

MICROBIOLOGICAL DIAGNOSTICS OF ANTHRAX, RICKETSIOSIS AND LEGIONELLOSIS

Anthrax

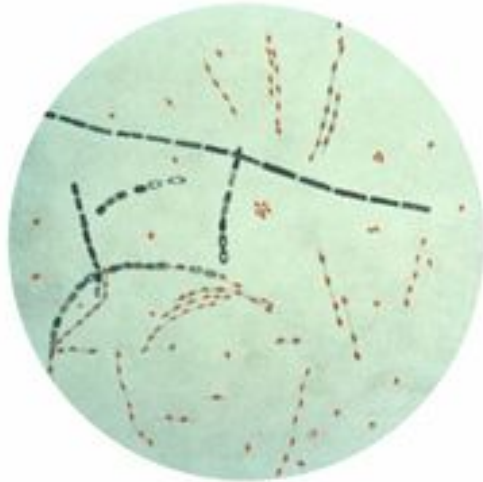
is an infection caused by the bacterium *Bacillus anthracis*. It can occur in four forms: skin, lungs, intestinal, and injection. Symptoms begin between one day and two months after the infection is contracted. The skin form presents with a small blister with surrounding swelling that often turns into a painless ulcer with a black center. The inhalation form presents with fever, chest pain, and shortness of breath. The intestinal form presents with nausea, vomiting, diarrhea, or abdominal pain. The injection form presents with fever and an abscess at the site of drug injection.



Family: Bacillaceae

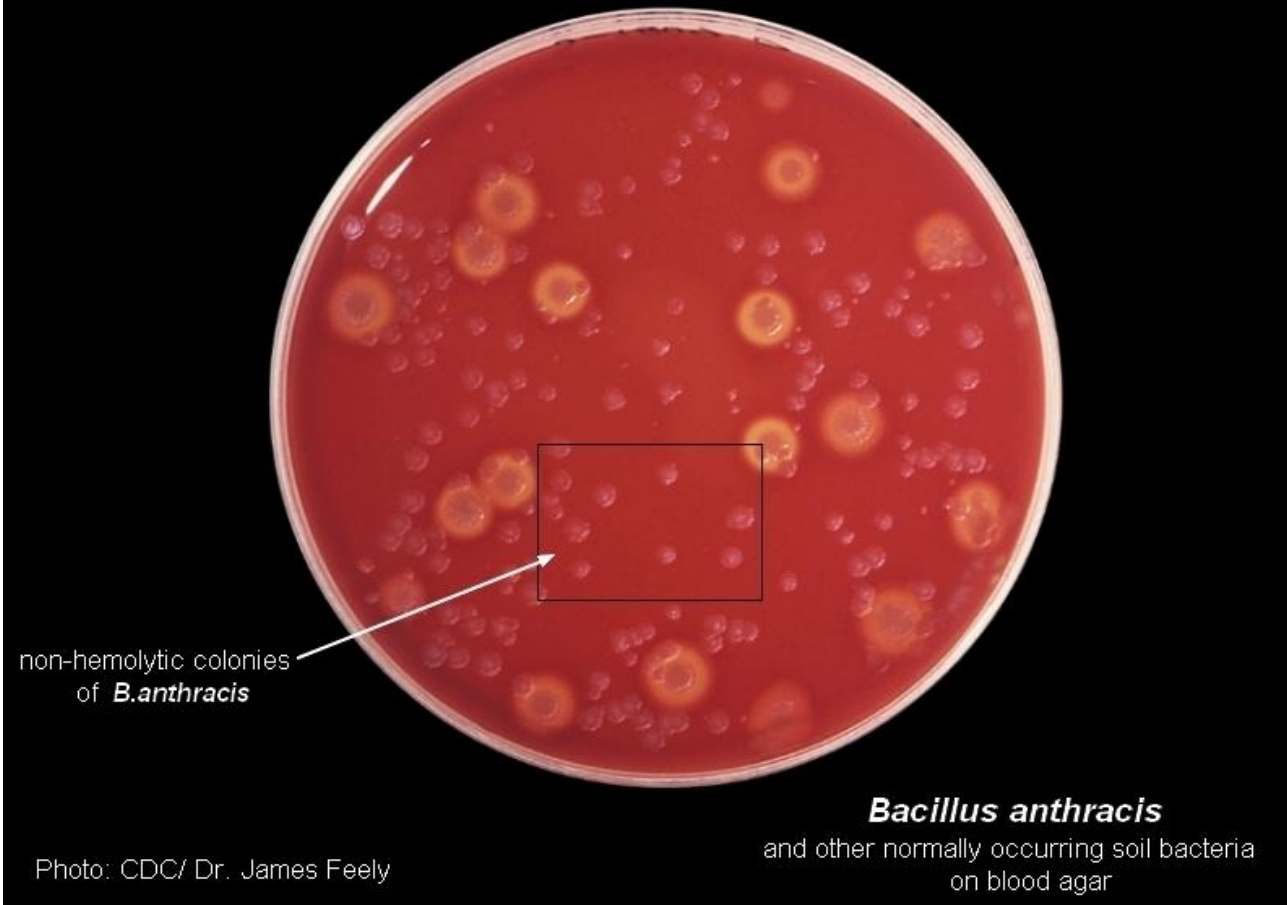
Genus: Bacillus

Bacillus anthracis



fuchsin-methylene
blue spore stain

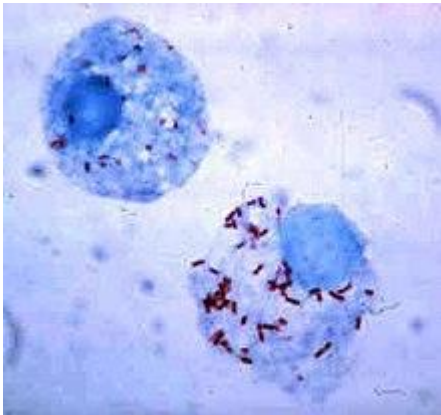
| Basic Characteristics | Properties (<i>Bacillus anthracis</i>) |
|------------------------|--|
| Capsule | Capsulated |
| Catalase | Positive (+ve) |
| Hemolysis | Negative (-ve) |
| Indole | Positive (+ve) |
| Motility | Negative (-ve) |
| Spore | Positive (+ve) |
| Fermentation of | |
| Glucose | Positive (+ve) |
| Lactose | Negative (-ve) |
| Maltose | Positive (+ve) |
| Sucrose | Positive (+ve) |



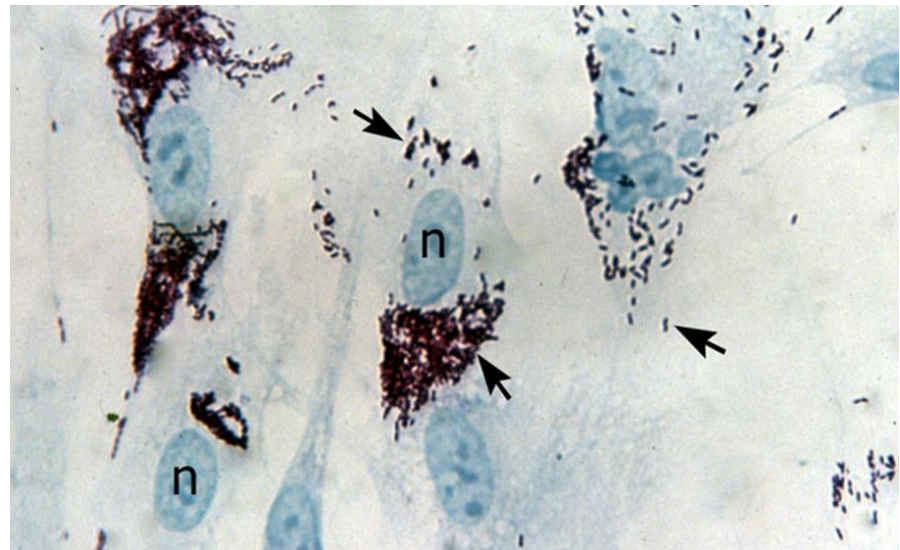
This was a blood agar culture plate growing *Bacillus anthracis* and other soil flora. This blood agar culture plate grew representative colonies of *B. anthracis* and other normally occurring soil inhabitants.

RICKETSIOSIS

Rickettsiosis is a group of acute infectious diseases caused by intracellular parasites occupying an intermediate position between bacteria and viruses; with a predominant transmission mechanism of transmission and characterized by generalized vasculitis and rash, occurring against a background of febrile-intoxication syndrome.

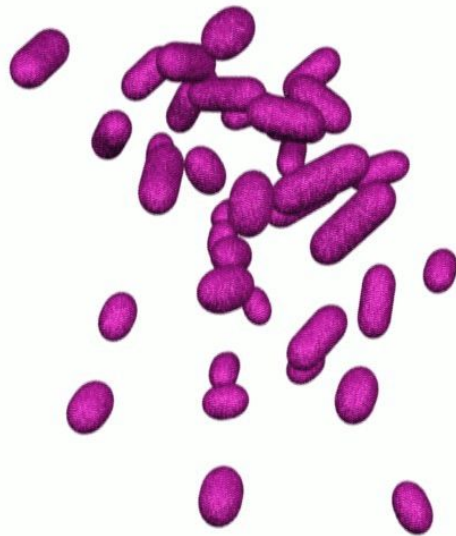


Rickettsia rickettsii (red dots)
in the cell of a deer tick



Family: Rickettsiaceae

Genus: Rickettsia



www.bacteria.cz

Han. et.

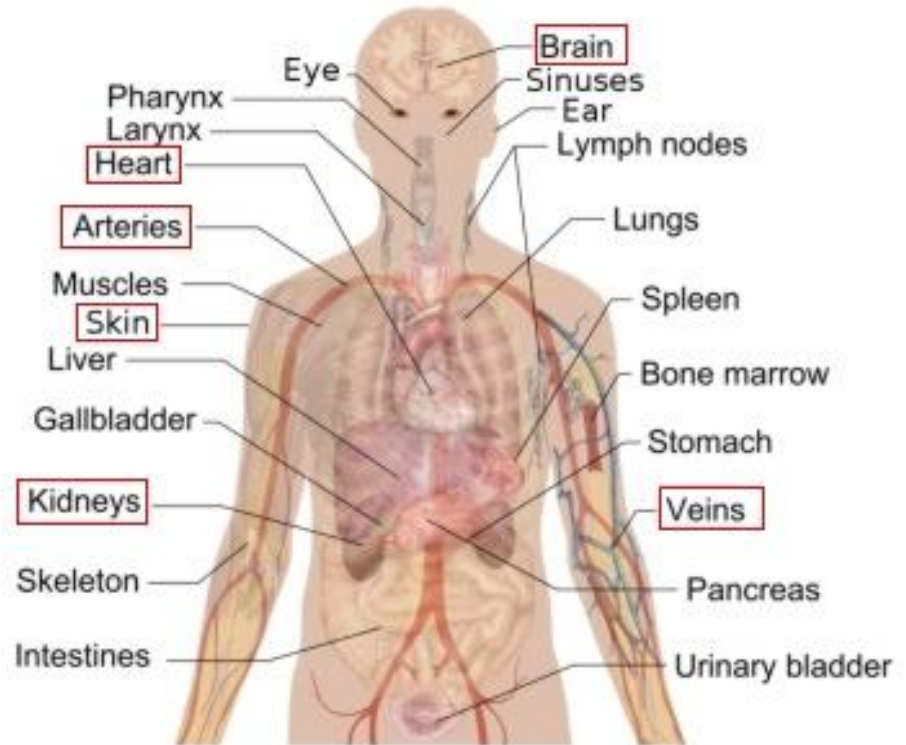
Rickettsia prowazekii

Rickettsia

prowazekii appearance

small **Gram-negative** short rods or coccobacilli
nonmotile
obligate intracellular parasite

Rickettsia prowazekii INFECTIONS



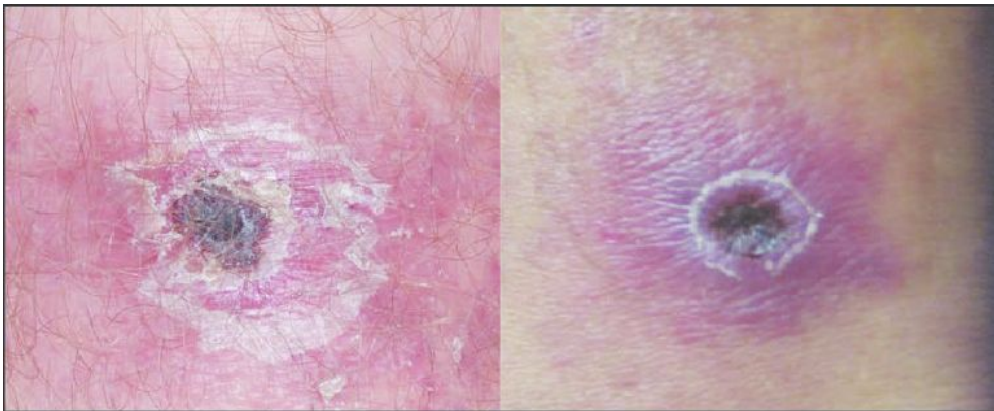
Häggröm, Mikael. "Medical gallery of Mikael Häggröm 2014"

Infections caused by *Rickettsia prowazekii*

Rickettsia prowazekii is the etiologic agent of **epidemic typhus**, transmitted in the **feces of lice**. Epidemic typhus is a form of typhus so named because **the disease often causes epidemics following wars and natural disasters**. Typhus was also common in prisons (and in crowded conditions where lice spread easily), where it was known as Gaol fever or **Jail fever**.

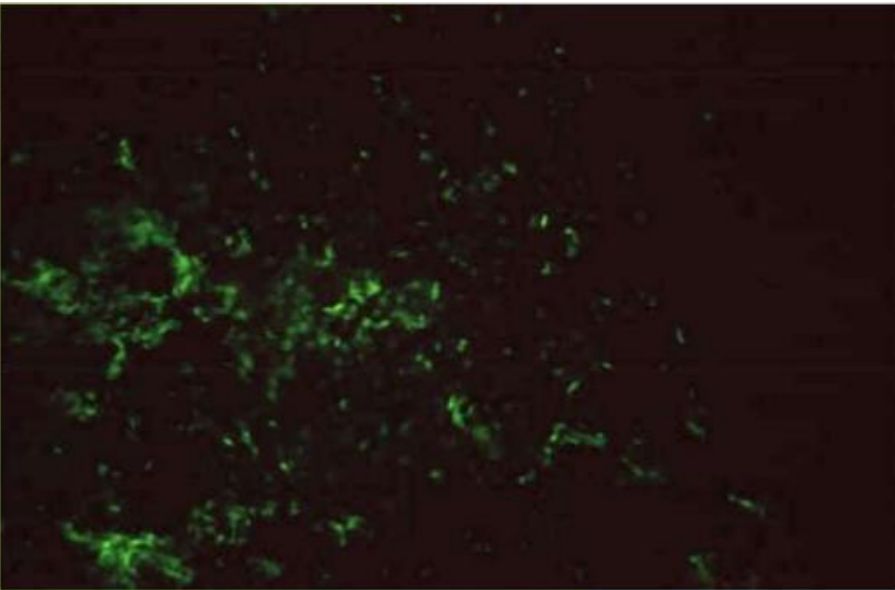
Symptoms include severe headache, a sustained high fever, cough, rash, severe muscle pain, chills, falling blood pressure, stupor, sensitivity to light and delirium. **A rash begins on the chest** about five days after the fever appears, and **spreads to the trunk and extremities**.

Epidemic typhus is found most frequently during times of war and deprivation. In the periods between outbreaks, when human to human transmission occurs less often, the flying squirrel serves as a zoonotic reservoir for the *Rickettsia prowazekii* bacterium. **The mortality rate is 10% to 60%**, but is vastly lower (close to zero) if intracellular antibiotics such as tetracycline are used before 8 days



Lab diagnostics

1. Micro Immunofluorescence



Immunofluorescent Antibody Technique

(utilizes fluorescent antibody to detect rickettsial antigen in infected tissues)

2. ELISA



LEGIONELLOSIS

Legionellosis is an infectious disease caused by legionella bacteria that multiply in air conditioning systems, showerheads, humidifiers, inhalers

Family: Legionellaceae

Genus: Legionella

Species: *L. pneumophila*



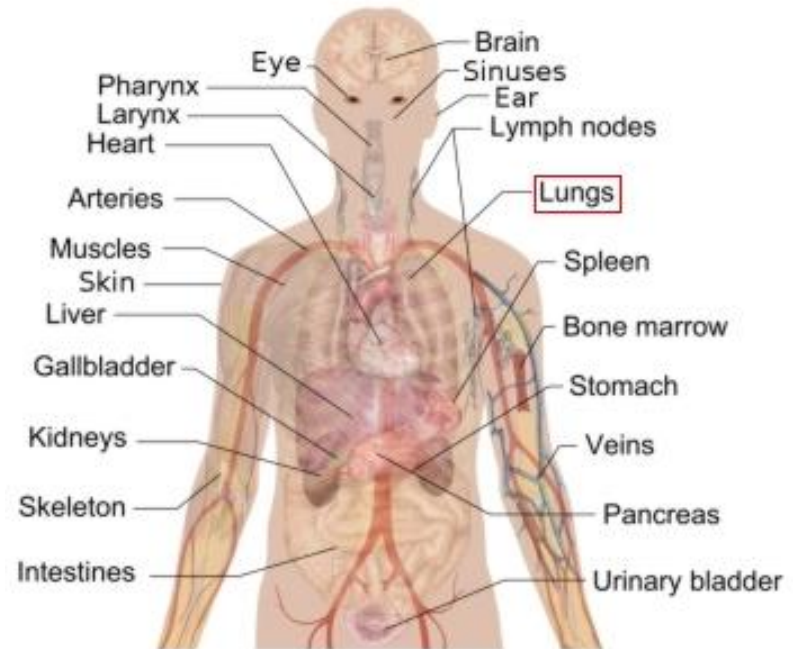
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He et al.

Legionella pneumophila

thin, **Gram-negative** bacteria; *Legionella* stains **poorly** with Gram stain; may become filamentous in culture
motile (one polar flagellum)
non-encapsulated
non-spore-forming

Legionella pneumophila INFECTIONS



Häggeström, Mikael. "Medical gallery of Mikael Häggeström 2014"

Legionnaires' disease (also **legionellosis** or **Legion fever**) is a form of **atypical pneumonia** caused by any species of Gram-negative aerobic bacteria belonging to the genus **Legionella**. Over 90% of cases of Legionnaires' disease are caused by *Legionella pneumophila*. *L. pneumophila* has only been found in **aquatic systems**, where it is symbiotically present in aquatic-borne amoebae. It thrives in temperatures between 25 and 45°C, with an optimum temperature of 35°C. During infection, the bacterium **invades macrophages and lung epithelial cells and replicates intracellularly.**

Legionnaires' disease is **transmitted by inhalation of aerosolized water**. It is not airborne and **it is not transmitted from person to person**. Sources where temperatures allow the bacteria to thrive include hot-water tanks, cooling towers, and evaporative condensers of large air-conditioning systems, such as those commonly found in hotels and large office buildings



L. pneumophila (red chains) multiplying inside *Tetrahymena pyriformis*

In humans, *L. pneumophila* invades and replicates inside macrophages. The internalization of the bacteria can be enhanced by the presence of antibody and complement, but is not absolutely required. Internalization of the bacteria appears to occur through phagocytosis.

Laboratory Diagnosis of *Legionella*

- **Culture** of *Legionella* organism from normally sterile tissue
- Detection of *L. pneumophila* **antigen in urine**
- **Seroconversion**: 4 fold or greater rise in specific serum antibody titer *L. pneumophila*
- **Direct fluorescent antibody (DFA) staining**