ANTHRAX and LIVESTOCK
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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 let me know. Ron Parker

What is Anthrax, and what are its characteristics?
Anthrax is a disease of warm-blooded animals, including man, 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. The disease in livestock is usually an acute one, resulting in death in 1-3 days. By the time an animal displays signs of disease, including staggering, trembling, convulsions, or bleeding from body openings, death usually follows. Body temperatures may reach as high as 107°F. It 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 other 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 is the growing, reproducing form found in infected animals and is the state that actually causes the disease. After an animal dies from anthrax, if the carcass is opened during necropsy, or by scavengers or decay, the vegetative state is exposed to oxygen. This allows the vegetative state to forms spores. The spores are highly resistant to disinfectants and the weather and may remain viable in the soil for many years. Studies have shown spores to remain viable for more than 50 years. When the spores enter another animal, usually through grazing contaminated vegetation or by inhalation of spores, the bacteria revert to the disease-causing vegetative state.

How common is Anthrax and where is it naturally found?
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 is also common in many areas of the United States, including New Mexico. The New Mexico State Veterinarian’s office indicates that we probably have an occurrence in this state every 2-4 years. It has occurred within the last couple of years in deer and cattle in Southwest Texas counties along the Rio Grande River. In recent years, it has also been diagnosed in livestock in California, North Dakota, South Dakota, Minnesota, Nebraska, Mississippi, Louisiana, and Canada, 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 1800's. One textbook summarizes more recent outbreaks as..."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." This shows the prevalence of the disease in our soils. We've lived with it for years and will continue to do so.

Anthrax primarily occurs in regions with alkaline soils with a high nitrogen level 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”.
Obviously, spores will be found in soils in those areas where it has been diagnosed in the past. It is much like another disease we have in cattle called blackleg (\textit{Clostridium chauvoei}). Blackleg also is a spore former, and 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 occurrences. We don't know all the reasons why the disease suddenly appears after a lapse of many years, but we would assume that it occurs in response to some environmental changes. This may be drought in the case of blackleg, so that cattle grazing short vegetation 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 its reoccurrence.

**What are the symptoms in cattle?**

In cattle, the most common initial sign of anthrax is sudden death. The course of the disease is usually short (one to three days). Once an outbreak begins, animals may be seen with 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 treatment with antibiotics is started very early.

In animals that die, bloody discharges from body openings are commonly found. 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. Enlargement of the spleen is almost always present.

**What should the rancher 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 spore 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. For this reason, great care should be taken to protect anyone handling the carcass or live animals suspected to have anthrax. All livestock producers should keep a supply of shoulder-length disposal gloves on hand for handling any animals showing 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 some 26 reportable diseases affecting livestock. This simply means that these diseases have considerable economic impact and when suspected or diagnosed must, by law, be reported to the New Mexico Livestock Board's State Veterinarian by the attending veterinarian. This insures that when one of these diseases pops up in our livestock industry the proper authorities are notified and a containment system can be put into place. These 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. However, remember that minimal handling of the carcass is essential.
Is anthrax vaccine available and recommended for cattle and humans?  
Anthrax vaccine is available, and may be used as part of a containment procedure if an outbreak should occur in livestock. However, routine vaccine of livestock for anthrax is not generally a recommended practice, except in those areas where anthrax has historically been a problem. Anthrax vaccine for use in livestock has been available for over 40 years. It is made from a nonpathogenic strain of the organism, meaning it will not cause the disease. It has a high margin of safety, has good immunizing properties and 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 1950’s and 1960’s. However, currently it is only available to persons who work directly with the organism in the laboratory and military personnel deployed to areas with high risk for exposure to the organism.

Can humans be infected from the spores that live in the ground?  
Yes, the same as the spores used for biological warfare. However, spores in the soil are not generally ingested or inhaled by man because of their nature. 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 bacterium enters a cut or abrasion on the skin, such as when handling contaminated wool, hides, leather or hair products of infected animals. The disease is often referred to as “woolsorters’ disease”. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a vesicle and then a painless ulcer. Ulcers are usually 1/2 to 1_ inches in diameter, with a characteristic black area in the center. If left untreated, other symptoms such as swollen glands, fever and malaise often develop after several days. About 20 percent of untreated cases of cutaneous anthrax will 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 is usually fatal.

**Intestinal:** The intestinal disease from of anthrax may follow the consumption of undercooked, contaminated meat, and 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% of cases. However, the chances that anthrax contaminated getting into 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 insure that meat from diseased animals would likely not 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.
Concerning bio-terrorism, what is the danger of infecting livestock and then allowing them to infect humans?

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