

Xenopsylla cheopis

Vector for pathogens

Xenopsylla cheopis



500 μm

Pasteurella

- **Clinical Manifestations**

- In cattle, sheep and birds *Pasteurella* causes a life-threatening pneumonia. In humans, *Pasteurella* causes chronic abscesses on the extremities or face following cat or dog bites.

- **Structure, Classification, and Antigenic Types**

- *Pasteurellae* are **small, nonmotile, Gram-negative coccobacilli** often exhibiting bipolar staining. *Pasteurella multocida* occurs as **four capsular types** (A, B, D, and E), and **15 somatic antigens** can be recognized on cells stripped of capsular polysaccharides by acid or hyaluronidase treatment. *Pasteurella haemolytica* infects cattle and horses.

- **Pathogenesis**

- Human abscesses are characterized **by extensive edema and fibrosis**. Encapsulated organisms resist phagocytosis. Endotoxin contributes to tissue damage.

- **Host Defenses**

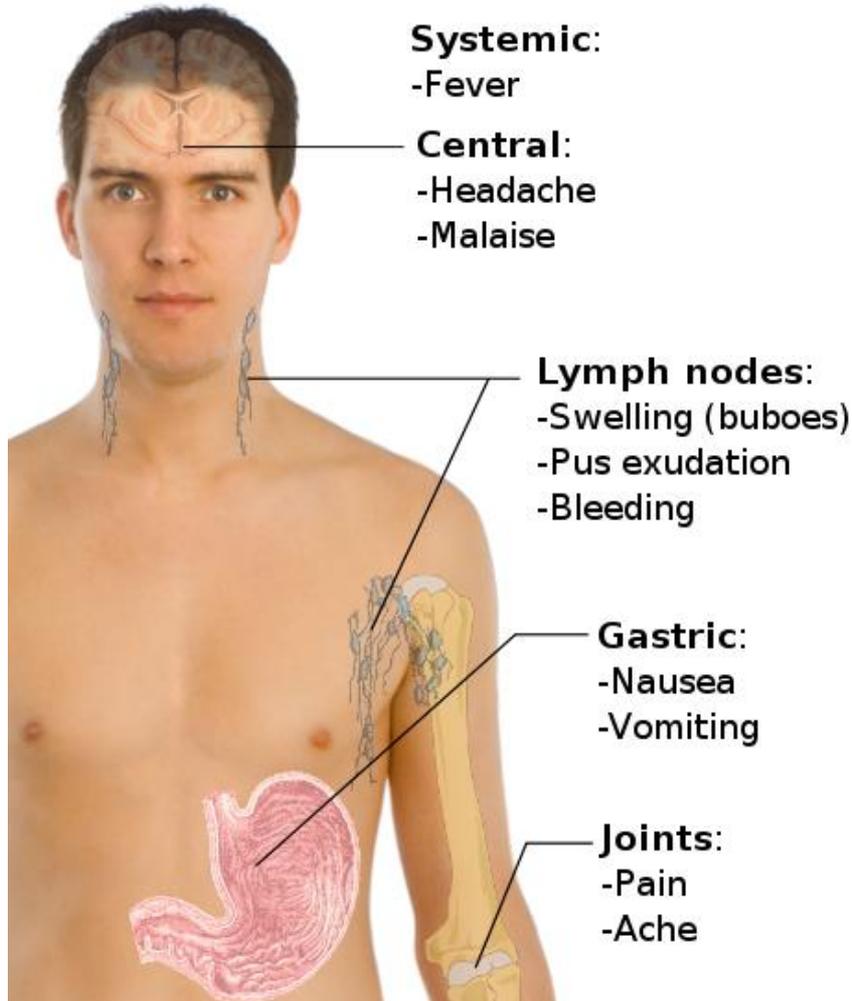
- Encapsulated bacteria are not phagocytosed by polymorphs unless **specific opsonins** are present. Acquired resistance **is humoral**.

- **Epidemiology**

- *Pasteurella* species are primarily pathogens of cattle, sheep, fowl, and rabbits. Humans become infected by handling infected animals.

Pasteurella

Symptoms of Bubonic plague



Pasteurella

- **Diagnosis**

- Diagnosis depends on clinical appearance, history of animal contact, and results of culture on blood agar. Colonies are small, nonhemolytic, and iridescent. The organisms are identified **by biochemical and serologic methods.**

- **Control**

- Several vaccines are available for animal use, but their effectiveness is controversial. No vaccines are available for human use. Treatment requires drainage of the lesion and prolonged multidrug therapy. *Pasteurella multocida* is susceptible to **sulfadiazine, ampicillin, chloramphenicol, and tetracycline.**

Yersinia

- **Clinical Manifestations**

- *Yersinia pestis* causes **bubonic and pneumonic plague**. Bubonic plague is transmitted by the bite of infected rat fleas. Swollen, blackened lymph nodes (**buboes**) develop, followed by septicemia and hemorrhagic pneumonia and death. The pneumonic form spreads directly from human to human via respiratory droplets. Outbreaks are explosive in nature, and invariably lethal. *Yersinia enterocolitica* causes **severe diarrhea and local abscesses**, and *Y pseudotuberculosis* causes severe enterocolitis.

- **Structure, Classification, and Antigenic Types**

- *Yersinia* are small, Gram-negative coccobacilli showing bipolar staining. The capsular or envelope antigen is heat labile. **Somatic antigens V and W** are associated with virulence.

- **Pathogenesis**

- In bubonic plague, the bacilli spread from a local abscess at the flea bite site to draining lymph nodes; followed rapidly by **septicemia and hemorrhagic pneumonia**. *Yersinia enterocolitica* enters via the Peyer's patches following ingestion of contaminated water or food and cause **severe liver and splenic abscesses**. *Yersinia pseudotuberculosis* causes enlarged, caseous nodules in the Peyer's patches and mesenteric lymph nodes.

Yersinia

- **Host Defenses**

- Specific anti-envelope antibodies are opsonic and protective. Cell-mediated resistance may also be involved.

- **Epidemiology**

- *Yersinia pestis* is primarily a rat pathogen. Human infections are initially transmitted by rat fleas, but later the disease may shift into the pneumonic form and continue by direct person- to-person spread. *Yersinia enterocolitica*, a pathogen of deer and cattle spreads to humans via contaminated drinking water.

- **Diagnosis**

- Early clinical diagnosis is essential in plague. Blood cultures are positive for *Y. pestis*. Sputum may show large numbers of small bacilli when stained with fluorescent antibody. *Yersinia pestis* is an extremely infectious hazard for nursing and laboratory personnel.

- **Control**

- Control of rats and rat fleas is crucial. Laboratory personnel should be vaccinated. *Yersinia pestis* is susceptible to **sulfadiazine, streptomycin, tetracycline, and chloramphenicol**. *Yersinia enterocolitica* is best controlled by purifying drinking water and pasteurizing dairy products. *Yersinia pseudotuberculosis* disease requires aggressive treatment with **ampicillin and tetracycline**.

Rickettsia

- **Clinical Manifestations**

- Rickettsia species cause **Rocky Mountain spotted fever**, rickettsialpox, other spotted fevers, **epidemic typhus**, and murine typhus. Orientia (formerly Rickettsia) tsutsugamushi causes scrub typhus. Patients present with febrile exanthems and visceral involvement; symptoms may include nausea, vomiting, abdominal pain, encephalitis, hypotension, acute renal failure, and respiratory distress.

- **Structure, Classification, and Antigenic Types**

- Rickettsia species are small, Gram-negative bacilli that are obligate intracellular parasites of eukaryotic cells. This genus consists of two antigenically defined groups: spotted fever group and typhus group, which are related; scrub typhus rickettsiae differ in lacking lipopolysaccharide, peptidoglycan, and a slime layer, and belong in the separate, although related, genus Orientia.

- **Pathogenesis**

- Rickettsia and Orientia species are transmitted by the bite of infected ticks or mites or by the feces of infected lice or fleas. From the portal of entry in the skin, rickettsiae spread via the bloodstream to infect the endothelium and sometimes the vascular smooth muscle cells. Rickettsia species enter their target cells, multiply by binary fission in the cytosol, and damage heavily parasitized cells directly.

- The clinical symptoms of other spotted fevers are very similar to Rocky mountain spotted fever



Early (macular) rash on sole of foot.



Late petechial rashes on palm and forearm.

Rickettsia

- **Host Defenses**
 - T-lymphocyte-mediated immune mechanisms and **cytokines, including gamma interferon and tumor necrosis factor alpha**, play a more important role than antibodies.
- **Epidemiology**
 - The geographic distribution of these **zoonoses** is determined by that of the infected arthropod, which for most rickettsial species is the reservoir host.
- **Diagnosis**
 - Rickettsioses are difficult to diagnose both clinically and in the laboratory. Cultivation requires viable eukaryotic host cells, such as antibiotic-free cell cultures, embryonated eggs, and susceptible animals. Confirmation of the diagnosis requires comparison of acute- and convalescent-phase serum antibody titers.
- **Control**
 - *Rickettsia* species are susceptible to the broad-spectrum antibiotics, **doxycycline, tetracycline, and chloramphenicol**. Prevention of exposure to infected arthropods offers some protection. A vaccine exists for epidemic typhus but is not readily available.