

# ***Bacillus anthracis***

## **General Information**

*Bacillus anthracis* is a Gram-positive, spore-forming bacterium that causes anthrax, a severe and often fatal disease in animals and humans. The bacterium produces highly resilient spores that can survive in soil for decades, making anthrax a persistent threat in endemic regions.

## **Transmission**

Humans can contract anthrax through exposure to infected animals or contaminated animal products.

The three main routes of transmission include:

- **Cutaneous Anthrax:** The most common form, occurring when spores enter the skin through cuts or abrasions in the skin.
- **Inhalation Anthrax:** The most severe form, caused by breathing in anthrax spores.
- **Gastrointestinal Anthrax:** Caused by consuming contaminated meat from infected animals.

Occupational groups at increased risk of anthrax exposure include:

- **Military Personnel:** Primarily U.S. service members deployed to areas with a risk of biological warfare.
- **Laboratory Workers:** Those working with live *Bacillus anthracis* cultures or high-risk samples, particularly in biosafety level (BSL-3/4) laboratories where aerosol exposure is possible.
- **Veterinarians and Animal Handlers:** Professionals who handle infected animals or animal products in anthrax-endemic regions, such as zookeepers, wildlife biologists, and animal researchers.
- **Workers Handling Imported Animal Products:** Individuals employed in industries processing wool, hides, or animal hair, especially in countries where anthrax is prevalent.

## **Symptoms (Animals)**

The severity of infection depends on the species and route of exposure.

### **Peracute Form (Sudden Death) – Common in Herbivores**

- Rapid death with no prior symptoms.
- Bloody discharge from the nose, mouth, or anus.
- Absence of rigor mortis (body remains limp after death).

### **Acute Form – Observed in Some Herbivores & Omnivores**

- High fever, difficulty breathing, and staggering.
- Swollen throat and neck, particularly in pigs and dogs.
- Bloody diarrhea or tar-like stools.
- Seizures and rapid deterioration, often leading to death.

### **Chronic Form – Rare, Mostly in Some Carnivores**

- Mouth or throat abscesses.
- Gradual weight loss and weakness.

Animal	Susceptibility	Common Symptoms
Dogs & Cats	Resistant	Rare cases, mild illness, or localized swelling
Cattle, Sheep, Goats	Highly susceptible	Sudden death, fever, bleeding from orifices
Horses	Moderately susceptible	Fever, colic, swelling, respiratory distress
Pigs	Moderately resistant	Swollen throat, difficulty breathing, localized infections
Wildlife (Deer, Bison, Elephants, etc.)	Highly susceptible	Mass die-offs in outbreaks

## Symptoms (Humans)

The severity of infection depends on the route of exposure.

**Cutaneous anthrax** has an incubation period of 1–7 days after exposure. Symptoms often include:

- A small, itchy bump resembling an insect bite that gradually transforms into a painless ulcer with a black center (eschar), accompanied by localized swelling.
- In severe cases, fever and swollen lymph nodes may occur.
- If left untreated, the infection can spread to the bloodstream, leading to serious complications.

**Inhalation anthrax** typically has an incubation period of 1–7 days, though it can occasionally extend up to 60 days. Early symptoms often include:

- Fever
- Chills
- Fatigue
- Cough
- Body aches
- Sore throat

As the infection worsens, individuals may develop:

- Severe breathing difficulties and chest pain
- High fever and a rapid heart rate
- Mediastinal widening (swollen lymph nodes in the chest, detectable via X-ray)
- Shock and multiple organ failure in advanced stages

**Gastrointestinal Anthrax** has an incubation period of 1–7 days after exposure. Symptoms often include:

- Severe abdominal pain, nausea, vomiting
- Bloody diarrhea
- Loss of appetite and swollen intestinal lymph nodes.
- If left untreated, the infection can progress to sepsis and become fatal.

## Treatment

Anthrax infections require immediate medical intervention. Treatment depends on the form of anthrax (cutaneous, inhalation, gastrointestinal, or injection) and the severity of the infection. Antibiotics and antitoxin therapy are the primary treatment methods, while supportive care is essential for managing severe cases.

Type of Anthrax	Primary Treatment	Additional Care
Cutaneous Anthrax	Oral antibiotics (Ciprofloxacin or Doxycycline for 7–10 days)	Severe cases may require IV antibiotics
Inhalation Anthrax	IV antibiotics + antitoxin therapy	ICU care, respiratory support
Gastrointestinal Anthrax	IV antibiotics (Ciprofloxacin + Clindamycin or Penicillin)	Fluid resuscitation, intensive care

## Prevention & Control

Prevention and control strategies involve maintaining proper hygiene and implementing biosecurity measures in livestock management. Proper disposal of animal carcasses is essential, and movement restrictions should be enforced in outbreak areas. Livestock at risk of exposure can be protected through anthrax vaccination (Sterne Strain).

Key safety measures include:

- Wearing protective gloves when handling infected animals.
- Wearing respiratory protection, as applicable.
- Isolating infected animals to prevent disease transmission.
- Disinfecting contaminated equipment and surfaces.
- Regularly washing hands with warm water and soap.

For individuals at high risk of exposure to *Bacillus anthracis* spores, anthrax vaccination is recommended. The Anthrax Vaccine Adsorbed (AVA) is the only approved vaccine for human use in the United States and is primarily administered as a pre-exposure prophylaxis (PrEP) for military personnel, laboratory workers, and other high-risk groups.

## References

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