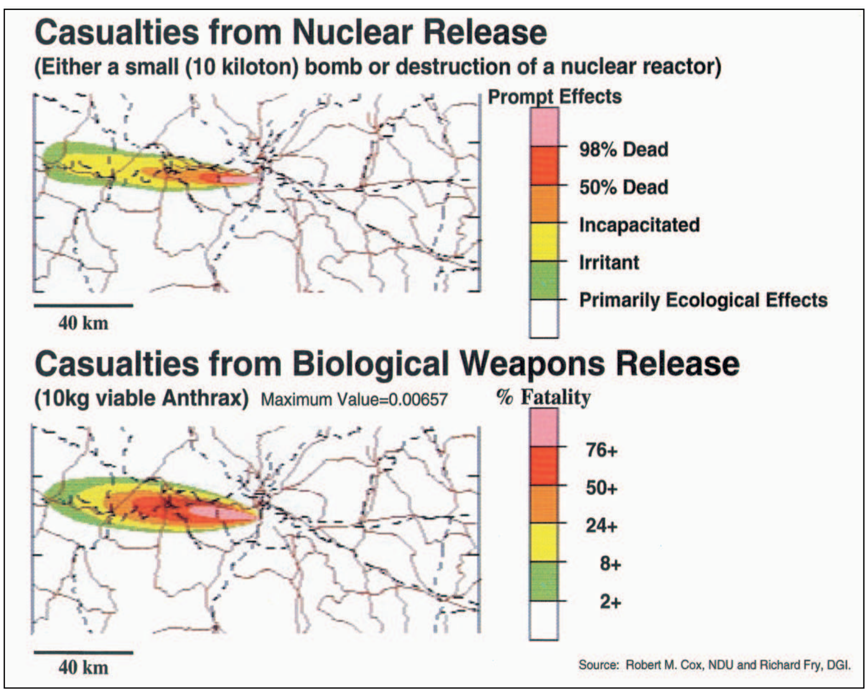

Figure. Effects of a nuclear and a biological weapons release.

Local emergency medical response capability is limited. A number of localities define a "mass casualty event" as one with more than a dozen casualties, far fewer than an intentional biological release could cause. Emergency room capacity in major cities can be overwhelmed all too quickly by more common emergencies. Much emergency medical capability is also located in downtown areas that may be targeted for attack.

The National Disaster Medical System has voluntary access to approximately 100,000

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hospital beds across the country to cope with a large-scale medical emergency. However, not all of those beds have the specialized means for patient respiration and supportive therapy that may be needed in a crisis. Such equipment is not available in large numbers (>5,000), even from deployable field hospital Department of Defense war stocks (1). Further, current federal plans favor not evacuating injured people from the affected area but may relocate patients who were already in hospitals to free up local bed space (2). This indicates that localities need to increase their own capabilities. The federal government will augment local efforts, not supersede them.

Steps are being taken to decrease U.S. vulnerability to biological attack. Technical research is being supported, needed medicines and vaccines will be acquired, and emergency response templates are being developed. One of the reforms was setting up the Office of State and Local Domestic Preparedness Support within the Department of Justice. The office has developed a set of objective criteria that measure domestic readiness to deal with an attack by a weapon of mass destruction. No locality has yet qualified for the top ranking—being prepared for such a crisis (3).

Perpetrator Capability

Biological weapons can range in lethality from salmonella used to temporarily incapacitate to super bubonic plague engineered for mass casualities. Biological weapons include ricin, which an extremist may use to assassinate a single local official, as well as pathogens with high transmissibility and broad potential impact. Biological agents may be used to kill or disable humans or to attack plants or animals to harm a nation's economy. Given that broad scope, biological attacks have already taken place and continue to be a distinct probability for the foreseeable future (4). However, of greatest concern is the capability to deliver a sizable lethal attack against a population center.

Technical Capability

Making reliable biological weapons requires art as well as science. Such weapons are not readily adaptable to "cookbook" type recipes that can be implemented by novices. Nevertheless, technical expertise and sophistication about biological processes have become much more widespread. Moreover, even though technical expertise is required to produce high-quality, military-grade biological weapons and reliable means of dissemination, terrorist applications are less demanding.

Making biological weapons requires sample cultures; the means to grow, purify, and stabilize them; and the means to reliably disseminate them. All these tasks pose substantial but not insurmountable challenges. More than 1,500 biological culture libraries worldwide, as well as numerous research institutions and natural sources, maintain sample cultures (5). Growth media and fermenters to multiply the sample cultures are widely available. Purifying, concentrating, and stabilizing agents is demanding and dangerous but not a great technical challenge. Freeze-drying the product and milling it into particles of a uniform respirable size requires even more technical capabilities. A state sponsor may be needed to do it, although companies and institutes regularly spray dry and mill commercial microbes. Moreover, a respirable aerosol of germs can be achieved through other high-pressure devices.

Biological production and weapon-producing facilities can be small, inexpensive, and inconspicuous. Equipment to develop biological arms may have legitimate commercial and research purposes, as well as nefarious ones. Unlike nuclear weapons, biological weapons do not require unique ingredients that are ready objects of arms control.

Institutional Capability

Depending on their sophistication, terrorist groups may or may not have the capability to build broad-impact biological weapons. However, most nations have the capability to make biological weapons. Some 18 nations are believed to have done so, including the former Soviet Union and several nations the State Department lists as supporting terrorism.

Intention to Use Biological Weapons

Why would anyone wish to use biological weapons? A leading entity with a motive to perpetrate a biological attack could be a rogue state as an act of clandestine warfare. The very strength of a superpower may provide an incentive to adversaries to challenge this strength unconventionally.

If a rogue regime were to mount such an unconventional asymmetric attack, they might choose biological weapons because their extreme destructive potential is concentrated in a relatively small and unremarkable package with virtually no detectable sensor signature. Because of the agent's incubation period, the perpetrators might be gone before anyone knew that an attack had been made. Finally, biological agents, unlike ballistic missiles, lend themselves to clandestine dissemination.

Warfare itself may be becoming more total and losing much of its political character in some situations. Biological weapons, which kill people but leave infrastructure intact, could become the "poor man's neutron bomb."

In the past, the essence of terrorism was to make a political statement through violence. It was a political act designed to influence an audience. Levels of violence were carefully calculated so as to draw attention but not to be so high as to alienate supporters or trigger overwhelming response from authorities. That continues to be a main theme of conventional terrorism. However, in so-called postmodern or superterrorism, the aim is to maximize the number of casualties (6). This reflects a shift in the goal of the terrorists, from trying to make a political statement through violence to maximizing damage to the target as an end in itself. Such terrorists may be motivated by ethnic or religious considerations, among others (7).

Even conventional terrorism tends to escalate levels of violence to keep garnering attention. The threat of biological weapons imparts high levels of fear that may make them desirable to perpetrators who wish to terrorize, even more than to kill. Threats have to become increasingly credible after the initial shock of specious threats has diminished. Even a minor biological attack, made to demonstrate credibility, could have a disproportionate impact. Thus, a certain subset of terrorists may be motivated to commit mass casualty terrorism, including biological terrorism.

Nonintentional Pathogen Releases

Certain kinds of biological assaults can be predicted with even higher confidence than bioterrorist attacks. Stephen Morse, Defense Advanced Research Projects Agency, has said that Mother Nature is the greatest terrorist. Since infectious diseases were widely dismissed as a world health threat some 30 years ago, nature has loosed some 30 new or reemerging infectious diseases on the world (Table) (8). An influenza pandemic was averted 2 years ago by the alert and energetic actions of epidemiologists in Hong Kong and around the world. Slower reactions might have permitted the pathogen's genes to shuffle among human and avian infections to make the flu strain readily transmissible from person to person. Multidrug-resistant tuberculosis is increasing rapidly in Russia in part because of lack of adequate antibiotics (9). More health challenges are almost certainly in store. Causes contributing to emerging disease outbreaks (overcrowding, deforestation, airline travel) will likely continue (9).

Health security and national security needs overlap. If the United States prepares to confront and defeat intentional human releases of pathogens, we will be better prepared for the unpredictable but robust threats likely to occur from nature. For emergency medical response, patients need rapid and efficacious treatment, whether the source of an outbreak of disease is intentional or natural. Medical research needs drugs that treat disease after symptoms become apparent. Such drugs might target common features of disease (10), e.g., inflammation cascade and toxic shock. Aerosol challenge is also typical of both military threats and other airborne pathogens; vaccines that enhance mucosal immunity may mitigate them. Expression of specific genes that may be critical and unique to a number of pathogens might one day be inhibited by medicine.

Effective and safe multipurpose and specific drug treatments would help in the battle against both naturally occurring and intentional releases of infectious disease. Through advanced biotechnology, we could begin to reverse the offense-defense mismatch that now greatly favors disease over cure.

Conclusions

Vulnerability and capability, two prerequisites of bioterrorism, are in place. Enhancing emergency medical preparedness and supporting advanced pharmaceutical research for multivalent drugs, among other measures, will help us deter and defeat deliberate and naturally occurring pathogen releases, as well as increase the general health and well-being of the population. The intention of potential attackers is difficult to manage. Therefore, Table. New and reemerging viruses (8)

Viruses	Date	Family	Comments
New			
Human herpesvirus 6 (HHV-6)	1986	Herpesvirus	
Human herpesvirus 7 (HHV-7)	1990	Herpesvirus	
GS viruses (hepatitis)	1994	Flavivirus	
Human herpesvirus 8 (HHV-8)	1995	Herpesvirus	
Reemerging			
Cocoa swollen shoot		Badnavirus	Destroyed 200 million cocoa trees in West Africa.
Dengue		Bunyavirus	
Ebola		Flavivirus	
Equine morbillivirus	1994	Morbillivirus	Emerged in Brisbane, Australia. Causes acute respiratory disease with high mortality in horses. Believed to cause a fatal encephalitis in humans.
Hantaan group		Bunyaviruses	
Phocine distemper	1987	Morbillivirus	Caused death rates in seals in the Baltic and North Sea. Similar viruses subsequently recognized as responsible for porpoise and dolphin deaths in the Irish Sea and the Mediterranean.
Rabbit calicivirus disease /Viral hemorrhagic disease	1985	Calicivirus	Emerged in China, spread naturally through UK and Europe. Introduced to Wardang Island off the coast of South Australia to test potential for rabbit population control, accidentally spread to mainland decimating rabbit populations.
Rift Valley fever		Bunyaviruses	
Tomato spotted wilt		Bunyavirus	
Whitefly-transmitted geminiviruses (group III geminiviruses)		Geminivirus	

limiting our vulnerability is the most promising way to prevent or mitigate biological attacks on the United States.

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References

1. Army Reserve National Guard. Stakeholders III Conference Medical Panel. National Guard Bureau, Arlington, VA, December 1998.
2. Tonat K. Office of Emergency Preparedness, U.S. Department of Health and Human Services. Panel discussion at conference "Integrating Medical and Emergency Response," Washington, DC, March 10, 1999.
3. Mitchel A. Office of State and Local Domestic Preparedness Support, U.S. Department of Justice. Panel discussion at conference "Integrating Medical and Emergency Response," Washington, DC, March 10, 1999.
4. Carus S. Bioterrorism and biocrimes: the illicit use of biological agents in the 20th Century. Washington: Center for Counterproliferation Research, National Defense University; 1998.
5. Broad W, Miller J. The threat of germ weapons is rising. Fear, too. The New York Times, December 27, 1998.
6. Laqueur W. Postmodern terrorism. Foreign Affairs; Sep/Oct 1996.
7. Ikle F. Waiting for the next Lenin. The National Interest; spring 1997.
8. Cann AJ. Principles of molecular virology. 2d ed. San Diego: Harcourt Brace & Co. Academic Press; 1997. p. 230.
9. Lee C. US can't ignore implications of TB plaguing Russia. USA Today, February 8, 1999, p. 16A and 232.
10. Committee on R&D Needs for Improving Civilian Medical Response to Chemical and Biological Terrorism Incidents, Chemical and Biological Terrorism: Research and Development to Improve Civilian Medical Response, Institute of Medicine, National Research Council, National Academy Press, Washington: 1999; pp. 129-32.