American Association of Zoo Veterinarians Infectious Disease Manual

ANTHRAX

Animal Group(s) Affected	Transmission (Animal)	Clinical Signs	Severity	Treatment	Prevention and Control	Zoonotic
Mammals, including humans; and ratites.	Ingestion of spores that can come from soil, infected carcass, soil-contaminated forage or blow-fly contaminated browse. Usually direct transmission, possibly biting flies.	Sudden death, fever followed by death, excitement followed by stupor, respiratory and cardiac distress, colic, diarrhea and vomiting, edema.	Peracute and acute in ruminants and equids. Commonly fatal. Subacute and chronic forms in suids and carnivores from carcass consumption.	Long acting antibiotics given early. Multiple classes of antibiotics are effective. Vaccination.	Rapid detection followed by quarantine, carcass disposal, treatment and movement of adjoining animals, removal of contaminated feed or items, vaccination, and site de-contamination.	Humans affected via contact with diseased carcasses or via animal products (meat, bone meal, leather, wool, bristles)

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Susceptible animal groups: Domestic and wild ruminants are most commonly affected. However humans, equids, and other mammals - such as elephants are susceptible. Suids and carnivores may develop subacute to chronic gastrointestinal type disease after eating infected carcasses. It has been reported in ostriches and rheas. Scavenging birds and mammals, primarily carrion feeders, are known to pass spores through their digestive system without becoming infected as vegetative cells are killed in their acidic stomachs.

Causative organism: *Bacillus anthracis* (spore forming, non-motile, Gram positive rod)

Zoonotic potential: Humans affected via contact with diseased carcasses or via animal products (meat, bone meal, leather, wool, bristles, drum skins) from contaminated carcasses. Cutaneous, gastrointestinal, and inhalation forms of disease occur. It is considered a potential bioterrorism agent.

Distribution: World-wide, especially in areas with neutral or alkaline calcareous soils. Outbreaks can occur after soil disturbance following drought or flood conditions. In US, it occurs sporadically with limited distribution and is more common in west and midwest US, and is enzootic in west Texas, North and South Dakota, and northwest Minnesota.

Incubation period: Typically 3-7 days (range 1-14 days) (OIE standards: up to 20 days). Spores maybe inactive in lungs for several weeks before causing disease.

Clinical signs:

Peracute (ruminants): sudden death.

Acute (ruminants and horses): Abrupt fever and excitement followed by depression, respiratory/cardiac distress, staggering, convulsions, severe colic, and anterior edema; cutaneous signs can be seen in cattle and horses with biting fly infections. Process can lead to death.

Chronic (pigs and carnivores): Oropharyyngeal and gastrointestinal signs of disease, usually followed by recovery but death occurs if systemic. Death is not uncommon in free-ranging African lions.

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Post mortem, gross, or histologic findings: Carcass presented with absence of rigor mortis and rapid decomposition. Dark blood may ooze from mouth, nostrils, eyes, ears, vulva and anus. Edema may be apparent. Carcass will show lack of blood clotting and hemorrhages of serosal surfaces. Organs, particularly the spleen will be congested and enlarged. Oropharyngitis, pharyngeal edema, diptheritic membranes or ulcers of tonsils are seen in suids and carnivores. Gastrointestinal inflammation and mesenteric lyphadenitis may be seen in suids and carnivores. Hemorrhagic lymphadenitis is histopatholgic observation.

Diagnosis: Documentation of *Bacillus* spores in dried blood sample. PCR, culture, IFA, ELISA and Western Blot tests are available.

Material required for laboratory analysis:
Whole blood for culture can be taken post mortem from vein due to lack of clotting. Dried blood smears from similar source can be obtained or blood dried on a cotton swab. Prior to submission, laboratory must be notified for suspicion of anthrax.

Relevant diagnostic laboratories: Diagnostic laboratory with microbiological capacity. Confirmation is accomplished thru NVSL.

Treatment: Immediate antibiotic therapy. Numerous classes of antibiotics are effective: oxytetracycline, penicillins, aminoglycosides, fluoroquinolones, macrolides, and sulfonamides.

Prevention and control: Rapid detection and prevention of disease spread via quarantine and removal of affected animals. Vaccination of susceptible animals in enzootic areas. Move animals from potential contamination prior to periods of increased exposure. Do not use meat or animal products from uninspected or unknown sources, cases of sudden death, or emergency slaughters. Do not open carcasses in suspected cases. Do not contaminate soil during necropsy. Use protective clothing during necropsy. Post exposure antibiotics are recommended after exposure to aerosolized spores.

Suggested disinfectant for housing facilities: Cremation or deep burial of carcasses and contaminated materials. Disinfect using formaldehyde, oxidizing agents such as peroxides, 5% lye, quicklime (anhydrous calcium oxide), and bleach; however prolonged contact is required. A commercial product Mold Control 500® has been approved. Several protocols for large scale premise decontamination have been utilized. Formaldehyde (5%) can be used on soil if contamination is minimal otherwise soil removal is advised.

Notification: Reportable to USDA National Animal Health Reporting System (B051)

Measures required under the Animal Disease Surveillance Plan: None

Measures required for introducing animals to infected animal: Wait at least 21 days after outbreak is completed and quarantine varies although the recommended time is 21 days before movement is allowed.

Conditions for restoring disease-free status after an outbreak: Where the disease is known to be endemic, disease-free status will only be granted after an extended period, ~10 years, without cases and with surveillance. For normal sporadic cases, there should be at least 5 years without cases but with vaccination.

Experts who may be consulted:
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