

Gram-negative rods related to animal sources (Zoonotic pathogens):

Brucella:

- Gram negative rods.
- Non-motile.
- Non-capsulated.
- Urease is positive.

Transmission :

They survive in soil and manure. The bacteria are transmitted from animal to human by direct contact with infected animal or contact with contaminated feces, urine, milk, and tissue or ingestion of contaminated livestock products.

Virulence factors:

Major virulence mechanism stems from their ability to survive intracellularly inside macrophage , and production of endotoxin.

Pathogenicity and clinical features:

Four species are important pathogenic for animal and human ; *B.abortus* is responsible for infection mostly in cattle(cows, buffaloes), *B.melitensis* is pathogen for goats and sheep, and *B.suis* for swine(pigs). *B.canis* for dogs.

The bacteria cause disease called brucellosis . Brucella enter the body through small break in mucosa of oropharynx. Invasion of the body by brucella results in lymphatic dissemination of bacteria, the bacteria replication inside macrophage . When macrophages die, brucella released into blood stream and establish localized infection in liver, spleen, kidney and bone marrow.

After incubation period (4-30 days), mostly clinical features include irregular fever; elevated in day and falling during night, because this remittent so called undulant fever(Malta fever) , night sweat, enlarged lymph nodes, muscular and joint pain, chills.

Mammary glands (milk gland) in both human and animal can be infected and causing mastitis. Placental and fetal tissues are infected in animal, is not human, and it causing abortion in animal due to erythritol matter which found in animal placenta.

Lab. Dx :

1. Biopsy and blood culture are most definite method for diagnosis of brucellosis.
2. Serological tests such as Rose-Bengal test, milk ring test and CFT.
3. Skin test (brucellin test) is positive especially in chronic cases.

Control :

1. Antibiotic treatment; therapy for brucellosis is difficult because of intracellular growth of this bacteria. Rifampicin is drug of choice. Administration of tetracycline alone or with streptomycin for a period of not less than 3 week.
2. prevention:
 - A vaccine is available for vaccinating animal and human.
 - Pasteurization of dairy products has helped to decrease human disease.

Yersinia:

- Gram negative rods, showing bipolar staining.
- Catalase positive and oxidase negative.
- Encapsulated.

Virulence factors:

- Somatic antigen (V and W antigen) and fraction-1 antigen (F-1).
- Endotoxin and exotoxin A and B.

Transmission:

Y. pestis, the causative agent of plague (bubonic and pneumonic). Generally in bubonic plague, the bacteria transmitted from animal to animal via the bite of flea. The rats are common reservoirs in urban areas (urban plague). Wild animals (squirrels) are common reservoirs (sylvatic plague) in bubonic plague.

Infected humans with pneumonic plague transmit organism person to person through respiratory aerosols.

Pathogenesis and clinical features;

Bacteria spread from the site of inoculation to local and regional lymph nodes , where they are ingested by macrophage. It survive in macrophage(intracellular), replicate, and causes massive inflammatory swelling of lymph nodes(ie, bubo). Organism spread rapidly from buboes during blood stream to other organs , causing

hemorrhagic of peripheral blood vessels ,sepsis ,shock due to hypotension. **Black death**, medieval name for bubonic plague, which killed 50% of its victims . One feature of disease is bleeding beneath skin, causing dark blue or black bruises (black patches).

Bubonic plague is characterized by high fever, swelling, hemorrhagic, painful of lymph nodes of groin or axilla. The infection may progress to bacteremic phase with sudden onset of fever, chills , hemorrhagic lesion and sepsis . Mortality is high when left untreated, 75%.

Pneumonic plague results from inhalation of infectious aerosols or embolization of bacteremic organism to the lung. Development of disease is rapid and highly fatal during epidemics, in untreated patients 95%.

Lab. identification ;

Specimens: Sputum, aspirate from lymph nodes, aspirate from bubo.

Direct Gram-smear : G-ve bacilli with bipolar staining

Culture: Non-lactose fermenter on MacConkey agar

Treatment;

Streptomycin is the drug of choice for treatment plague.

Prevention;

- Control on rats and flea.
- Isolation of patient.
- Vaccine is available, provide short-time protection.