


ANTHRAX

Etiologic agent:

Bacillus Anthracis

- a large, aerobic, spore-forming, gram positive rod-shaped microorganism that is capsulated and non-motile. This microorganism grows in chain.
- Like many other members of the genus *Bacillus*, *Bacillus anthracis* can form dormant endospores often referred to as spores that are able to survive in harsh conditions for decades or even centuries. Such spores can be found on all continents, even Antarctica. When spores are inhaled, ingested, or come into contact with a skin lesion on a host, they may become reactivated and multiply rapidly.

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- ***Bacillus anthracis*** bacterial spores are soil-borne, and, because of their long lifetime, they are still present globally and at animal burial sites of anthrax-killed animals for many decades; spores have been known to have reinfected animals over 70 years after burial sites of anthrax-infected animals were disturbed.

Diagnosis:

- Gram staining
- Test of infected skin/skin sores
- Blood testing
- CT scans and Chest X-Ray
- Lumbar puncture (spinal tap)
- Endoscopy of the intestine and throat

Source of Infection:

Contact with spores through:

- tissues of infected animals such as cattle, sheep, horses, goats, and other wild herbivores.
- contaminated hair, wool, hides, and other products made from the said animals.
- soil associated by infected animals
- inhalation of aerosolised spores
- ingestion of contaminated undercooked meat.



Cutaneous (skin) anthrax

- Cutaneous anthrax is typically caused when *Bacillus anthracis* spores enter through cuts on the skin. This form accounts for over 95% of anthrax cases.
- Lesions usually occur on exposed skin and often commence with itchiness.

Cutaneous (skin) anthrax

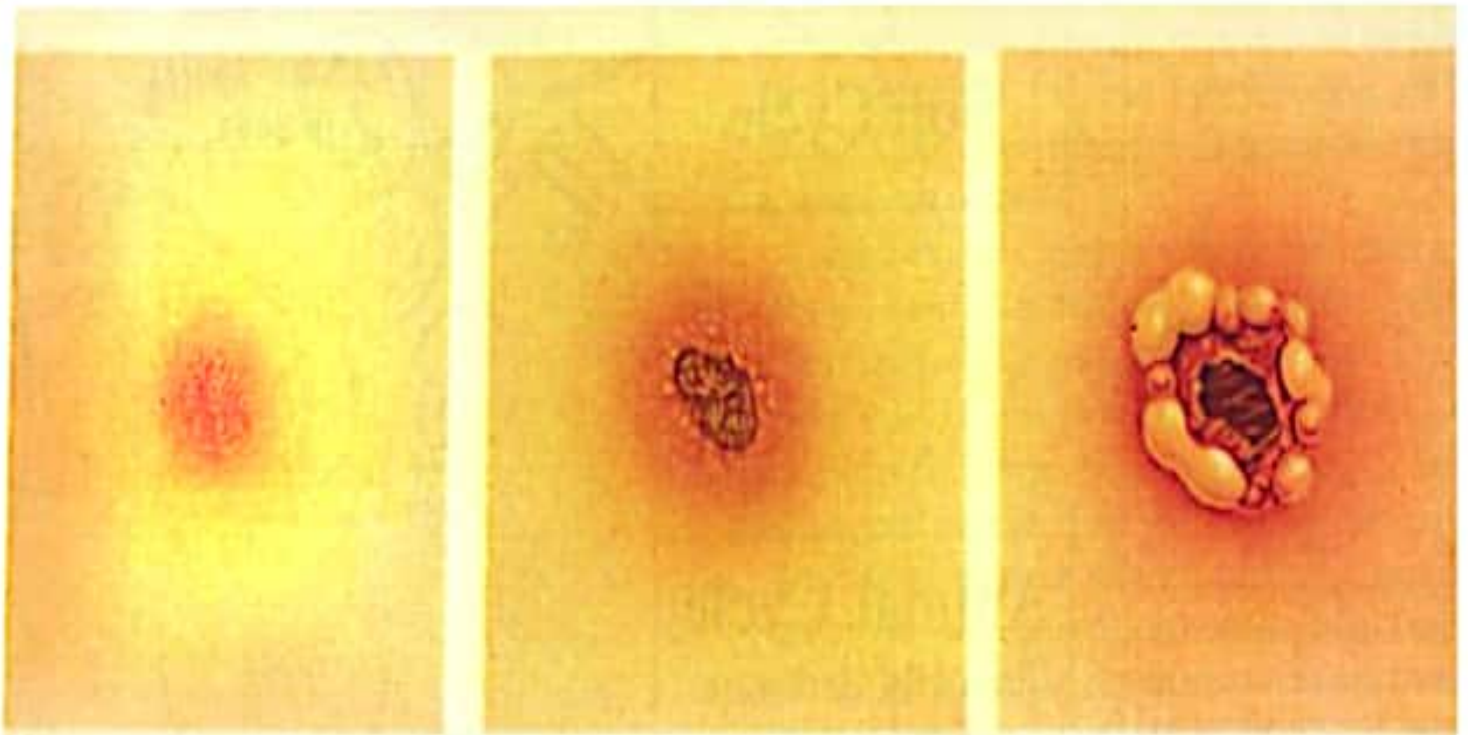
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They pass through several stages:

- **papular stage**
- **vesicular stage** with a blister that often becomes hemorrhagic
- **eschar stage** that appears two to six days after the haemorrhagic vesicle dries to become a depressed black scab (malignant pustule) which may have surrounding redness and extensive edema (swelling).


Anthrax lesions are usually painless but pain may result due to surrounding edema. Untreated lesions can progress to involve regional lymph nodes. An overwhelming septicaemia can occur in severe cases.



1st or 2nd DAY

3rd or 4th DAY

LATER STAGES

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- Symptoms include **muscle aches** and **pain, headache, fever, nausea,** and **vomiting.**
 - Cutaneous anthrax is rarely fatal if treated, because the infection area is limited to the skin. Without treatment, about 20% of cutaneous skin infection cases progress to toxemia and death.




Cutaneous anthrax infection

Inhalational (Pulmonary) anthrax

- also known as Woolsorter's disease
- results from breathing anthrax spores into the lungs.
- Earliest symptoms resemble those of a respiratory infection such as **mild fever** and **sore throat**.
- After one to three days of acute phase, increasing **fever, dyspnea, stridor, hypoxia, and hypertension** occur usually leading to death within 24 hours.

inhalational route normally proceeds as follows:

- Once the spores are inhaled, they are transported through the air passages into the tiny air particles sacs (alveoli) in the lungs.
- the spores get picked up in the lungs by scavenger cells called macrophages. Most of the spores are killed. Unfortunately, some survive and are transported to the lymph nodes in the central chest cavity (mediastinum).
- Damage caused by the anthrax spores and bacilli to the central chest cavity can cause chest pain and difficulty in breathing.

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- . Once in the lymph nodes, the spores germinate into active bacilli that multiply and eventually burst the macrophages, releasing many more bacilli into the bloodstream to be transferred to the entire body.
 - Once in the blood stream, these bacilli release three proteins named **lethal factor**, **edema factor**, and **protective antigen**.
 - These toxins are the primary agents of tissue destruction, bleeding, and death of the host.
 - If antibiotics are administered too late, even if the antibiotics eradicate the bacteria, some hosts will still die of toxemia. This is because the toxins produced by the bacilli remain in their system at lethal dose levels.



Mode of Transmission:

- **Direct transmission -**
through cutaneous contact with infected animals or contaminated animal products
- **Indirect transmission –**
through ingestion of contaminated meat
- **Airborne transmission –**
through inhalation of air contaminated by spores




Incubation period:

- Cutaneous anthrax occurs **1 to 7 days (usually 2 to 5 days)** after spores enter the body through breaks in the skin.
- Inhalational anthrax occurs **2 to 7 days (but sometimes up to 2 months)** after inhaling large amounts of anthrax spores
- Gastrointestinal anthrax occurs **2 to 5 days** after swallowing spores



Prevention and Control:

- Sterilize hair, wool or hides, bone meal or other feed of animal origin prior to processing.
- Avoid working with raw animal hides, fur or skin, especially those of goats, sheep, or cows.
- Do not eat meat that has not been properly slaughtered and cooked.
- Immunization of high risk individuals usually laboratory workers who are liable to handle *B. anthracis*
- Anyone working with anthrax in a suspected or confirmed victim should wear respiratory equipment.

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- Protective, impermeable clothing and equipment such as rubber gloves, rubber apron, and rubber boots with no perforations should be used when handling the body.
 - If an animal anthrax case is confirmed, the affected property is quarantined, potentially exposed stock vaccinated, dead animals buried and contaminated sites disinfected.
 - Control of dusts and proper ventilation in hazardous industries especially those that handle raw animal materials

Treatment:

- **Cutaneous/gastrointestinal anthrax**

- **Ciprofloxacin, penicillin or doxycycline** are the drugs of choice, usually given for 7–10 days. The duration of therapy for gastrointestinal anthrax is not well defined.

- If the case is associated with a bio-terrorist attack involving aerosolised anthrax where the risk is high, **ciprofloxacin or doxycycline are recommended and should be given for at least 60 days.**