

Anthrax and Livestock

Guide B-120

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What is Anthrax?

Anthrax is a disease of warm-blooded animals, including humans, most livestock and some wildlife. It is caused by the spore-forming bacteria *Bacillus anthracis*. Herbivorous animals are highly susceptible to anthrax, while carnivorous birds and reptiles are resistant. In livestock, the disease usually is acute, resulting in death in one to three days. By the time an animal displays signs of disease, including staggering, trembling, convulsions, or bleeding from body openings, death usually follows quickly. Body temperatures may reach as high as 107° F. The disease occurs in cattle, sheep, goats, horses and mules. In swine and dogs, anthrax generally occurs as a less acute form. They are infected only by ingesting heavily contaminated food—either the raw meat of animals that have died of the disease or, in swine, infected bone or meat meal given as a feed supplement.

The anthrax bacteria are found in two forms, the vegetative state and the spore state. The vegetative state, which is the growing, reproducing form found in infected animals, actually causes the disease. If the carcass of an animal that has died from anthrax is opened during necropsy, or by scavengers or decay, the vegetative state is exposed to oxygen. This allows the vegetative state to form spores. The spores are highly resistant to disinfectants and the weather and may remain viable in the soil for as many as 50 years. When the spores enter an animal, usually by grazing contaminated vegetation or inhalation, the bacteria revert to the disease-causing vegetative state.

How Common is Anthrax?

Anthrax is a naturally occurring disease. It is much more common in tropical countries, such as Africa, South and Central America, southern and eastern Europe, Asia, the Caribbean, and the Middle East. However, it also is common in many areas of the United States, including New Mexico. The New Mexico State Veterinarian's Office indicates that New Mexico probably has an occurrence of the disease every two to four years. It has occurred recently in deer and cattle in southwestern Texas counties along the Rio Grande. In recent years, it also has been diagnosed in livestock in California, Canada, Louisiana, Minnesota, Mississippi, Nebraska, North Dakota, and South Dakota, and probably other states as well. One theory is that many areas of the country were "seeded" with anthrax spores, during the great cattle drives of the 1800s. One study (Stern and van Ness, 1955, *Vet. Med* 50:579) summarizes more recent outbreaks: "From 1945 to 1954, losses among cattle, horses, mules, swine, and sheep were reported to be 17,604. These cases appeared in 3,447 outbreaks in 30 states."

Anthrax primarily occurs in alkaline soils with high nitrogen levels caused by decaying vegetation, alternating periods of rain and drought, and temperatures in excess of 60° F. Such areas are referred to as "incubator areas," where the spores apparently revert to the vegetative form and multiply to infectious levels when optimal environmental conditions occur. Obviously, spores will be found in soils in areas where it has been diagnosed previously. It is much like another cattle disease called blackleg (*Clostridium chauvoei*).

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Blackleg, also a spore former, is found in most soils. Both diseases are unique in that the spores can lie dormant in the soil for many years, and then suddenly the disease reoccurs in grazing animals. Even in endemic areas, anthrax occurs irregularly, often with many years between outbreaks. It is not well understood why the disease suddenly reappears, but it probably occurs in response to environmental changes. In the case of blackleg, cattle grazing short vegetation during a drought consume more soil and, therefore, more organisms. In the case of anthrax, increased periods of rainfall and flooding followed by drought seem to be ideal conditions for reoccurrence. Also, any disturbance of the soil can result in the release of spores.

What are the Symptoms in Cattle?

In cattle, the most common initial sign of anthrax is sudden death. The course of the disease usually is short (one to three days). Once an outbreak begins, animals may exhibit fever, lack of rumination, excitement followed by depression, difficult breathing, uncoordinated movements, convulsions and death. Bloody discharges from the natural body openings, as well as edema in different parts of the body, are sometimes observed. Some animals may be saved if antibiotic treatment starts early.

In animals that die, bloody discharges from body openings are common. Decomposition is more rapid than in other conditions, and the carcasses become bloated with gases. Rigor mortis or stiffening is not complete. When necropsied, hemorrhages are found in the internal organs. The spleen is almost always enlarged.

What To Do if Anthrax is Suspected?

Never open the carcass of an animal suspected of dying from anthrax. The discharges and blood are highly infectious to humans and other animals. Opened carcasses will deposit enormous quantities of bacteria on the ground that will sporulate to the long-lasting, protective form. A veterinarian can confirm anthrax by taking blood

from a peripheral vein and submitting it to a diagnostic laboratory.

Inhaling bacteria can cause the pulmonary form of the disease in humans. So, great care should be taken to protect anyone who handles carcasses or live animals suspected of having anthrax. All livestock producers should keep a supply of shoulder-length disposable gloves for handling animals that show symptoms of infectious disease. Meat obtained from animals dying of unknown causes or suspected of having anthrax should not be consumed.

In New Mexico, anthrax is one of 26 reportable diseases affecting livestock that have considerable economic impact. When a reportable disease is suspected or diagnosed, the attending veterinarian must, by law, report it to the New Mexico Livestock Board's State Veterinarian. This ensures that the proper authorities are notified and a containment system can be put into place. The authorities will assist ranchers in proper disposal of carcasses, either by burning or burial.

Carcasses should be isolated from other livestock and pets and protected from scavengers as much as possible, but remember that minimal handling of the carcass is essential.

What About Anthrax Vaccine?

Anthrax vaccine is available and may be used as part of a containment procedure if an outbreak occurs in livestock. However, routine vaccination of livestock for anthrax generally is not recommended, except in areas where anthrax has been a problem historically. Anthrax vaccine for use in livestock has been available for more than 40 years. It is made from a nonpathogenic strain of the organism, meaning it will not cause the disease. With a high margin of safety and good immunizing properties, it has been used effectively in preventing and curtailing outbreaks.

Anthrax vaccine for humans has been available for many years. It was first developed in the 1950s and 1960s. However, it currently is only available to people who work directly with the organism in the laboratory and military personnel deployed to areas with high risk of exposure.

Can Humans be Infected from Soil Spores?

Yes. However, spores in the soil generally are not ingested or inhaled by humans. They do not “float in the air” in abundance like the “germ warfare” types.

What are the Symptoms of Anthrax in Humans?

Symptoms of the disease vary depending on how the disease was contracted. Symptoms usually occur within seven days.

Cutaneous: Most anthrax infections occur when the bacteria enter a cut or abrasion on the skin, as when handling contaminated wool, hides, leather or hair products of infected animals. The disease often is referred to as “woolsorters’ disease.” Skin infection begins as a raised itchy bump that resembles an insect bite, but within one to two days it develops into a vesicle and then a painless ulcer. Ulcers usually are 1/2 to 1 1/2 inches in diameter, with a characteristic black area in the center. Other symptoms, such as swollen glands, fever and malaise, often develop after several days, if left untreated. About 20 percent of untreated cases of cutaneous anthrax result in death, but deaths are rare with appropriate antibiotics.

Inhalation: Initial symptoms may resemble a common cold and include a cough, chills and aches. After several days, however, the symptoms may progress to severe breathing problems and shock. If left untreated, inhalation anthrax usually is fatal.

Intestinal: The intestinal form of anthrax may follow consumption of undercooked, contaminated meat. It is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax can result in death in 25 to 60 percent of cases. However, the chances of anthrax contaminating our food supplies is very small. The relatively short incubation time, coupled with the rapid onset of the disease and quick death, all work to make it unlikely that meat from diseased animals will enter

the food chain in any form. Under no circumstances should meat from infected animals be consumed. Spores resist steaming or boiling for five minutes but are killed by autoclaving at 248° F for 20 minutes.

Can Infected Livestock Infect Humans?

This probably is an ineffective way of spreading anthrax to humans. Animal-to-animal is not a primary method of transmission. The general method is by inhaling or ingesting spores. However, caution should be exercised when handling carcasses of animals that have died of the disease, because they contain large reservoirs of spores. The disease also can be transmitted by consuming undercooked meat. Should an outbreak be diagnosed in an area, great caution by the proper health authorities will be taken to ensure that affected animals are isolated, a vaccination program is put in place, and carcasses are disposed of properly.

Author’s note: Information contained in this article has been gleaned from a number of sources, including textbooks, the Internet and personal communications. I believe this to be factual information. However, if you find information herein that you deem to be questionable or have unanswered questions, please contact one of the authors at (505) 646-3326.

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