

Anthrax

Anthrax also called malignant pustule or woolsorters' disease, Splenic fever.

Anthrax is a serious zoonotic disease that can affect most mammals and several species of birds, but is particularly important in herbivores.

Etiology

Bacillus anthracis, a spore forming, Gram positive aerobic rod in the family Bacillaceae.

Geographic Distribution

Although *B. anthracis* can be found worldwide, anthrax cases usually occur only in limited geographic regions. Outbreaks are most common in areas characterized by alkaline, calcareous soil, a warm environment, and periodic episodes of flooding. Anthrax is particularly common in parts of Africa, Asia and the Middle East.

Transmission:

In animals, transmission occurs by ingestion and inhalation of spores.

- **Herbivores:** infected by ingest of spores in soil or on plants in pastures.
- **Carnivores** infected by eating contaminated meat.
- Outbreaks are often associated with heavy rainfall, flooding or drought.
- Feeding on Contaminated bone meal and other feed .
- Vultures and flies spread anthrax after feeding on carcasses.

In humans:

- **abraded skin** contact with infected animal tissues such as hides, wool, bone meal and blood.
- **Biting flies** that feed on infected animals or carcasses
- **inhaling spores** from animal products, laboratory cultures or other sources.
- ingestion of raw or undercooked meat containing viable spores.

❖ **Clinical manifestations in Humans:**

Incubation Period : 1 to 7 days. Anthrax infection occurs in three forms: cutaneous, inhalation, and gastrointestinal depending on the mode of transmission



**** Cutaneous anthrax form:** occur mainly in professionals(Veterinarian, butcher, Zoo keeper), 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 incubation period for cutaneous anthrax is 1-7 days.

Skin infection begins as : a painless, pruritic papule that resembles an **insect bite** and after 1-2 days develops into a vesicle , and then a painless ulcer with a characteristic **black necrotic** (dying) area in the center.

Systemic symptoms : include malaise and low-grade fever , regional lymphangitis and lymphadenopathy.

In severe cases may developed to extensive local oedema, induration and toxemia , septicemia. About 20% of untreated cases result in death.

****Inhalational anthrax (pulmonary form(wool-sorter's disease":)** : Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock. Mediastinal widening is seen in the X-Ray chest. Diagnosis is difficult but inhalation anthrax should be suspected if there is a history of exposure to an aerosol that contains B.anthraxis. Inhalation anthrax usually results in death in 1-2 days after onset of the acute symptoms.

****Intestinal anthrax:** The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. There are two clinical forms of intestinal anthrax.

•**Intestinal anthrax(abdominal anthrax):** Symptoms include nausea, vomiting, fever, abdominal pain,haematemesis, bloody diarrhoea and massive ascites. Unless treatment starts early toxemia and shock develop resulting in death.

•**Oropharyngeal anthrax:** Main clinical features are sore throat, dysphagia, fever,lymphadenopathy in the neck and toxemia. Even with treatment mortality is high, about50%.

Clinical manifestations in animals

***ruminants**

Peracute form: sudden death may be the only sign. Staggering, trembling and dyspnea may be seen in some animals, followed by rapid collapse, terminal convulsions and death.

acute form : the clinical signs may be apparent for up to 2 days before death., fever ,excitement may be followed by depression, stupor, disorientation, muscle tremors, dyspnea and congested mucous membranes. abortion, drop milk production can severely. Bloody discharges from the nose, mouth and anus are sometimes seen. Occasionally, infections in ruminants are characterized by subcutaneous edematous swellings, most often in the ventral neck, thorax and shoulders ..

***Horses** : typically develop acute disease. fever, chills, anorexia, depression, severe colic and bloody diarrhea. Swellings of the neck, sternum, lower abdomen and external genitalia. Dyspnea , die within 1 to 3 days ,some animals can survive up to a week.

dogs, cats and wild carnivores:

mild subacute to chronic infections characterized by localized swelling and systemic signs such as fever and enlarged lymph nodes. , swelling of the throat, with dyspnea and difficulty swallowing; these animals may suffocate. vomiting, diarrhea or constipation is less common.

Diagnosis and Treatment in human

- Identification of *B. anthracis*
 - Blood, skin, secretions
 - Culture
 - Polymerase Chain Reaction test
 - Serology
 - ELISA
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- **Treatment:** Penicillin, Ciprofloxacin, Doxycycline and Course of treatment is 60 days

Diagnosis and Treatment in animals :

a blood sample can be taken post-mortem from a superficial vessel, such as an ear vein. The collection site should be covered with a disinfectant-soaked bandage to prevent leakage of contaminated blood. Blood smears should be made and the blood submitted for isolation of *B. anthracis*.

the organism is very sensitive to **penicillin and tetracyclines**, and these are the antibiotics of choice if infection is detected early. Care must be taken in handling infected tissues or carcasses because the organism can penetrate cuts in the skin, resulting in localized infection with subsequent dissemination.

Prevention and control

Humans can protect themselves by preventing disease in animals.

1. Veterinary supervision of animal production and slaughter helps prevent contact with infected livestock or animal products.
 2. Prevent the import of animals and animal products from countries where anthrax is common and uncontrolled.
 3. Improvements in industry standards: have decreased the occupational risks for people exposed to imported hides, wool, bone meal, and other animal products.
 4. In laboratories, use of biological safety cabinets
 5. Veterinarians should use protective clothing and equipment when examining sick animals.
 6. avoid opening the carcasses of suspected cases.
 7. Post-exposure antibiotic prophylaxis is recommended for people who have been exposed to aerosolized anthrax spores.
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8. Vaccines are available for humans at a high risk of infection.

In animals :

1. Sick animals should be isolated.
2. To prevent sporulation, carcasses should not be opened.
3. Disposal of carcasses, contaminated manure, bedding and other materials.
4. Deep burial may also be used, but is less desirable. Disturbance of such sites, for example by ploughing or laying drainage, presumably brings the spores to the surface. Even without site disturbance, spores can work their way up to the soil surface. In either case, this may result in new livestock cases. Further disadvantages of burial sites are that

scavengers may dig down to reach the carcass, and in dry dusty areas, the digging process can spread the contaminated soil extensively.

5. Barns and equipment should be cleaned and disinfected.
6. Incineration must be carried out with appropriate care to ensure complete burning from beneath.
7. During an outbreak, **prophylactic antibiotics are given to exposed and at-risk** animals.
8. **Annual vaccination** of livestock in endemic areas is recommended. The most widely used vaccine is the **Sterne-strain vaccine**.

