



Yersinia

The genus *Yersinia* contains three species of medical importance:

Y. pestis, the agent of bubonic and pneumonic plague, and *Y. pseudotuberculosis* and *Y. enterocolitica*, both of which can result in severe gastroenteritis.

Clinical Manifestations

Yersinia pestis is primarily a rodent pathogen, with humans being an accidental host when bitten by an infected rat flea. The flea draws viable *Y. pestis* organisms into its intestinal tract with its blood meal. These organisms multiply in situ sufficiently to block the proventriculus, and some organisms are regurgitated into the next bite wound, transferring the infection to a new host. While growing in the invertebrate host, *Y. pestis* loses its capsular layer, and most of the organisms are phagocytosed and killed by the polymorphonuclear leukocytes which enter the infection site in large numbers. The re-encapsulated organisms kill the macrophage and are released into the extracellular environment, where they resist phagocytosis by the polymorphs. The resulting infection quickly spreads to the draining lymph nodes, which become hot, swollen, tender, and hemorrhagic, giving rise to the characteristic black buboes responsible for the name of this disease (Fig.1). Within hours of the initial flea bite, the infection spills out into the bloodstream, leading to substantial involvement of the liver, spleen, and lungs. As a result, the patient develops a severe bacterial pneumonia, exhaling large numbers of viable organisms into the air during coughing fits. Up to 90 percent of untreated patients will die representing a highly contagious health hazard to nursing staff. As the epidemic of bubonic plague develops (especially under conditions of severe overcrowding, malnutrition, and heavy ectoparasite infestation), it eventually shifts into a predominately

pneumonic form, which is far more difficult to control and which has 100 percent mortality.

Structure and Antigenic Types: *Yersinia pestis* is a small, Gram-negative coccobacillus, which frequently shows strong bipolar staining. Freshly isolated cultures often exhibit extensive slime production, due to capsular or envelope antigen which is heat labile. Fully virulent strains possess V and W (virulence) antigens.

Pathogenesis: The virulence of *Y. pestis* strains can be equated to the rate of growth (or elimination) of the organisms in the spleen following intravenous inoculation. The most virulent strains multiply logarithmically, reaching lethal proportions within 2 or 3 days. Infected animals exhibit a progressive septicemia and die as a result of a hemorrhagic pneumonia.

Diagnosis: *Yersinia* infections must be diagnosed quickly due to the extraordinary virulence of these organisms. Death from pneumonic plague can occur in as little as 24 hours after the first appearance of clinical symptoms. Sputum specimens from these patients contain large numbers of Gram-negative coccobacilli. Blood cultures are positive, and lymph node biopsy material shows a massive inflammatory cell infiltrate, together with numerous cell-free coccobacilli.

Control: *Yersinia* can be killed by mild heat (55°C) and by treatment with 0.5 percent phenol for 15 minutes. It is susceptible to sulfadiazine, streptomycin, tetracycline, and chloramphenicol in vitro. Thus far, few drug-resistant strains have emerged. Control measures against plague center largely on rat flea eradication programs.

Yersinia Pseudotuberculosis : is a natural pathogen of rodents and birds but can infect humans, causing a severe enterocolitis with enlarged caseous nodules in the Peyer's patches and the mesenteric lymph nodes. *Yersinia pseudotuberculosis* can be readily distinguished from other *Yersinia* species because of its motility when grown at 25°C. In humans, *Y pseudotuberculosis* causes severe intestinal abscesses that require aggressive chemotherapy with ampicillin and tetracycline. No vaccine is available.

Yersinia Enterocolitica: is a natural pathogen of cattle, deer, pigs, and birds. The organism is excreted in large numbers in the feces by infected carriers and can contaminate drinking water and dairy products. Oral infection results in a severe diarrhea in humans, together with necrosis of the Peyer's patches, chronic lymphadenopathy, and hepatic and splenic abscesses which require aggressive chemotherapy involving a combination of ampicillin, chloramphenicol, and polymyxin. The best prevention methods are adequate water purification and milk pasteurization. No vaccine is available for this infection.

Brucella

- Gram-negative bacilli

Habitat

- Chronically infected domestic animals

Medically Important Species

- *B. abortus* - Cattles
- *B. melitensis* - Goats & sheep
- *B. suis* - pigs
- *B. canis* - Dogs

Transmission

- Primarily animal disease: *B. abortus* causes abortion (in pregnant animals but not in pregnant women) & sterility of male animals due to presence of

erythritol in animal reproductive tissue and placenta of pregnant cattles, which considered as a growth factor for this organism. causes abortion & sterility

• From animals to animals & humans by:

◦ Abrasion in skin

◦ Inhalation

◦ Ingestion of contaminated milk & cheese

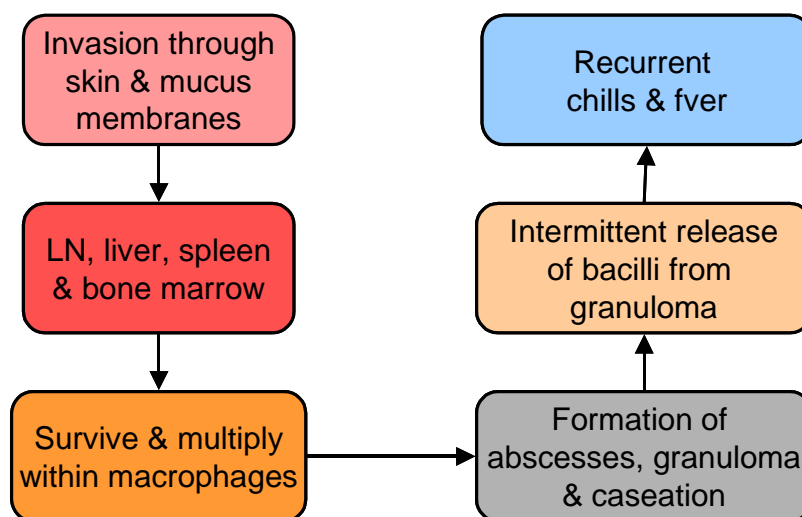
• **Persons at High Risk**

◦ Dairy workers & farmers

◦ Live stock handlers & veterinarians

◦ Slaughterhouse employees

PATHOGENESIS OF BRUCELLOSIS (Undulating fever)



- Infection of mammary glands of both animals & humans occur. Bacilli shed in milk
- Placental transfer & fetal infection occurs only in animals due to presence of erythritol in placental tissues

- *Initially influenza-like*
- *Undulating (rising & falling) fever for weeks & months*