Case #5
Slide #: 16-1608-3

Institution: North Carolina State University College of Veterinary Medicine

Signalment: 4 year-old castrated male wallaby

History: The animal originally presented to its primary care veterinarian for hyporexia and lethargy. Following a two-day course of empirical treatment with sulfamethoxazole and trimethoprim, the animal acutely declined and was barely able to maintain a normal posture. Empirical treatment for possible poisoning was initiated (specific medications not reported) but he did not respond to therapy and continued to decline. Euthanasia was elected and the animal was submitted for autopsy.

Gross findings: The lungs diffusely failed to collapse. They were slightly firm and mottled red and, on cut section, they were wet and oozed blood. There were many small, multifocal, 1-3 mm diameter, pale tan to white foci widespread throughout all lung lobes, which were visible both from the pleural and cut surfaces. Approximately 30 mL of a serosanguineous fluid were free within the abdominal cavity. The spleen was dark red and bulged slightly on cut surface with numerous multifocal pale, white foci throughout. The stomach and entire gastrointestinal tract were filled with a dark blue to black, coarsely granular, semi-solid material, thought to be activated charcoal. Multifocally throughout primarily the glandular portion of the stomach were approximately 5-10 ulcers that ranged from 1-4 mm in diameter.

Histopathology:
Lung: Multifocally throughout the lungs, there are many small hemorrhages and the normal alveolar and interstitial architecture are disrupted due to mixed mononuclear cell inflammatory infiltrates of lymphocytes, plasma cells, and histiocytes and/or coagulative to lytic necrosis with abundant fibrin and scattered necrotic debris. There are many small, free individual, 1-2 um, eosinophilic protozoal tachyzoites within the inflamed and necrotic foci. Throughout the pulmonary interstitium, there are rare scattered nodular and slightly expansile aggregates of mostly lymphocytes and fewer plasma cells and histiocytes. There are also scattered low to moderate numbers of foamy alveolar macrophages widespread throughout the lungs. Rare, scattered, larger intracytoplasmic clusters of 1-2 um, basophilic protozoal zoites, presumed tachyzoites within a parasitophorous vacuole and also bradyzoites within cysts with poorly-defined cyst walls, are also present. The cysts are surrounded by a very thin, sometimes difficult to appreciate, eosinophilic cyst wall. The cysts are generally not associated with areas of inflammation and necrosis. Occasionally, some of the larger foci of necrosis are infiltrated by high numbers of degenerative neutrophils in addition to the previously described smaller infiltrates of lymphocytes, plasma cells, and histiocytes. Multifocally, particularly within the previously described regions of necrosis, there is mild to occasional marked infiltration of inflammatory cells through vessel walls (vasculitis) with variable fibrinoid vascular necrosis.

Morphologic Diagnosis:
Lungs: Widespread, moderate, multifocal necrohemorrhagic and lymphohistiocytic interstitial pneumonia and vasculitis with intralesional free and intracellular protozoal tachyzoites

IHC: Immunohistochemical staining for *Toxoplasma gondii* positively labels the numerous scattered previously described free and intracellular protozoal zoites.

Discussion:

In addition to the pulmonary lesions, there are similar foci of necrosis with or without lymphoplasmacytic and histiocytic inflammation with intralesional protozoal tachyzoites scattered throughout nearly all tissues examined, including the liver, spleen, heart, adrenal glands, lymph node, gastrointestinal tract, and brain (sections not provided). The histologic lesions, intralesional protozoal morphology, and positive *Toxoplasma gondii* immunohistochemical staining lead to a diagnosis of disseminated systemic toxoplasmosis. While pulmonary toxoplasmosis is the most classically described entity in veterinary species, in this animal, the most severely affected organs were the gastrointestinal tract (predominantly stomach and small intestine) and the brain. Involvement of the central nervous system and the resulting neurologic signs were ultimately the most significant factor contributing to the clinical decline of this patient and eventual decision for euthanasia.

Toxoplasma gondii is an apicomplexan protozoan parasite that infects most homeothermic animals, including humans. Although *T. gondii* has a broad intermediate host range, felids are the only definitive hosts. Highly susceptible species to *T. gondii* infection and severe clinical disease include Australian marsupials, New World primates, and prosimians of Madagascar. Among marsupials, wallabies and other macropods are the most susceptible species. Clinical presentation and disease is often acute, severe, and rapidly fatal in these animals. A recent report (2) describes an atypical genotype of *Toxoplasma gondii* in a Bennett's wallaby. In humans, atypical strains are associated with uncommon but more severe cases of toxoplasmosis.

This animal was being housed at an exotic animal sanctuary that also houses large felids. Wallabies are herbivores and this infection likely occurred via ingestion of oocysts from a contaminated environment and/or food. In this instance, contamination of the ground or feed by feral cats or prior contamination of the enclosure by a large felid are possible sources of infection.

References

1. Basso W *et al.* Toxoplasmosis in captive Bennett's wallabies (*Macropus rufogriseus)* in Argentina. Vet Parasitol. 2007; 144(1-2): 157-61.
2. Fernandez-Aguilar X *et al.* Fatal toxoplasmosis associated an atypical *Toxoplasma gondii* strain in a Bennett's wallaby (*Macropus rufogriseus*) in Spain. Vet Parasitol. 2013; 196(3-4): 523-7.
3. Maxie MG, ed. *Jubb, Kennedy, and Palmer's Pathology of Domestic Animals*. 6th ed. St. Louis, MO: Elsevier; 2016.

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