**CYTAUXZOOONOSIS**

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<th>Animal Group(s) Affected</th>
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<td>Felids, wild and domestic</td>
<td>Tick-borne (Amblyomma americanum and Derma-centric variabilis)</td>
<td>Domestic cats and some exotic felids: some cats develop no clinical signs while others may develop high fever, lethargy, dyspnea, depression, dehydration, anorexia, anemia, hepatosplenomegaly, and/or jaundice; others die acutely. Exotic felids often show no clinical signs.</td>
<td>Non-clinical or mild to severe including death; could depend on numerous factors such as species of felid, strain or genotype of parasite, or other unknown factors.</td>
<td>Mortality is generally high even with treatment. A combination of atovaquone and azithromycin seems to have the highest success rates.</td>
<td>Avoid contact with ticks by keeping cats indoors. Outside cats should have effective acaricides applied. No vaccine available.</td>
<td>No</td>
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**Susceptible animal groups:** Felids. *Cytauxzoon felis* has been reported from domestic cats, bobcats (*Lynx rufus*), puma (*Puma concolor*), and captive exotic felids (e.g., tigers [*Panthera tigris*]). *C. manul* infects the Pallas cat. *Cytauxzoon* spp., some genetically similar to *C. felis*, have been reported from domestic cats and numerous free-ranging and/or captive exotic felids in South America and Europe.

**Causative organism:** *Cytauxzoon* spp. are Apicomplexan parasites in the Order Piroplasmida, which are related to important human and veterinary pathogens in the genera *Babesia* and *Theileria* spp. In the US, *C. felis* is the causative agent of cytauxzoonosis in domestic cats and some exotic felids. Bobcats, and other wild felids (e.g., cougars), are the natural reservoir but chronically infected domestic cats can serve as a source of infection for ticks. Outside the US, other species or genetic variants of *C. felis* infect wild and domestic felids; however, clinical cytauxzoonosis is rare.

**Zoonotic potential:** None

**Distribution:** *C. felis* has been reported from numerous states in the eastern US but is likely found throughout the range of the vector(s) and the main wildlife reservoir (bobcats). Other species of *Cytauxzoon* have been reported in parts of South America, Europe and Asia. Some of the *Cytauxzoon* likely represent novel species or have been described as separate species (e.g., *C. manul*), but recent genetic data indicates that *Cytauxzoon* from Brazil is closely related to *C. felis* from the US. Exotic felids kept in enclosures that allow tick exposure within the natural range of any *Cytauxzoon* spp. are at risk of infection.

**Incubation period:** *C. felis* can typically be detected in erythrocytes of infected cats approximately 1-3 weeks after an infected tick bite. Clinical signs typically occur 5-16 days after infected tick bite.

**Clinical signs:**  
Domestic cats: The majority of domestic cats develop severe clinical disease but some never develop clinical signs, but remain chronic carriers. Those with clinical signs may develop high fever, lethargy, dyspnea, depression, dehydration, anorexia, anemia, hepatosplenomegaly, and/or jaundice.  
Captive wild/exotic felids: Development of clinical signs is highly variable and may depend on felid species,
strains of parasite, or some other factor. Fatal cases have been reported in a tiger housed in Florida and lions in Brazil; however, asymptomatic infections have been detected in tigers in US and ocelots (*Leopardus pardalis*), oncilla (*L. tigrinus*), jaguar (*Panthera onca*), and puma in Brazil.

Wild felids (natural reservoirs): Wild reservoir species rarely develop clinical signs but very rare acute mortality has been reported among young bobcats. In addition, three infected cougar in the US developed a transient anemia and increased serum bilirubin concentrations and increased alanine aminotransferase and aspartate aminotransferase activities soon after infection; however, all recovered rapidly without treatment.

### Clinical pathological, gross, and histopathological findings:
Parasitemia of *C. felis* on blood smears is generally low (<5%), even for clinically ill felids. Leukopenia or pancytopenia may be present as well as thrombocytopenia and normocytic, normochromic anemia. Gross lesions are typically severe as death occurs due to severe occlusions of vessels by developing parasites. Felids may have pale or icteric mucous membranes, petechiae and ecchymoses in the lung, heart, lymph nodes and on mucous membranes, splenomegaly, lymphadenomegaly, and hydropericardium. Numerous large schizonts will be noted in the cytoplasm of infected macrophages that often occlude the lumens of numerous vessels of many tissues, especially the lungs. Despite the large numbers and size of schizonts, a lack of inflammatory reaction generally is present.

### Diagnosis:
Pyroplasms may be detected in stained thin blood smears if sufficiently high parasitemias are present; however, subclinical chronic carriers generally have very low parasitemias. Although feline babesiosis has not been reported in domestic cats in the US, *C. felis* trophozoites are morphologically similar to other small piroplasms so PCR testing is necessary to definitive identify *C. felis*. If possible, a fine needle aspiration of a peripheral lymph node, spleen, or liver should be performed to identify schizonts in macrophages. These intracellular schizonts are not found in babesiosis cases so can be used to definitively identify *Cytauxzoon* infections. Several PCR protocols have been developed for the detection of *C. felis*. If PCR assays are not specific to *C. felis*, amplicons should be sequenced to confirm identification as other piroplasms can infect felids, especially wild felids.

### Material required for laboratory analysis:
Thin blood smears fixed and stained for detection of piroplasms and anticoagulated whole blood (for PCR testing and preparation of thin blood smears). Formalin fixed needle biopsies of tissues for histologic evaluation for schizonts.

### Relevant diagnostic laboratories:
Many diagnostic laboratories have PCR based assays for *C. felis*.

### Treatment:
Despite treatment, mortality rates can be high. The greatest success has been obtained using atovaquone (15 mg/kg, PO, tid for 10 days) and azithromycin (10 mg/kg, PO, sid for 10 days) with supportive care (fluid therapy and heparin). Limited success has been obtained using imidocarb and diminazene diaceturate while even less success has been obtained using parvaquone, buparvaquone, trimethoprim/sulfadiazine, and sodium thiacetarsamide.

### Prevention and control:
Because *Cytauxzoon* is tick-borne, limiting exposure of felids to ticks is necessary to prevent transmission. For domestic cats, the best prevention is to keep cats indoors. For exotic or wild felids or domestic cats that are allowed outdoors, an effective acaricide or acaricide-treated collar should be used to prevent or limit tick infestation. If possible, tick checks can also decrease risk by finding and removing ticks prior to transmission. Habitat modification can also be used around a premise to decrease local habits for ticks which should decrease tick infestation rates of animals.

### Suggested disinfectant for housing facilities:
Prevent tick-exposure

### Notification:
None

### Measures required under the Animal Disease Surveillance Plan:
None

### Measures required for introducing animals to infected animal:
This parasite is tick-borne so direct contact between animals is not a risk factor for infection. However, tick prevention should be implemented.

### Conditions for restoring disease-free status after an outbreak:
Not applicable
Experts who may be consulted:

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