

Medical Bacteriology- Lecture 14

Gram negative coccobacilli

Zoonosis

Brucella

Yersinia

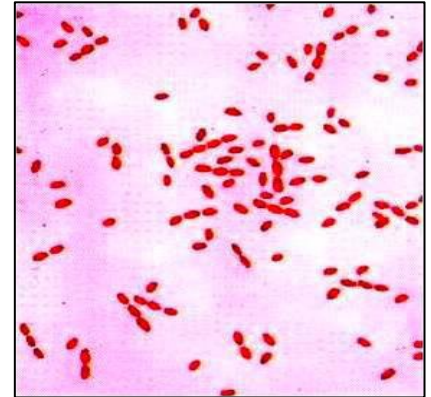
Francisella

Zoonosis

- A disease, primarily of animals, which is transmitted to humans as a result of
- **direct contact**
- **indirect contact with the infected animal**

Brucella

- Small gram-negative coccobacilli
- Aerobic growth on chocolate agar and blood agar
- strongly positive to urease
- Grow slowly at 37C
- Causes Brucellosis (undulant fever) or (Malta fever)
- facultative intracellular
- Brucella can go through intact skin



- **Major human pathogenic species**

- | Species | Primary animal host |
|------------------------|---------------------|
| • <i>B. abortus</i> | Cattle |
| • <i>B. melitensis</i> | Goat / Sheep/ camel |

- **Brucellosis** is a zoonotic disease transmitted to human by direct contact with infected animal skin, inhalation, or ingestion of unpasteurized dairy products.
- **symptoms:** chills, fever (undulant) sweats, weakens and headache.
- **Complication:** Brucella spondylitis (Vertebral brucellosis)
- **no vaccine to humans.**

Brucella

Mechanism of pathogenesis

Skin , contaminated milk and cheese, Aerosols to the mucosa of (nose, mouth & conjunctiva)



Local multiplication

(Slight ulceration of mucosa, PMN phagocytize but *Brucella* multiply in them)



Lymphatic system (local lymph nodes)



Reticulo-endothelial system

(Liver, spleen, and bone marrow)

chronic inflammation (granulomas → abscesses)



Septicemia



Generalized infections

(Meningitis, L-forms in bone marrow)

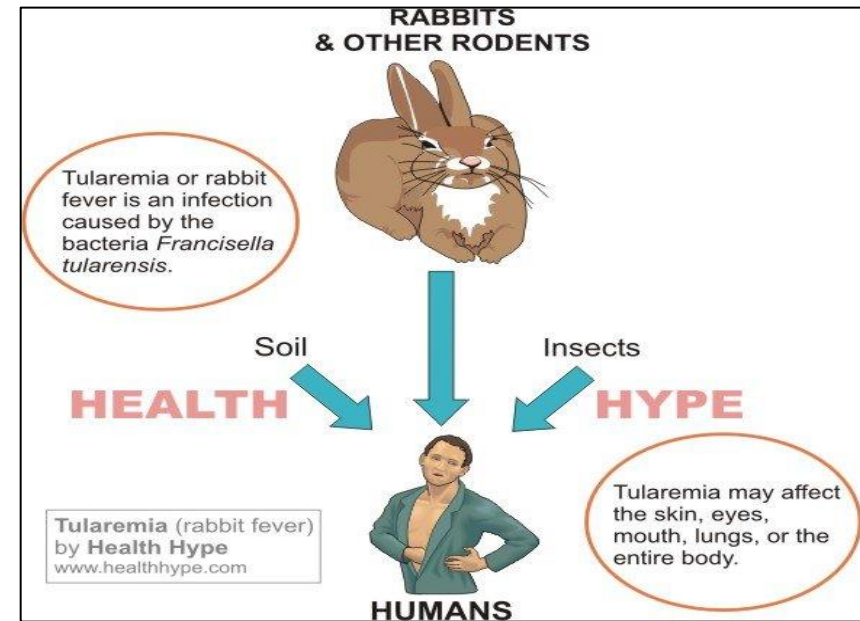
Francisella

Francisella tularensis

- Small gram negative coccobacillus
- low infectious dose
- slow growing (48hrs) at 37C
- fastidious (grow in blood-cysteine agar, chocolate agar)
- encapsulated
- not grow on MacConkey or EMB
- capsule protect from complete killing
-
- **Tularemia (Rabbit Fever)** is a zoonotic disease transmitted to human by
 -
 - 1- biting (rabbit)
 - 2- direct contact with infected animal tissue
 - 3- inhalation of aerosols
 - 4- ingestion of contaminated food and water.
 - 5- by fly or Ticks

Francisella

- **Tularemia types**
- **Ulceroglandular tularemia:** arms and hands
- **Oculoglandular tularemia:** conjunctiva
- **Pneumonic tularemia:** contaminated aerosols
- **Typhoidal tularemia:** ingestion of inadequately cooked food
- **Symptoms:** (fever, chills, sore throat, headache)



Yersinia

Short, pleomorphic gram negative coccobacillus

- microaerophilic or facultative anaerobic
- facultative intracellular
- non motile
- non lactose fermenter

- Three species are pathogenic for humans
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- *Y. pestis* (Pneumonic, bubonic and septicemic plague)
- *Y. pseudotuberculosis*
- *Y. enterocolitica*
 - These are primarily animal pathogens, and humans are accidental hosts for infection.

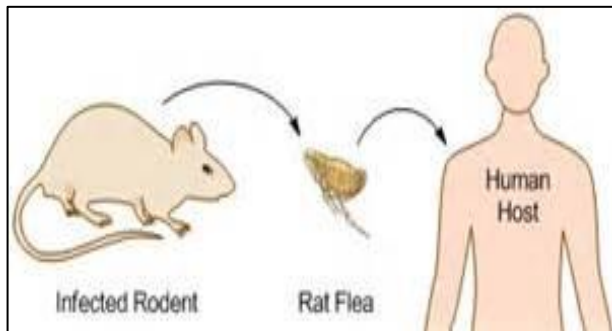
Y. pestis

- Causes plaque
- Natural disease of rodents
- optimal growth at 28C
- Inoculum dose: 10^8 - 10^9 organism
- **Virulence Factors**
 - Antigenic change at 37c
 - antiphagocytic capsule
 - Protein (V) and Lipoprotein (W) (overwhelming septicemia)
 - Clasiu dependence at 37C
 - Yersinia outer membranes (Yops) proteins, cytotoxic, inhibit phagocytes
 - Hemolysin
 - Coagulase, produce at 28 C but not at 32C
 - Fibrinolysin (promotes dissemination)

Y. pestis

- **plaque types**
- **Bubonic Plaque (black Plaque):** cutaneous, bites- high fever- painful and enlarged lymph nodes called buboes- 60 % mortality if untreated
- **Pneumonic Plaque:** transmitted via aerosols - rapidly- infection of lungs- High mortality rate (95-100%) - painful in muscles- high fever- enlarged liver and spleen- bloody sputum
- **Septicemic plaque:** primary or secondary from bubonic or pneumonic- 100% mortality of untreated
- **Diagnosis and treatment must be rapid due to the fast progression and deadliness of the plague**
- **Phage typing**
- **Fluorescent antibody**
- **Treatment and Prevention** Streptomycin or tetracycline
Strict isolation
Control domestic rat and flea

Y. pestis



Mechanism of pathogenesis

Dogs and cats

Rodent → Rodent

↓ Fleas ↓

↓ ↓ ↓

Septicemic plague ←←← **Man**

↓ ↓ 1-6 days

↓ Small pustule (or no local lesion)

↓ ↓

↓ Phagocytosis

↓ Bacteria survive, macrophage killed,

↓ Cal⁺ determinant or VWa⁺

↓ ↓

↓ Enlarged lymph nodes (buboes)-**Bubonic plague**

↓ ↓

↓ Lymphatic system

↓ ↓

→ Septicemia (endotoxin, Schwartzman reaction)

↓ ↓

Pneumonia (**Pneumonic plague**) Meningitis