

## Anthrax

Anthrax, a disease of mammals and humans, is caused by a spore-forming bacterium called *Bacillus anthracis*. Anthrax has an almost worldwide distribution and is a zoonotic disease, meaning it may spread from animals to humans. All mammals appear to be susceptible to anthrax to some degree, but ruminants such as cattle, sheep, and goats are the most susceptible and commonly affected, followed by horses, and then swine.

The U.S. Department of Agriculture (USDA) main diagnostics laboratory in Ames, Iowa, the National Veterinary Services Laboratories (NVSL), maintains small quantities of anthrax to use as reference material in making confirmatory anthrax diagnoses in animals. USDA's Animal and Plant Health Inspection Service (APHIS) maintains that laboratory as part of fulfilling its mission to protect American agriculture.

### Disease Epidemiology

Anthrax is endemic to the United States, occurring sporadically throughout the country as environmental conditions allow. The Del Rio, Texas, region has reported ongoing outbreaks of anthrax in deer and livestock this summer. The most recent outbreak there occurred on Sept. 21, 2001. Other recent outbreaks include an outbreak in cattle and horses in Minnesota in June-July 2000; in cattle, horses, and bison in North Dakota in August 2000; and in cattle in Nebraska in January 2001.

During their vegetative stage, cells of the anthrax agent multiply in the lymph nodes of susceptible animals, including humans. When cells of *B. anthracis* escape from the animal's body and are exposed to oxygen, they form spores. These spores are highly resistant to heat, cold, chemical disinfectants, and long dry periods. *B. anthracis* spores are reported to survive for years in the environment. Environmental persistence may be related to a number of factors, including high levels of soil nitrogen and organic content, alkaline soil (a pH level higher than 6.0), and ambient temperatures higher than 60 degrees Fahrenheit.

The anthrax organism may be spread within an area by streams, insects, wild animals and birds, and contamination from wastes of infected animals. Anthrax may be perpetuated in nature by hosts such as a wildlife reservoir, which in turn spills over into the livestock population. Animals are usually infected by ingesting soilborne spores, such as in contaminated

food or water. Spores can be picked up directly from the soil through grazing or from feed grown on infected soil. When periods of drought cause livestock to forage much closer to the ground, animals may ingest spores in soil they accidentally eat along with forage. After flooding, the concentration of spores caught in standing water increases when preexisting or transitory ponds begin to evaporate.

Although rare, it is possible for animals to inhale dust harboring anthrax spores. Bites from flies and other insects that may harbor vegetative anthrax have also been reported to be vehicles for mechanical transmission.

### Clinical Signs

Disease occurs when spores enter the body, germinate, multiply, and release toxins. The incubation period of natural infection in animals is typically 3 to 7 days with a range of 1 to 14 days, or more.

In cattle and sheep, the course of illness may last about 1 to 2 hours. Clinical signs, such as fever up to 107 degrees Fahrenheit, muscle tremors, respiratory distress, and convulsions, often go unnoticed. After death, there may be bloody discharges from the natural openings of the body, rapid bloating, a lack of rigor mortis, and the presence of unclotted blood. This failure of blood to clot is due to a toxin released by *B. anthracis*.

Anthrax in horses and related animals is acute and can last up to 96 hours. Clinical manifestations depend upon how the infection occurred. If due to ingestion of spores, as in cattle, septicemia, fever, colic, and enteritis are prominent. Anthrax due to insect bite introduction (mechanical transmission) is characterized by localized hot, painful, edematous, and subcutaneous swellings at the bite location that spread to the throat, lower neck, floor of the thorax, abdomen, prepuce, and mammary glands. These horses may have a high fever and dyspnea due to swelling of the throat or colic due to intestinal involvement.

Swine, dogs, and cats usually show a characteristic swelling of the neck secondary to regional lymph node involvement, which causes dysphagia and dyspnea following ingestion of the bacteria. An intestinal form of anthrax with severe enteritis sometimes occurs in these species. Many carnivores apparently have a natural resistance, and recovery is not uncommon.

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