

ANIMAL AND HUMAN HEALTH PREVENTION OPPORTUNITIES

Anthrax

Anthrax is a zoonotic disease caused by the spore-forming bacterium *Bacillus anthracis*. The disease is naturally occurring with worldwide distribution. Anthrax is most common in wild and domestic herbivores (e.g. cattle, sheep, goats, camel, antelope). Humans can also become infected when exposed to tissue from infected animals, contaminated animal products, or directly to *B. anthracis* spores under certain conditions. Outbreaks of anthrax occur occasionally in certain areas of the United States when animals encounter an environment that has been contaminated with the highly resistant spores. Anthrax has been used as biological weapon, such as in 2001, when it was deliberately spread in the US through letters containing powder with anthrax spores which killed 5 people and caused disease in 22. In July 2008, Montana reported an anthrax outbreak that resulted in the loss of nearly 300 domestic bison in Gallatin county. This outbreak did not pose a threat to humans. The last reported human infection of anthrax in Montana was in 1961.

Animal Health

Naturally occurring anthrax is seen worldwide. The precise incidence within the US is unknown, however, the highest frequency of disease is seen within the Midwest and Western US. The highly resistant spores can remain viable in the soil for many years. In these regions, anthrax periodically emerges causing outbreaks due to suitable weather conditions (flooding and drought) leading to soil disturbances. Grazing animals (e.g. cattle, sheep, goats), become infected through the ingestion of sufficient quantities of the spores from the soil. Biting flies may also serve as a mechanical vector to transmit *B. anthracis* spores from one animal to another.

Several factors play a role in clinical presentation of the disease, including route of infection, host factors, and potentially strain-specific factors. In herbivores, anthrax commonly presents as an acute septicemia with a high fatality rate, often accompanied by hemorrhagic lymphadenitis. Following the death of the animal, the vegetative bacilli are discharged (by carcass bloating, scavengers, or postmortem examination), allowing the oxygen content of air to induce sporulation. Anthrax spores are relatively resistant to temperature extremes, chemical disinfection, and desiccation. Necropsy is highly discouraged due to the potential for blood spillage and exposure of vegetative cells to air, resulting in the large production of spores. Vegetative cells in unopened carcasses die quickly without sporulating due to the rapid change in pH after death and decomposition.

The incubation period for anthrax is 3-7 days with a range of 1-14 days. The clinical course of disease can be characterized by sudden onset and rapid death. Cattle, sheep and goats may show brief evidence of illness, including fever, staggering, dyspnea, collapse, convulsions, and death. Post-mortem findings may include a lack of rigor mortis, dark blood from the mouth, nostrils, and anus, marked bloating and rapid body decomposition.

Diagnosis of anthrax based on clinical signs alone is difficult. If anthrax is suspected, confirmatory laboratory examination should be attempted. The optimal sample is a cotton swab dipped in the blood and allowed to dry, or a postmortem blood sample from a peripheral vein (e.g., jugular vein or ear vein). Specific diagnostics tests include bacterial culture, PCR tests, and fluorescent antibody stains to demonstrate the agent in blood films or tissues. Other conditions that cause sudden death in livestock species must be considered and differentiated from anthrax.

Anthrax is best managed through rapid detection and reporting, quarantine, and treatment of asymptomatic animals (postexposure prophylaxis). A vaccine is available but permission from the Department of Livestock is required before use. Anthrax in livestock can be controlled through annual vaccination of all grazing animals in endemic areas. Vaccination should be done at least 2 – 4 weeks prior to the season when outbreaks are expected. Carcasses of suspected or confirmed anthrax cases should be burned or buried. Strict biosecurity measures and good hygiene are essential in protecting against disease outbreaks. Report all suspected anthrax cases immediately to the Montana Department of Livestock.

Human Health

Although rare, human cases of anthrax have been seen following exposure to infected animals or contaminated animal products. The type of illness that a person develops depends on the transmission of anthrax into the body (cutaneous, gastrointestinal, inhalation, or injection). All types of anthrax can cause death if not properly treated with antibiotics. Human cases of anthrax are primarily seen as cutaneous disease (>95% of all cases). Under artificial conditions (e.g. laboratories, animal hair processing facilities, exposure to weaponized spore products), people may develop a highly fatal, inhalational (pulmonary or “wool sorter’s disease”) form of the disease. Inhalation anthrax is considered the most severe form of the disease and can lead to death.

The primary risk factor for human infection appears to be occupational exposure to contaminated carcasses or animal products. The spores infect, germinate, and proliferate following wound inoculation, ingestion, or inhalation. Proliferation can occur at the site of infection and in the lymph nodes draining the site. Frequently, *B. anthracis*

produces toxins that cause local necrosis and extensive edema. As the bacteria multiply, toxemia progresses, and bacteremia ensues.

Clinical symptoms of anthrax depend on the type of infection and can take one day to several months to appear. All types of anthrax have the potential, if untreated, to spread throughout the body and cause severe illness and death. The cutaneous form of infection appears commonly on the face, neck, arms and hands, and may present as small, itchy blisters or bumps, or as a painless skin ulcer with a black center. Inhalational or gastrointestinal anthrax infection may present as flu-like symptoms, with swollen lymph nodes, and nausea.

The only way to confirm an anthrax diagnosis is to measure antibodies or toxin in blood, or to test directly for *B. anthracis* from a sample of blood, skin lesion swab, spinal fluid or respiratory sections. Prompt diagnosis and treatment of anthrax improves outcomes. If you think that you or someone you know may have come into contact with anthrax, call your health care provider and the local health department right away.

Anthrax Key Points

Animal Health

- Animal health authorities should encourage producers, exhibitors, and animal caretakers to practice biosecurity measures.
- Necropsy of suspect animals is strongly discouraged due to the potential for blood spillage and vegetative cells to be exposed to air, resulting in large numbers of spores being produced.
- To avoid transmission to carnivores, animal that have died of suspected or confirmed anthrax should be burned or buried.
- Veterinarians should immediately report any suspected anthrax cases to the Montana Department of Livestock at 406-444-2976.

Human Health

- Anthrax is a potentially fatal bacterial infection with worldwide distribution.
- Anthrax is not transmitted person to person.
- If you suspect contact with material potentially contaminated with anthrax, wash your hands with soap and water and immediately contact your health care provider.
- Health care providers should immediately report any suspected anthrax cases to their local health department.

References available on web version. [Visit http://www.dphhs.mt.gov/publichealth/publications.shtml](http://www.dphhs.mt.gov/publichealth/publications.shtml).

2,836 copies of this public document were published at an estimated cost of \$0.59 per copy, for a total cost of \$1660.54, which includes \$711.04 for printing and \$949.50 for distribution.

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