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***Yersinia Pestis* Infection in Cats: ABCD guidelines on prevention and management**

Maria Grazia Pennisi, Herman Egberink, Katrin Hartmann, Albert Lloret, Diane Addie, Sándor Belák, Corine Boucraut-Baralon, Tadeusz Frymus, Tim Gruffydd-Jones, Margaret J Hosie, Hans Lutz, Fulvio Marsilio, Karin Möstl, Alan D Radford, Etienne Thiry, Uwe Truyen and Marian C Horzinek
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YERSINIA PESTIS INFECTION IN CATS

ABCD guidelines on prevention and management



Maria Grazia Pennisi, Herman Egberink, Katrin Hartmann, Albert Lloret, Diane Addie, Sándor Belák, Corine Boucraut-Baralon, Tadeusz Frymus, Tim Gruffydd-Jones, Margaret J Hosie, Hans Lutz, Fulvio Marsilio, Karin Möstl, Alan D Radford, Etienne Thiry, Uwe Truyen and Marian C Horzinek

Overview: Plague, the medieval ‘Black Death’, is caused by a Gram-negative coccobacillus, *Yersinia pestis*, which also infects cats. As in people, it is transmitted from rodents through flea bites; it occurs in Asia, Africa and the Americas in flea-infested regions, all year round, and where rodent reservoirs are abundant. A poor prognosis is associated with high fever, and the pulmonary and septicaemic forms. Antibiotic therapy, flea control and avoidance of rodent contacts have made this infection manageable.

Agent properties

Yersinia pestis, a Gram-negative coccobacillus that belongs to the family *Enterobacteriaceae*, is the causative agent of plague, a rare but often fatal zoonosis of historical significance in Europe (Black Death). *Y. pestis* is resistant to low temperatures and freezing, and sensitive to high temperatures.¹

Epidemiology and vectors

Plague occurs in Asia, Africa and the Americas in semi-arid areas, where fleas are active all year round and rodent reservoirs are abundant. Epizootics in rodents expose humans and domestic animals to plague.¹ Transmission occurs via flea bite or ingestion of infected rodents or lagomorphs.² Less common is transmission through mucous membranes, skin lesions or inhalation of infected aerosols from individuals suffering from the pulmonary form. *Xenopsylla cheopis* fleas that have fed on bacter-aemic rodents are efficient transmitters of the infection – for more than 1 year – to nearly all mammals. However, not all flea species are efficient vectors: *Ctenocephalides* species are considered poor transmitters of plague.¹

European Advisory Board on Cat Diseases

The European Advisory Board on Cat Diseases (ABCD) is a body of experts in immunology, vaccinology and clinical feline medicine that issues guidelines on prevention and management of feline infectious diseases in Europe, for the benefit of the health and welfare of cats. The guidelines are based on current scientific knowledge of the diseases and available vaccines concerned.

The latest version of the *Yersinia pestis* infection in cats guidelines is available at www.abcd-vets.org

Clinical signs

The prognosis for a cat with high and continual fever is poor.³ The bubonic form is most common and usually involves the mouth (necrotic stomatitis) and mandibular or sublingual lymph nodes when the infection is acquired by preying on infected rodents; drainage of abscesses is a favourable prognostic factor (Figure 1). Septicaemic forms may involve any organ (mainly the lungs), with a clinical presentation of endotoxic septic shock and death in 48 h. The pulmonary form has the worst prognosis and may derive from one of the previous forms or, rarely in the cat, occur as the primary form.^{2,4} The overall mortality rate is about 50%.¹

Diagnosis

Clinical suspicion is confirmed by cytology on smears from draining lesions, where only Gram-negative organisms with a bipolar safety-pin shape are seen.¹ Bacteria can be isolated from the tonsils, blood or other infected tissues by reference laboratories; transportation is subject to class II precautions (hazardous agents). A fourfold rise in antibody titre on serology confirms an acute infection [EBM grade III].¹

Treatment

Gentamicin is the drug of choice; doxycycline is used in less severe cases (bubonic form) or for prevention [EBM grade III].⁵



Figure 1 Cat recovering from plague and submandibular bubo. Image courtesy of the Centers for Disease Control and Prevention, www.bt.cdc.gov; <http://emergency>

Cats are considered the most important domestic animal involved in plague transmission to humans.



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Conflict of interest

The authors do not have any potential conflicts of interest to declare.

EBM grades

The ranking system for grading the level of evidence of various statements within this article is described on page 533 of this Special Issue.

Disease in humans

An infected flea bite leaves no lesion at the site of inoculation; mononuclear cells carry *Y pestis* to the regional lymph node, where the 'bubo' develops – a swelling with necrosis and suppuration with fistulous tracts (bubonic form). Subsequent dissemination may follow in a few days to the lungs (pulmonary form) and to other lymph nodes and tissues, which may show similar lesions (septicaemic form). In cases of ingestion or inhalation, the incubation period is even shorter. The clinical course may be rapid because of the development of endotoxic shock and disseminated intravascular coagulation; otherwise it lasts for 2–3 weeks.^{1,6} Any delay in diagnosis and treatment increases the risk of mortality.⁷

Zoonosis

Y pestis is the causative agent of plague.



Recommendations for avoiding zoonotic transmission from the cat

Between 1977 and 1988, several human cases were reported from the USA, in veterinarians, their technicians and in owners of sick cats.¹ Cats are considered the most important domestic animal involved in plague transmission to humans. Outdoor cats in endemic areas may transmit the infection to their owners or to veterinary personnel. Close contacts (like sharing the bed) are associated with a higher risk of human plague.^{8,9} Standard hygiene measures and strict flea control should be implemented in endemic areas. Suspected cases must be kept in isolation and protective gloves, clothes, goggles and facemasks must be used by the clinic staff.

Vaccines are available for humans only.

KEY POINTS

- ❖ Plague is a zoonosis with a fatal outcome, if left untreated.
- ❖ Plague is caused by *Y pestis*, a Gram-negative coccobacillus that is resistant to low temperatures.
- ❖ Plague occurs in Asia, Africa and the Americas in areas where fleas are active all year round and rodent reservoirs are abundant.
- ❖ Transmission occurs via flea bites or ingestion of infected rodents or lagomorphs; not all flea species are efficient vectors.
- ❖ Different clinical forms are found; a poor prognosis is associated with high fever, and the pulmonary and septicaemic forms.
- ❖ The bubonic form is common and manifests with necrotic stomatitis.
- ❖ Drainage of abscesses is a favourable prognostic factor.
- ❖ Overall mortality is about 50%.
- ❖ Diagnosis is confirmed by cytology on smears from draining lesions or by serology.
- ❖ The bacterium can be isolated from tonsils, blood or other infected tissues by reference laboratories; transportation is subject to class II precautions.
- ❖ Gentamicin is the drug of choice; doxycycline is used in mild cases (bubonic form) or for prevention.
- ❖ Prevention is based on flea control and avoidance of contact with mice.
- ❖ Veterinarians, technicians and owners of diseased cats are at risk.



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