



Anthrax

Pathogen: *Bacillus anthracis*

Occurrence

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. The spore is highly stable and can survive for decades in the soil and water. Anthrax is distributed worldwide and occurs predominantly in agricultural regions with livestock (ruminants). Through contact with infected animals or their products (contaminated meat, hide, leather), anthrax can be transmitted to humans. There are three forms of anthrax: inhalation, cutaneous (skin), and gastrointestinal.

Identification

Inhalation anthrax: The onset of the disease is characterised by fatigue, fever and a respiratory infection. This is followed by severe lung problems, coughing up of blood, as well as lung and heart failure. Death occurs within 2-3 days after the onset of the infection. If left untreated, the mortality rate for inhalation anthrax is over 90%. The administration of antibiotics is only effective in the early stages of the disease.

Cutaneous anthrax: Infection occurs when the bacterium enters the body through cuts or small skin lesions as the result of handling contaminated animal products or leather for example, or through direct contact with infected animals. Pustules, similar to insect bites, begin to form. Within 2 to 6 days, these develop into ulcers, normally 2-3 cm in diameter, which are covered with a black scab. If left untreated, the mortality rate is around 20%; with treatment, the mortality rate falls to under 1%.

Gastrointestinal anthrax: Infection occurs through the consumption of contaminated meat and is characterised by an acute inflammation of the digestive system. Initial symptoms are nausea, vomiting and fever, which are then followed by the onset of stomach cramps, vomiting of blood and severe diarrhoea. If left untreated, this form of anthrax has a 25-60% mortality rate.

Diagnosis

Anthrax is diagnosed by isolating the pathogen from blood, skin lesions or from respiratory secretions. This diagnosis is then confirmed by immunological and molecular tests.

Transmission

The source of infection of naturally-occurring anthrax is infected animals or anthrax-contaminated animal products. Direct person-to-person transmission is extremely unlikely. In a bioterrorism context, the primary source of infection is aerosol (airborne bacteria) inhalation. The effective infectious dose is between 8,000 and 50,000 spores

Incubation period

As a rule, one to six days; in rare cases, up to 60 days before the first symptoms appear.

Prophylaxis

Although a vaccination for humans does exist, it is complicated to administer and its effectiveness is debatable. Currently, no country has a licensed vaccine for public use. In the event of suspected exposure, antibiotics are administered prophylactically.

Therapy

Anthrax can be successfully treated with antibiotics (ciprofloxacin, doxycyclin, penicillin) insofar as the therapy is initiated in the early stages of the disease. The fatal effect of anthrax is due to the toxins which are produced by the bacteria during the course of the disease. Since no antidote exists, the pathogens must be killed off with antibiotics, preferably as soon as infection occurs.

***Bacillus anthracis* as a biological weapon**

Anthrax is the classic biological weapon and is number one on the international priority list of biological weapon pathogens due in the main to its ability to survive long-term in the environment. In the past, several countries have manufactured anthrax as part of their bioweapons programmes and carried out research on the release of these bacteria in aerosol form.

In Autumn 2001, following the September 11 terrorist attacks, letters were sent containing a high concentration of anthrax spores, leading to 27 cases of cutaneous and inhalation anthrax; 5 of these were fatal. Since then, diagnostic capabilities and research have intensified worldwide with the aim of diagnosing the disease more quickly and providing better treatment, should such a bioterrorist attack occur in the future.