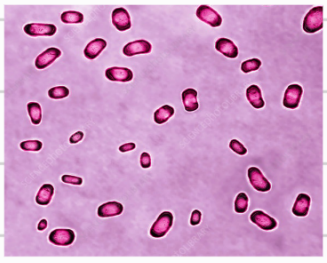
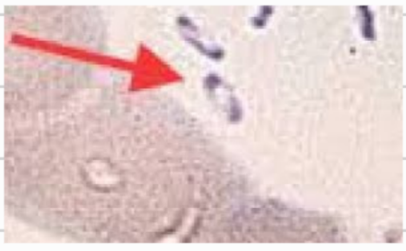
Yersina Pestis

"Black death"

Charecteristics :-

- Family :- enterobacteria
- gram -ve, Small rods, pleomorphic, safety pin appearance
- aerobic, faculative aerobic and intracellular
- mostly Zoontic, can cause disease in men
- grow best in blood agar ?? No hemolysis of blood cells
- Bipolar Staining with lieshman stain
- ferments glucose + mannitol, produces acid only





- Pathogenic to mice, white rats, pigs

Plasmids and virulence factors :-

- Antiphagocytic V and F_1 antigens
- Type 3 Secretion system → inject pore forming proteins → inhibit phagocytosis and signaling
- Adhesions :- invade epithelial cells
- Plasminogen activator :- dissolve clots → systemic invasion

Transmission vector of plague

- From animals :- flea bites 78%

  direct contact with infected animals
- From human to human :-

  droplet contact → coughing, sneezing

  direct physical contact → touching

  airborn transmission → microorganism in air

  fecal oral transmission → contaminated water, food

* The begining of plague spread :-

rats didn't start the spread fleas did, this disease infected rats and dogs (1st victims of plague).

Humans get infected by flea bites, contact with infected rats and dogs

How do humans/animals get infected ?

Yersina pestis is maintained in the flea's digestive system by several proteins called "Hemin storage system" HMS

this system causes bacteria to stick forming plugs → blocks the flea's stomache → starvation the flea bites the host (to feed) → vomitting plague infected blood at the site of the bite → infection will spread

Disease Types

Bubonic Plague

- based on the lymphatic system
- mortality :· 50-60%
- clinical signs :·

fever, malaise, chills, headache

Vomitting, abdominal pain, nausea

Swollen painful LNs

- incubation :· 2-6 days
- 80-90% of the cases

other rare types → plague meningitis, cutaneous plague, Pharyngitis

Septicemic plague

- in the bloodstream
- 100% mortality (untreated)
- clinical signs :·

Similiar to bubonic, circulatory collapse

Septic Shock, DIC, hemorrhage

organ failure,

Necrosis of extremites (black death)

pneumonic Plague

- in the lungs
- 100% mortality within 24 hours
- clinical signs :·

fever, malaise, chills, Septicemia

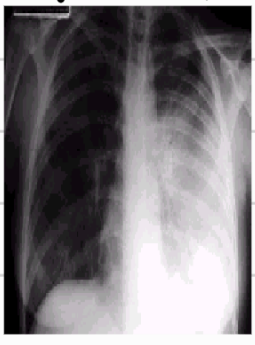
purulent Pneumonia

respiratory distress, hemoptysis

- incubation :· 1-6 days
- primary → if from aerosols

Secondary → if signs of (bubonic, septicemic)

highly fatal / person to person possible



Diagnosis

- isolation of organism culture of blood, sputum, csf

Gram Stains can confirm the presence of gram-ve rods, leishman in some cases

- AB 4 fold rise (Serology) :· Anti F1 Serology test differntiates between different yersina species
- Single titer > 1:128 +ve
- leukocytosis
- PCR