



Anthrax Backgrounder

Historically, human anthrax in its various forms has been a disease of those with close contact to animals or animal products contaminated with *Bacillus anthracis* spores. In the mid-1800s, inhalational anthrax related to the textile industry became known as Woolsorter disease (in England) and Ragpickers' disease (in Germany and Austria) because of the frequency of infection in mill workers exposed to imported animal fibers contaminated with *B. anthracis* spores. In the early 1900s, human cases of inhalational anthrax occurred in the United States in conjunction with the textile and tanning industries. In the last part of the 20th century, with improved industrial hygiene practices and restrictions on imported animal products, the number of cases fell dramatically; however, death rates remained high (>85%).

Anthrax, in the minds of most military and counter-terrorism planners, represents the single greatest biological warfare threat. A World Health Organization report estimated that 3 days after the release of 50 kg of anthrax spores along a 2-km line upwind of a city of 500,000 population, 125,000 infections would occur, producing 95,000 deaths. This number represents far more deaths than predicted in any other scenario of agent release. Moreover, it has been estimated that an aerial spray of anthrax along a 100-km line under ideal meteorologic conditions could produce 50% lethality rates as far as 160 km downwind. The United States chose to include anthrax in the now-defunct offensive biological weapons program of the 1950s, and the Soviet Union and Iraq also admitted to possessing anthrax weapons. (*Health Aspects of Chemical and Biological Weapons*. Geneva, Switzerland: World Health Organization; 1970:98-99.)

Anthrax is caused by infection with *Bacillus anthracis*. The spore form of this organism can survive in the environment for many decades. Certain environmental conditions appear to produce "anthrax zones," areas wherein the soil is heavily contaminated with anthrax spores. Such conditions include soil rich in organic matter (pH <6.0) and dramatic changes in climate, such as abundant rainfall following a prolonged drought. Partly because of its persistence in soil, anthrax is a rather important veterinary disease, especially of domestic herbivores. Anthrax zones in the United States closely parallel the cattle drive trails of the 1800s. The trails started in Texas and passed through New Mexico, Colorado, Wyoming, Oklahoma, Kansas and Missouri.

The most common anthrax cases are cutaneous and are contracted by close contact of open sores on the skin with products derived from infected herbivores, principally cattle, sheep and goats. Such products might include hides, hair, wool, bone and meal. Cutaneous anthrax is readily recognizable and is responsive to treatment with any number of antibiotics and is rarely fatal. While common in parts of Asia and sub-Saharan Africa, cutaneous anthrax is very rare in the United States; the last naturally occurring case was reported in 1992.

The US anthrax vaccine, an inactivated cell-free product, was licensed in 1970 and is produced by Bioport Corp, Lansing, Michigan (formerly called the Michigan Biologic

Products Institute). The vaccine is licensed to be given in a 6-dose series and has recently been mandated for all US military active- and reserve-duty personnel. Current vaccine supplies are limited and the US production capacity is modest. It will be years before increased production efforts can make available sufficient quantities of vaccine for civilian use. However, even if vaccine were available, population-wide vaccination would not be recommended at this time, given the costs and logistics of a large-scale vaccination program and the unlikely occurrence of a bioterrorist attack in any given community. Vaccination of some essential service personnel should be considered if vaccine becomes available. Post-exposure vaccination following a biological attack with anthrax would be recommended with antibiotic administration to protect against residual retained spores, if vaccine were available.

In 1979, an accidental aerosolized release of anthrax in the former Soviet Union resulted in at least 79 cases of anthrax infection and 68 deaths.

Most experts concur that the manufacture of a lethal anthrax aerosol is beyond the capacity of individuals or groups without access to advanced biotechnology. However, autonomous groups with substantial funding and contacts may be able to acquire the required materials for a successful attack. One terrorist group, Aum Shinrikyo, responsible for the release of sarin gas, a chemical agent, in a Tokyo, Japan, subway station in 1995, dispersed aerosols of anthrax and botulism throughout Tokyo on at least 8 occasions. For reasons that are unclear, the attacks failed to produce illness

From October 4 to November 2, 2001, the first 10 confirmed cases of inhalational anthrax caused by intentional release of *Bacillus anthracis* were identified in the United States. Epidemiologic investigation indicated that the outbreak, in the District of Columbia, Florida, New Jersey, and New York, resulted from intentional delivery of *B. anthracis* spores through mailed letters or packages. These cases were reported as a bioterrorism-related attack.

Before October 2001, the last case of inhalational anthrax in the United States had occurred in 1976. Before this outbreak of bioterrorism-related anthrax, only 18 cases of inhalational anthrax had been reported in the United States in the 20th century.