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Diagnostic Exercise
From the Latin Comparative Pathology Group and the Davis-Thompson Foundation

Angiostrongylus vasorum infection in a fox

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History:

A juvenile, gray fox arrived at the zoo with dehydration, depression and poor body condition. He died the day after arrival.

Necropsy findings:

Grossly, both lungs (Fig. 1) were markedly edematous and had an increased consistency. They did not collapse when the thoracic cavity was open. Samples from both lungs (Figs 2, 3 and 4) were submitted for histopathology.

Follow-up questions:

- *Morphologic diagnosis*:
- *Etiology*:
- *Name the disease*:

**The Diagnostic Exercises are an initiative of the Latin Comparative Pathology Group (LCPG), the Latin American subdivision of The Davis-Thompson Foundation (DTF). These exercises are contributed by members and non-members from any country of residence.*
Consider submitting an exercise! A final document containing this material with answers and a brief discussion will be posted on the DTF website: https://davisthompsonfoundation.org/diagnostic-exercise/

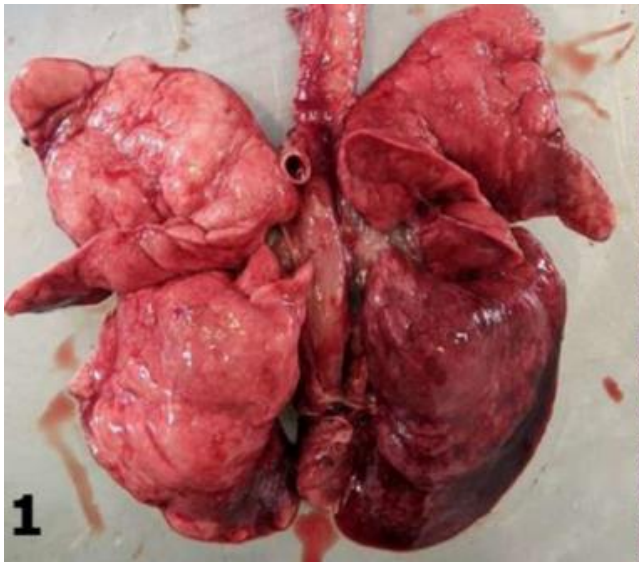

Figure 1. Lung, fox. Lungs were edematous and had an increased consistency.

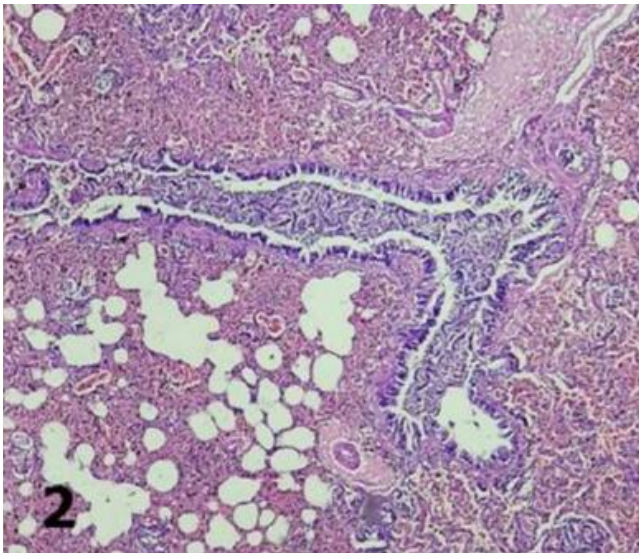

Figure 2: Lung, fox. Numerous nematode larvae and inflammatory cells expand the bronchiolar lumen. H&E. Obj. 10x.

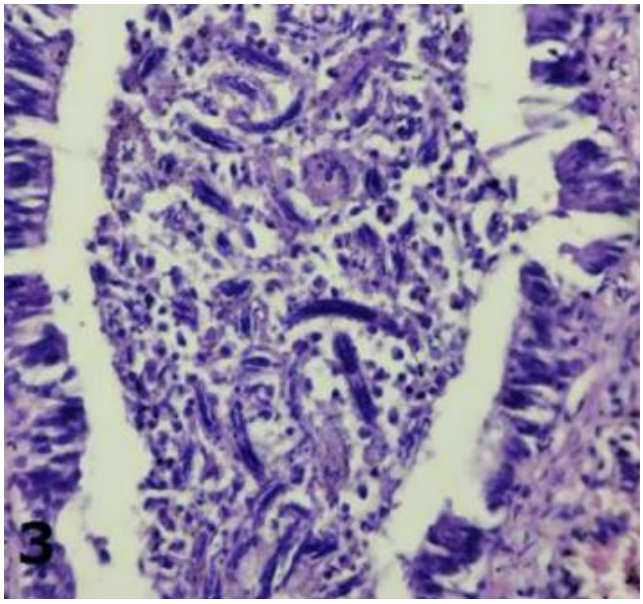

Figure 3. Lung, fox: Intrabronchiolar larvae are elongate, measure 20x80 µm and are surrounded by moderate numbers of lymphocytes and plasma cells. H&E. Obj. 40x.

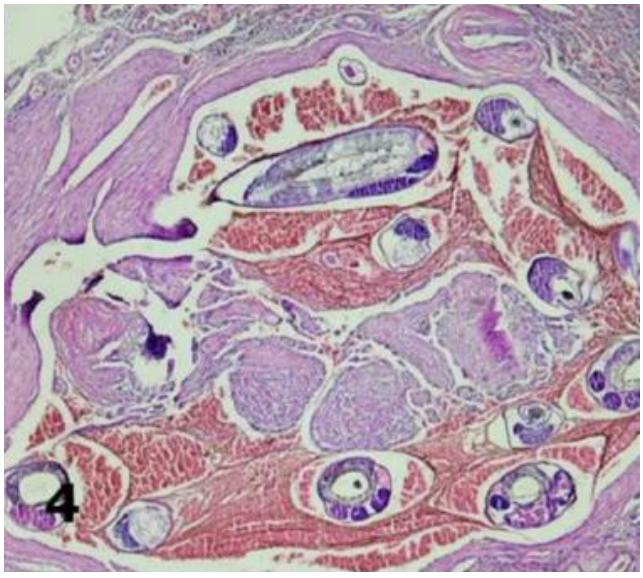

Figure 4. Lung, fox: Adult nematodes and thrombus within a pulmonary artery. Adults measure 270-350 µm in diameter and are characterized by a thin eosinophilic cuticle, polymyarian-coelomyarian musculature, pseudocoelom, and multinucleated intestinal cells. H&E. Obj. 10x.

ANSWERS

Histologic description:

Sections consist of chronic inflammation of arteries and pulmonary parenchyma. Moderate numbers of lymphocytes, eosinophils, plasma cells, and fewer macrophages thicken the tunica media and there is hyperplasia of the tunica intima. Numerous adult nematodes measuring 270-350 µm in diameter are within the arterial lumina and are characterized by a thin eosinophilic cuticle, polymyarian-coelomyarian musculature, pseudocoelom, and multinucleated intestinal cells. Organized and recanalized thrombi are within the arteries. Numerous 20 x 80µm long nematode larvae distend the bronchiolar lumen and are surrounded by moderate numbers of lymphocytes and plasma cells.

Alveolar lumina contain small numbers of uninuclear and multinuclear nematode eggs and larvae along with erythrocytes, hemosiderin-laden macrophages, and pneumocyte type II hyperplasia. The pulmonary interstitium has multiple nodules composed of macrophages and lymphocytes. In the center of these nodules are moderate to large numbers of 20 x 80µm nematode larvae and fewer multinuclear and uninuclear eggs.

Morphologic diagnosis:

Granulomatous pneumonia, multifocal to coalescing, chronic, with arterial thrombosis and intralesional nematodes morphologically consistent with *Angiostrongylus vasorum*.

Etiology:

Angiostrongylus vasorum.

Comments:

Angiostrongylus vasorum is a nematode with an indirect life cycle, belonging to the superfamily Metastrongyloidea (2). Definitive hosts include wild and domestic dogs, but also other closely related carnivore species, such as mustelids and the red panda. Intermediate hosts include slugs and snails, while frogs and chickens can be paratenic hosts (1).

Canids get infected by eating intermediate or paratenic hosts with infective L3. Following ingestion, the L3 penetrates through the intestinal wall and migrates to the mesenteric lymph nodes, where they mature to L5. Via the mesenteric lymphatics and hepatic and portal veins, L5 migrate to the right ventricle and pulmonary arteries and become adults, where they reproduce and release larvae and eggs in alveoli and bronchioles. L1 are then coughed up, swallowed, and passed with the feces (3).

Clinical signs of angiostrongylosis vary from mild to severe respiratory disease; cor pulmonale may develop in response to chronic pulmonary vascular disease and lung fibrosis. Other less common clinical signs include neurologic signs associated to cerebral hemorrhage because of disseminated intravascular coagulation, as well as miscellaneous signs that reflect aberrant migration of larvae in a variety of organs (1). Ectopic locations of both adult worms and larvae include the eye, pericardium, and urinary bladder (4). Histologically, adults must be differentiated from *Dirofilaria immitis*, a common nematode that also infects the pulmonary arteries and heart of dogs. Adult *Angiostrongy*lus spp. are 270-350 µm in diameter with thin coelomyarian musculature, a large intestine composed of few tall multinucleate cells, and eggs in the uterus. In contrast, *Dirofilaria* spp. have a well-developed coelomyarian musculature, a smaller intestine, and a uterus containing microfilariae (1).

Angiostrongylosis has worldwide distribution, although it is commonly considered sporadic (6). There are few reports of the infection in Latin America, resulting in limited knowledge about its distribution and prevalence in this region. Some of these reports are from infected foxes, making this species an important potential factor for the propagation and sylvatic life-cycle maintenance of the parasite in South America. Clinicians involved in small and wildlife practice should consider angiostrongyliasis as a differential diagnosis when encountering cardiopulmonary disorders in canids (5).

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