COLLEGE OF VETERINARY MEDICINE
& BIOMEDICAL SCIENCES
Department of Veterinary Pathobiology

TEXAS A&M UNIVERSITY

C. L. Davis South-Central Division 2016 Annual Meeting

October 8-9, 2016
Galveston, Texas

Presenter: Alycia Fratzke, DVM

Contributors: Drs. Raquel Rech and Maureen O'Brien
Department of Veterinary Pathobiology
College of Veterinary Medicine and Biomedical Sciences
Texas A&M University
College Station, TX 77843-4467
afratzke@cvm.tamu.edu

Case Number: AFratzke – CLD 2016

Signalment: Adult, female intact, mixed-breed cat

History:
The cat was found in Kansas on 5/26/16. It was diagnosed by a local veterinarian with anemia, thrombocytopenia, low creatinine, hypocalcemia and hyperbilirubinemia and was given doxycycline and a steroid injection. The cat was presented to TAMU Emergency Service on 5/31/16 for ataxia, lethargy, and icterus. She was diagnosed with abdominal effusion and severe anemia and thrombocytopenia, before being humanely euthanized and submitted for necropsy.

Gross findings:
The mucous membranes were diffusely icteric. Approximately 150 mL and 300 mL of, yellow fluid containing strands of fibrin was in the thoracic and abdominal cavities, respectively (bicavitary fibrinous effusion). The lungs, spleen, liver, left renal cortex, and peritoneal surface of the diaphragm contained numerous 0.5-2 mm, tan-yellow, raised, irregular nodules. The tracheobronchial, mesenteric, and ileocolic lymph nodes were moderately to severely enlarged and mottled tan to dark red on cut surface.

Histologic findings:
Liver: Multifocally are random foci of lytic necrosis with abundant cellular and karyorrhectic debris surrounded by aggregates of macrophages and neutrophils. Occasionally, vessel walls are effaced by moderate numbers of macrophages, lymphocytes, neutrophils and fibrin (vasculitis) and vessel lumens are occluded by aggregates of fibrin and inflammatory cells.
Lymph Node: Replacing approximately 90% of the parenchyma are irregular areas of lytic necrosis admixed with degenerate neutrophils. The edges of the necrotic area are lined by moderate numbers of macrophages and lymphocytes. Multifocally, endothelial cells are plump and reactive and the vascular lumen contains moderate amounts of fibrin (vasculitis).
Spleen: Multifocally throughout the parenchyma are irregular foci of lytic necrosis surrounded by macrophages with fewer lymphocytes and mild hemorrhage. The remaining white pulp is hypocellular.

Morphologic Diagnosis:
Liver, Lymph Node, Spleen: Multifocal, mild to severe, necrotizing hepatitis, lymphadenitis and splenitis with fibrinocellular vasculitis and intravascular thrombi;

Additional Tests:
Culture and Immunofluorescence Assay at CDC: Positive for *Francisella tularensis*

Comments:
The findings in this case are consistent with systemic tularemia due to infection by *Francisella tularensis*. *F. tularensis* is a gram negative, pleomorphic coccobacillus that is capable of infecting a wide range of species including mammals, birds, reptiles, and ticks. [1,5] Tularemia was first reported as a plague-like disease of ground squirrels in Tulare county, California in 1911. In 1947, the agent was named *Francisella tularensis* in honor of the US Public Health Service surgeon who performed extensive research into the disease, Edward Francis, and the county in which the disease was first discovered.[1] *F. tularensis* is also an important zoonotic disease in humans, with a very low infectious dose of 10-50 organisms, and a mortality rate of up to 60%, if left untreated.[1] Despite, the bacteria's origin of discovery, the majority of cases reported to the CDC originate from Arkansas, Missouri, Oklahoma, South Dakota, Massachusetts, and Kansas, usually in summer months coinciding with increased transmission from arthropod vectors.[2] *F. tularensis* survives readily in the environment, persisting for weeks to months in fresh water, soil, animal fodder and carcasses. Transmission has been associated with bite or direct contact with an infected animal, tick bite, ingestion of contaminated food or water, and aerisolization.[1,4] The main pathogenic forms of *F. tularensis* are Jellison type A (*F. tularensis* subspecies *tularensis*), which is the more virulent type and found in North America, and Jellison type B (*F. tularensis* subspecies *holartica*) which is found in Europe and Asia.[1]

Clinical signs are variable, ranging from mild lymphadenopathy and fever to severe infection and death. Cats appear to be more susceptible to severe and systemic infection than other domestic species.[1] Clinical signs of systemic infection in cats include icterus, anorexia, organomegaly, anorexia, oral ulcerations and pneumonia.[5] Clinical illness in dogs is far more rare, and usually self-limiting, despite the prevalence of seroconversion. Similarly, sheep appear to be far more susceptible to disease than cattle. Outbreaks of high morbidity and mortality in sheep usually occur following severe winter weather and poor body condition with heavy tick infestations. [1,4] Tularemia in horses has been rarely described, but resulted in death of 2 out of 5 foals reported.[1] In humans, there are seven different forms of tularemia infection: ulceroglandular, glandular, oculoglandular, oropharyngeal, pneumonic, typhoidal and septicemic tularemia, depending on the route and severity of infection.[2,3]

F. tularensis is a facultative intracellular bacteria that infects macrophages and disseminates to major organs hematogenously, most commonly affecting the spleen, liver, lymph nodes and lungs.[1] On gross examination, hepatomegaly and splenomegaly have been reported in cats with numerous, small, gray to yellow foci of necrosis in the liver, spleen and lungs. Lymphoadenopathy is also common and fibrinonecrotic pneumonia may occur.[1,5] Main differential diagnoses for *F. tularensis* include *Yersinia pestis* andfeline infectious peritonitis. Histologically, initial reponse is neutrophilic with subsequent macrophage and lymphocyte infiltration and may occasionally form caseating granulomas.[1] *F. tularensis* is not readily detectable on H&E or Gram stain.[5] The gold standard technique to diagnose tularemia is culture. The diagnosis can also be made

by agglutination, ELISA, IFA, PCR, and immunohistochemistry.[1] Biosafety level 2 is recommended for diagnostic work on infected tissues and Biosafety level 3 is required for culture.[5] The bacterium has been proposed as a potential weapon for bioterrorism due to its long-term survival in the environment, potential to cause serious illness, and low infectious dose.[2]

References:

1. Feldman KA. Tularemia. J Am Vet Med Assoc. 2003;222:725–730.
2. Tularemia—United States, 2001–2010. MMWR Morb Mortal Wkly Rep 2013;47:963–966.
3. Cross JT, Penn RL. *Francisella tularensis* (tularemia). In:Mandell GL, Bennett JE, Dolan R, eds. Mandell's principles and practice of infectious diseases. 5th ed. New York: Churchill Livingstone Inc, 2000;2393–2402
4. Geiger JC. Tularemia in cattle and sheep. Calif West Med 1931;34:1–3.
5. Rhyan JC, Gahagan T, Fales WH. Tularemia in a cat. J Vet Diagn Invest 1990;2:239–241.