

## Occupational Health - Zoonotic Disease Fact Sheet

### **YERSINIA PESTIS**

#### **KEY FACTS:**

- Better known as the Plague, or Black Death, plague is a disease that affects humans and other mammals and is caused by the bacterium *Yersinia pestis*.
- The first recorded outbreak of bubonic plague, known as the Plague of Justinian, occurred in 531, killing thousands of people in Constantinople, Egypt, and along the eastern Mediterranean.
- The second pandemic of plague, known then as the "Black Death," originated in Mesopotamia about the middle of the 11th century, attained its height in the 14th century and did not disappear until the close of the 17th century.
- Beginning in Europe in 1367, the plague epidemic continued for more than 60 years, killing as much as a quarter of the European population. Spread by the bite of infected fleas, the Black Death traveled rapidly through overcrowded cities with poor sanitation.

**SPECIES:** Wild rodents, however, the disease is also associated with humans, cats, goats, camels, rabbits, dogs, and coyotes. Dogs and cats may serve as passive transporters of infected rodent fleas into the home or laboratory.

**CAUSATIVE AGENT:** *Yersinia pestis*, a gram negative coccobacillus.

**TRANSMISSION:** Plague can be transmitted through the bite of an infected flea, contact with contaminated fluid or tissue, or from inhalation of infectious droplets. A protein secreted by the *Yersinia* is a coagulase that causes blood ingested by the flea to clot in the proventriculus. The bacillus proliferates in the proventriculus, and thousands of organisms are regurgitated by obstructed fleas and inoculated intradermally into the skin. This coagulase is inactive at high temperatures and is thought to explain the cessation of plague transmission during very hot weather. Flea bite exposure may result in primary bubonic plague or septicemic plague; contact with contaminated fluid or tissue primarily results in bubonic or septicemic plague; contact with infectious droplets results in the pulmonary form of infection.

**DISEASE IN ANIMALS:** Dogs usually have a brief self-limiting illness, while cats usually exhibit severe and often fatal infection, with fever, lymphadenopathy, hemorrhagic pneumonia, and encephalitis. Rodents may carry the disease asymptotically or develop fatal disease. Infected rats and squirrels frequently die unless they are from an enzootic area and have acquired immunity.

**DISEASE IN HUMANS:** According to the Centers for Disease Control, plague can present in humans in three forms: bubonic, septicemic, and pneumonic plague. In bubonic plague, patients develop a sudden onset of fever, headache, chills, and malaise and one or more swollen, tender, and painful lymph node called buboes. With septicemic plague, patients develop fever, chills, extreme weakness, abdominal pain, shock, and possibly bleeding into the skin and other organs. Skin and other tissues may turn black and die. This is most common on fingers, toes, and the

nose. Pneumonic plague is systemic plague with lung involvement. Patients develop fever, headache, weakness, and a rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery mucous. Mortality rates for untreated individuals range from 30-60 percent for bubonic plague and is almost always fatal for both septicemic and pneumonic plague if left untreated.

**DIAGNOSIS:** In many cases, particularly in septicemic and pneumonic plague, there are no obvious signs that indicate plague. Diagnosis is made by taking samples from the patient and performing laboratory tests. Impression smears of aspirates or blood stained with gram or Giemsa. Organisms have a typical "safety pin" appearance. *Please review current literature before prescribing diagnostic testing as recommendations may have changed.*

**TREATMENT:** Plague is treatable with common antibiotics, including streptomycin with tetracycline or chloramphenicol. *Please consult with your physician for treatment options as recommendations may have changed.*

**PREVENTION\CONTROL:** Wild rodents should be controlled and fleas should be eliminated. It is important to control rodents and fleas for outdoor housed animals. Sentinel animal programs have been used in endemic areas. Appropriate personal protective equipment is important. Masks, gowns, and gloves should be worn when handling cats suspected to be infected, and all contaminated surfaces disinfected. Vaccines are available for high risk personnel. To prevent and control unintended infections, use uninfected animals for research, and isolate any animals used in clinical trials. Additionally, only conduct projects in laboratories with proper engineering controls and train staff members in the proper use of required personal protective equipment when they are in spaces containing live agent.

More information on Yersinia Pestis can be found on the Centers for Disease Control and Prevention website at: <https://www.cdc.gov/plague/index.html>