

Popular Article

ANTHRAX – All you need to know

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Abstract

Anthrax also called Malignant pustule, Malignant oedema, Wool sorter's disease, Ragpicker's disease, Splenic fever or Milzbrand is an acute infectious disease of animals, primarily herbivorous animals that occasionally affects human. Anthrax is considered as rapidly fatal infectious disease often characterized by sudden death, exudation of tarry uncoagulated blood from the mouth, nares, and anus, splenomegaly, gelatinous infiltration of subcutaneous and subserous tissues, and malignant pustule. It was also the first infectious disease against which a bacterial vaccine was found to be effective by Louis Pasteur in 1880. Herbivores including domestic animals (cattle, sheep, goat and buffalo) as well as many wild species are highly susceptible to anthrax, while Pigs, Equines, Dogs and Camels are moderately susceptible.

Introduction

Anthrax also called Malignant pustule, Malignant oedema, Wool sorter's disease, Ragpicker's disease, Splenic fever or Milzbrand is an acute infectious disease of animals, primarily herbivorous animals that occasionally affects human.

Etiology

The causal agent of anthrax – *Bacillus anthracis* is one of the largest of all bacterial pathogen and is a gram-positive, spore-forming bacillus. Spores of *B. anthracis* can persist in the environment for many years in some types of soil and enter the body through skin abrasions, inhalation or ingestion and multiply to produce exotoxins. The first bacterial vaccine was prepared against anthrax by Louis Pasteur.

Distribution Of Disease

In animals Anthrax cases are distributed world over and, majority of these are reported in livestock from Africa, Asia and Middle East. It is endemic in certain parts of countries like Russia, France and India. In India, animal anthrax has been reported from most of the states. It is widespread in Tamil Nadu and Maharashtra, and has remained restricted to certain endemic areas in other states.



In man: The incidence of human anthrax in the world is estimated to be 20,000 to 1,00,000 cases per annum. Cutaneous anthrax accounts for 95-99% of human cases throughout the world. It is endemic in Middle-East Asia, Kenya, Gambia, Thailand, Iran, Iraq. In India, the disease has been reported from very limited geographic locations and majority of cases occurred in tri-junctional zone of south-west Andhra Pradesh, south-east Karnataka and north Tamil Nadu.

Current Indian Scenario

Anthrax is enzootic in southern India but is less frequently present in the northern Indian states. In the past years, the anthrax cases have been reported from Andhra Pradesh, Jammu and Kashmir, Tamil Nadu, Orissa and Karnataka. Outbreaks of Anthrax have been reported from Mysore 1999, Orissa 2004, 2005, West Bengal 2000, Jharkhand 2014. Recently kerala has reported the death of wild boars in Athirappilly forest region (June,2022).

Host Range and Reservoirs

Herbivores including domestic animals (cattle, sheep, goat and buffalo) as well as many wild species are highly susceptible to anthrax, while Pigs, Equines, Dogs and Camels are moderately susceptible. Carnivores and birds are generally highly resistant to anthrax, while Man is moderately resistant. In high-risk industries (wool, hair, meat and bone meal, leather) anthrax remains a major occupational zoonosis. Soil is considered as major reservoir for *Bacillus anthracis*. The pathogen present in the body fluid of infected host when comes in contact with atmosphere air, forms highly resistant spores under favourable conditions which remains viable for about 40-60years in contaminated soil and about 20-50years in bones of dead hosts.

Transmission

Animals usually become infected by ingestion of contaminated soil or feeds. Infected animals shed the bacilli during terminal hemorrhage, or if the blood of the dead animal is spilled accidentally. On exposure to the air, the vegetative forms sporulate. These spores are markedly resistant to many disinfectants and adverse environmental conditions and remain viable in the contaminated soil for many years. Dried or otherwise processed skins of infected animals may also harbor the spores for years. Thus, the spores are predominantly present in the environment and it is very largely through the uptake of spores that anthrax is contracted.

Cutaneous anthrax is the most common anthrax infection. Transmission occurs after exposure to infected animals and contaminated animal products such as hair, hides, wool, bones, or skin. Inhalation



anthrax results from inhalation of spores in particles less than 5 µm in diameter that may reach the terminal alveoli of the lungs. Aerosols of such particles may be created by the agitation of the hair or wool in the industry settings. Intestinal and oropharyngeal anthrax results from ingestion of contaminated meat. There is no evidence that milk from infected animal transmits anthrax. The disease spreads among omnivores and carnivores through contaminated meat, bonemeal and other feeds and among wild life from feeding on anthrax carcasses. Vultures have been reported to spread the organism from one area to another.

Accidental infection may occur among laboratory workers. Direct person to person spread of anthrax is extremely rare. However, precautions should be taken with drainage and secretions of patients to prevent cutaneous anthrax. Incubation period of this disease varies from a few hours to seven days but sometimes, a incubation period up to 60 days is also possible. Most cases occur within 48 hours of exposure.

Clinical Manifestations

In animals

Important clinical manifestations in animals

- In ruminants, sudden death, bleeding from orifices, subcutaneous hemorrhage, without prior symptoms or following a brief period of fever and disorientation should lead to suspicion of anthrax
- In equines and some wild herbivores, some transient symptoms such as fever, restlessness, dyspnoea or agitation may be apparent
- In pigs, carnivores and primates, local oedema and swelling of face and neck or of lymph nodes, particularly mandibular and pharyngeal and/or mesenteric may be present

The incubation period in the susceptible herbivore ranges from about 36 to 72 hours. The first signs of an anthrax outbreak are one or more sudden deaths in the affected livestock. Other signs include going off feed, or producing less milk than usual. During the systemic phase, the animals become distressed, appear to have difficulty in breathing and cease eating and drinking. Swellings in the submandibular fossa may be apparent, and temperature may rise. If the animal fails to respond to the treatment, it lapses into coma followed by death from shock.

In humans

Anthrax infection occurs in three forms: cutaneous, inhalation, and gastrointestinal form depending on the mode of transmission. Symptoms of disease vary depending on how the disease was contracted, but symptoms usually occur within seven days.

Cutaneous anthrax: 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 incubation period for cutaneous anthrax is 1-7 days. Skin infection begins as a painless, pruritic papule that resembles an insect bite but within 1-2 days develops into a vesicle (usually 1-3 cm in diameter) and then a painless ulcer with a characteristic black necrotic (dying) area in the center. Systemic symptoms are mild and may include malaise and low-grade fever. There may be regional lymphangitis and lymphadenopathy. The infection can also spread to the bloodstream with overwhelming septicemia. About 20% of untreated cases of cutaneous anthrax result in death. Deaths are infrequent with appropriate antimicrobial therapy.

Inhalation anthrax: Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems, shock along with the mediastinal widening which can be seen in the chest X-Ray. Diagnosis of inhalation anthrax is difficult but should be suspected if there is a history of exposure to an aerosol that contains *B. anthracis*. Inhalation anthrax usually results in death in 1-2 days after onset of the acute symptoms.

Intestinal anthrax: The intestinal form of anthrax may occur following the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. There are two clinical forms of intestinal anthrax. Symptoms include nausea, vomiting, fever, abdominal pain, hematemesis, bloody diarrhea and massive ascites. Early toxemia and shock develop in this form which can result in death if treatment is not started timely or not given at all.

Case fatality rates

Inhalation anthrax is almost fatal, and results in death in 25% to 60% of cases. The fatality rate of untreated cutaneous anthrax may be up to 20% but can be considerably reduced with early treatment options.

Measures in the event of an outbreak of anthrax

Every effort is to be made to investigate the outbreak, to confirm through laboratory diagnosis and to search for the source. In the affected area, the following measures must be applied:

- The carcasses of infected cattle have to be either burnt at the site of death and the ashes of the carcass to be buried deeply; or the carcass should be wrapped in double thickness plastic bag to prevent spilling of body fluids and removed to a more suitable site where they are burnt and the ashes buried.
- The site where the animal died is to be disinfected with 5% formaldehyde after disposal of the carcass.
- All other animals in the affected herd are to be vaccinated.
- Affected premises has to be quarantined for at least 20 days after the last case or 6 weeks after



vaccination, whichever is later.

- Any milk collected from a cow, buffalo or goat showing signs of anthrax within 8 hours of milking have to be destroyed, along with any other milk that may have been mixed with the suspected milk.
- People entering infected premises are required to wear protective clothing and footwear, which has to be disinfected before leaving the premises.
- All cattle on neighboring premises should also be vaccinated.
- A buffer zone, 20-30 Km wide, is to be established around the infected area within which all cattle and exposed sheep are vaccinated and quarantined.
- Persons who have handled infected animals or their carcasses should be vaccinated against anthrax, if their exposure is frequent and if the human vaccine is available.
- Such persons should avoid any contact with other persons or animals and should change contaminated clothes, washing hands and taking appropriate disinfection measures.
- Where there is a risk of aerosolization of spores, further precautions should be considered such as damping down the material possibly with 5% formalin and, wearing facemasks etc.

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