

PLAGUE in NEW MEXICO: INFORMATION FOR VETERINARIANS

General Information

Plague is caused by *Yersinia pestis*, a gram-negative bacterium that is endemic to most of the western United States. Epizootics of plague occur in wild rodents (rock squirrels, prairie dogs, ground squirrels, chipmunks, woodrats, and others) and most people acquire plague by the bite of an infectious rodent flea. However, about one-fifth of all human cases result from direct contact with infected animals. Cats are particularly susceptible to plague and can play a role in transmission to humans by a variety of mechanisms including transporting infected fleas or rodent/rabbit carcasses into the residential environment, direct contact contamination with exudates or respiratory droplets, and by bites or scratches. Cat-associated human cases were first reported in 1977. In a study by Gage (2000), 23 human plague cases were associated with exposure to infected cats, including 5 cases among veterinarians and veterinary assistants. Dogs are frequently infected with *Y. pestis*, develop antibodies to the organism, and occasionally exhibit clinical signs. However, dogs have not been shown to be direct sources of human infection. Dogs can transport infected fleas or rodent/rabbit carcasses into the residential environment, leading to plague transmission to people. Plague-infected ungulates have rarely been identified.

Plague in Cats and Dogs

Clinical features

In enzootic areas, plague should be considered in the differential diagnosis of fever of unknown origin in cats and dogs. In a study of plague in cats by Eidson (1991), 53% of cats had bubonic plague, 8% were septicemic, and 10% had plague pneumonia. In 29% of the cats, the form of illness was unknown but was presumed to be septicemic. Of cats with bubonic plague, 75% had submandibular lymphadenitis. Abscessed lymph nodes can be clinically indistinguishable from abscesses due to other causes (e.g. bite wounds). Fever, lethargy and anorexia are common in both cat and dog cases and oral lesions are often present. In addition to pneumonia, cats with advanced disease may develop DIC, multi-organ failure and other complications of gram-negative sepsis. Untreated, approximately 38% of cat cases will be fatal.

Laboratory Diagnosis

Because of zoonotic concerns, it is important to collect and submit samples for diagnostic testing. Samples should be placed on ice or frozen, and shipped via courier to the New Mexico Department of Agriculture's Veterinary Diagnostic Services (VDS) which is located in Albuquerque.

Antemortem Samples *Fluorescent antibody (FA) and culture:* Swabs of lesions using culturettes (oral cavity, draining lymph nodes), whole blood, or lymph node aspirate are the preferred samples, if available. If there is evidence of plague pneumonia, get a pharyngeal swab using a culturette. Aspirates may be left in the syringe for shipment or transferred to a culturette. An air-dried glass slide smear of a bubo aspirate can also be submitted for FA testing. *Serology:* Acute and convalescent serum (0.5 ml), collected at least 14 days apart. In enzootic areas, dogs and cats that roam and hunt may retain titers from previous infections so interpretation on single serology is problematic. A four-fold rise between acute and convalescent titers is confirmatory. A naive animal acutely ill with plague or tularemia may not have detectable antibodies until day 9 or later after exposure, so a single acute negative titer cannot rule out these diseases. NOTE: It is preferable to collect specimens for culture prior to administering antibiotics, but samples should still be collected if antibiotics have been given.

Postmortem Samples Tularemia can be clinically indistinguishable from plague and is easily aerosolized, causing a hazard for veterinarians and their staff if necropsies are performed outside of a Bio-Safety level 2 hood and without appropriate personal protective equipment. If it can be done safely, then appropriate samples include lymph node aspirate and tissues from lymph node, liver, spleen, lung, or whole blood. Tissue samples should be placed in a clean container, (do NOT use formalin or alcohol). As a safer alternative, the entire carcass may be submitted to VDS for necropsy. Please call ahead so VDS staff can take appropriate measures.

Management and Therapy

In addition to thorough physical examination, auscultation and x-rays of the chest should be done to check for the possibility of plague pneumonia. A flea control product that kills fleas on contact (e.g. fipronil) should be applied to the cat.

Due to the rapid progression of this disease, treatment for suspected plague (and infection control practices) should be started before a definitive diagnosis is obtained. Streptomycin has been considered the drug of choice in human cases but is difficult to obtain and rarely used today. Gentamicin is currently used to treat most human plague cases and should be considered a suitable alternative choice in veterinary medicine for seriously ill patients, although it is not approved for this purpose. Animals with renal failure or severe dehydration will require adjusted dosages. Doxycycline is appropriate for treatment of less complicated cases. It can also be used to complete treatment of seriously ill patients after clinical improvement and where potential toxic side effects of gentamicin are a consideration. Tetracycline and chloramphenicol are also options. In treatment studies with experimentally infected mice, the fluoroquinolones performed as well as streptomycin. No veterinary clinical trials have been performed on fluoroquinolones however there is growing evidence from their use by veterinarians in enzootic areas that they are effective in the treatment of plague in dogs and cats. The recommended duration of treatment is 10 to 21 days with clinical improvement (including defervescence) expected within a few days of initiation of treatment. Penicillin analogs and cephalosporins are not efficacious against plague.

Because of the risk of disease transmission to their owners, cats should not be sent home immediately, but should be hospitalized and placed in isolation, especially if there is evidence of pneumonia. The duration of infectivity in treated cats has not been studied, but cats are thought to be noninfectious after 72 hours of appropriate antibiotic therapy with evidence of clinical improvement. Patients receiving parenteral antibiotics may be switched to oral therapy upon clinical improvement.

Risks to Veterinarians, Veterinary Staff and Pet Owners

Every case of cat plague represents a potential risk for human exposure and illness. Acquiring primary pneumonic plague from cats is a particular risk for veterinarians, their assistants and pet owners. In addition, bubonic plague or primary plague septicemia can result from contact with infectious tissues, exudates, or fleas.

Personal Protection: Any exudates and the oral cavity should be considered infectious. In pneumonic plague, spread occurs by respiratory droplet, requiring close patient contact for transmission to occur. Masks, gloves and eye guards should be worn when examining and treating cats suspected of having plague. Exudates should be considered infectious and any material used for treating suspect cats should be disinfected, autoclaved, or incinerated.

Veterinary clinic personnel should be advised of these risks and advised to consult their physician and state health department in the event of possible exposure to an infected cat. If you suspect that you have been exposed to *Y. pestis* and develop febrile illness, seek medical attention immediately. The usual incubation period for bubonic plague in humans is 2 to 7 days. The incubation period for primary pneumonic plague is considerably shorter, only 1 to 3 days. Most fatalities are a result of a delay in appropriate antimicrobial therapy.

Advising clients: Owners of cats with suspected plague should be advised to consult their physician and state health department. Animal owners in plague enzootic areas should be advised to confine pets and to apply a flea control product to pets which go outside. This is especially important during the most common periods of plague transmission (March through October). Clients should be warned that pets should not share sleeping areas with family members. All ill animals, especially cats, should be seen by a veterinarian.

Contacting Health Officials

It is *extremely important* that public health officials be notified promptly when plague is suspected. Public health officials can assist in follow-up of potentially exposed persons, consult with the veterinarian, veterinary staff, and the owner's physician about the need for antibiotic prophylaxis, do an environmental risk assessment at the owner's home and provide community education. The New Mexico Department of Health's Epidemiology and Response Division can be contacted at 505-827-0006 for follow up. Ask for the on-call person.

References

Eidson M, Thilsted JP, Rollag OJ. Clinical, clinicopathologic, and pathologic features of plague in cats: 119 cases. *J Am Vet Med Assoc* 1991;199(9):1191-1197.

Gage KL, Dennis DT, Orloski KA, Ettestad P, Brown TL, Reynolds PJ, Pape WJ, Fritz CL, Carter LG., and Stein JD. Cases of human plague associated with exposure to infected domestic cats. *Clin. Infect. Dis.* 30:893-900. 2000.