THE SPECTER OF BIOTERRORISM

In September 1999, the federal Centers for Disease Control and Prevention allocated some $40 million to state and local health departments across the country to expand and upgrade their ability to detect and respond to biological and chemical agents, and to provide a public health response to terrorist acts in the United States. Beyond the public health monies, the federal government allocated an additional $133 million for bioterrorism preparedness. It seems fitting that the CD Summary kick off this, the final year of the second millennium, by delving into the current concern about the potential for bioterrorist attacks.

HISTORICAL NOTES
Bioterrorism has been defined as the threat or use of biological agents by individuals or groups motivated by political, religious, ecological, or other ideological objectives. An analysis of agents potentially useful for these purposes is illuminated by a look at the record of their uses for military purposes.

The first such use occurred in Kaffa (now Feodosiya, Ukraine), a Genoese Black Sea port city on the Crimean peninsula. When an outbreak of bubonic plague among the besieging Tatar forces threatened to rob them of their victory, they catapulted the cadavers of dead plague victims into Kaffa. (Although plague subsequently broke out in Kaffa and traveled to Europe with the city’s refugees, helping the second outbreak.3 The Soviet program is now decried unnecessary. They were unproven from a military standpoint, and potentially hazardous to US troops. And the US had a strategic interest in preventing the development by other nations of such low-cost weapons of mass destruction. For pragmatic reasons such as these, President Nixon renounced the military use of biological agents in 1969. The US subsequently destroyed existing biowarfare stockpiles and signed the 1972 Biological Weapons Convention treaty.2 Although signatories of the same treaty, the Soviet Union and Iraq have had extensive bioweapons programs uncovered in recent years. In the Russian city of Sverdlovsk (now Ekaterinburg) an accidental release of B. anthracis spores from a Soviet bioweapons facility resulted in at least 77 human cases of inhalational anthrax, 66 of which were fatal, occurring over a period of 39 days. Rarely, anthrax can be contracted through the gastrointestinal route, and this outbreak was initially attributed by the Soviets to consumption of contaminated beef sold on the black market. Experts scoffed, and in May 1992, Russian President Boris Yeltsin admitted that “military developments” caused the outbreak.3 The Soviet program is now known to have built the capacity to produce hundreds of tons of biological

### Estimated Casualties from a Hypothetical Biological Attack

<table>
<thead>
<tr>
<th>Agent</th>
<th>Downwind reach (km)</th>
<th>Dead</th>
<th>Incapacitated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rift Valley fever</td>
<td>1</td>
<td>400</td>
<td>35,000</td>
</tr>
<tr>
<td>Tick-borne encephalitis</td>
<td>1</td>
<td>9,500</td>
<td>35,000</td>
</tr>
<tr>
<td>Typhus</td>
<td>5</td>
<td>19,000</td>
<td>85,000</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>10</td>
<td>500</td>
<td>125,000</td>
</tr>
<tr>
<td>Q fever</td>
<td>&gt;20</td>
<td>150</td>
<td>125,000</td>
</tr>
<tr>
<td>Tularemia</td>
<td>&gt;20</td>
<td>30,000</td>
<td>125,000</td>
</tr>
<tr>
<td>Anthrax</td>
<td>&gt;20</td>
<td>95,000</td>
<td>125,000</td>
</tr>
</tbody>
</table>

*Release of 50 kg of agent by aircraft along a 2-km line upwind of a city of 500,000.*
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agents, including those of plague, tularemia, glanders, anthrax, smallpox, and Venezuelan equine encephalitis. Intercontinental ballistic missiles containing *Y. pestis* were available for launch. Our ignorance of what happened after the collapse of the Soviet Union to most of the ≥50,000 personnel working in the Soviet program and to the stocks of seed cultures of biological weapons agents is hardly cause for comfort.

Before the 1991 war with Iraq, it was widely suspected that Iraq had developed a sizeable bioweapons program. Following the cease-fire that ended the war, United Nations inspectors confirmed that Iraq had weaponized *Bacillus anthracis*, botulinum toxin, ricin, and aflatoxin, and investigated the potential biowarfare use of *Clostridium perfringens*, wheat cover smut, Congo-Crimene hemorrhagic fever virus, yellow fever virus, enterovirus 17, rotavirus, camelpox virus, and tricothecene mycotoxins. Iraq was ordered to destroy all biological warfare agents in 1991, but UN inspectors could not confirm that this took place.

**ATTENTION FOR TERRORISTS**

Although the military utility of biological agents remains questionable, potential terrorist uses are easier to fathom. First of all, biological agents are relatively easy to come by. If you have access to a microbiology laboratory, you can recover microbes from patient specimens. Almost any pathogen can be purchased inexpensively from various microbe repositories, which exist to provide grist for legitimate scientific experimentation. Finally, those really short on cash might recover bacteria like *Clostridium botulinum* and *B. anthracis* from a scoopful of soil in their backyards.

Once acquired, microbes are easy to transport through airports or through the mail in containers that neither trip metal detectors nor cause concern if visualized by security personnel. Once in the hands of terrorists with a minimum of microbiology training, a few bacteria can be multiplied to enormous numbers through the miracle of exponential growth. Unlike chemical weapons, biological agents dispersed in clouds are essentially invisible and odorless, so that the first sign of an attack may be illness. Finally, the incubation periods afforded by biological agents allow putative bioterrorists time for a leisurely trip across the globe before their pestilential work is detected.

**CAUSES OF CURRENT CONCERN**

Events over the past few years have served to heighten concern about potential terrorist attacks in general and bioterrorist attacks in particular. Six persons were killed and >1,000 wounded in the February 1993 bombing of the World Trade Center. Perpetrators of the April 1995 bombing of the Alfred P. Murrah federal building in Oklahoma City killed 168 persons and wounded hundreds more. Might potential terrorist try biological agents? Well, some already have. The Japanese Aum Shinrikyo cult obtained notoriety when its members released sarin nerve gas in the Tokyo subway system in March 1995, killing 11 and sickening more than 5,000 persons; perhaps less well known is the fact that cult members also experimented with several microbes, including *B. anthracis*, *Coxiella burnetii*, botulinum toxin and perhaps Ebola virus, and attempted several times to transmit anthrax and botulism.

What is the likelihood that bioterrorists will strike closer to home? What agents might they use? How can we prepare for such horrors? Stay tuned. In a future issue, we will discuss potential agents of bioterrorism, clinical scenarios that might bespeak a bioterrorist attack, public health efforts to deal with the threat, and resources for medical response.

**REFERENCES**