**NOTE Pathology**

**Myocarditis by Nematodes Infection, Presumably Sarconema eurycerca, in a wild whooper swan (Cygnus cygnus) in Korea**

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ABSTRACT. A dead whooper swan was found in an area of cropland near a stream and was submitted to the National Veterinary Research and Quarantine Service (NVRQS) in Korea. The affected animal was in relatively good condition. Grossly, the heart was enlarged and had pale and dark red stripes. A white, elongated parasite was seen on the cut surface of the heart. Histopathologically, severe lymphohistiocytic inflammation, myocardial necrosis, many adult heart worms and microfilariae were observed in the myocardium. Hemorrhage, lymphohistiocytic inflammation, mineralization, and myocardial degeneration were also seen around the adult worms. No bacteria or viruses were isolated from the affected bird. The pathological findings indicate that the whooper swan was infected with nematodes, presumably Sarconema eurycerca, resulting in non-suppurative myocarditis.

KEY WORDS: lymphohistiocytic inflammation, microfilaria, myocardial necrosis, Sarconema eurycerca, whooper swan.

*Sarconema eurycerca* is a filarial nematode of the superfamily Filarioidea. It is transmitted by a biting louse and infects swans and geese [1, 3, 4]. *S. eurycerca* was first found in a whistling swan, and has since been found in trumpeter, tundra, black, and mute swans, as well as in Canadian, snow, white-fronted, and bean geese [1, 2, 4, 5, 8, 9]. Although a sufficient number of studies on frequency of occurrence and mortality have not been performed, *S. eurycerca* has been implicated as a cause of mortality in wild birds [6]. In this study, we describe heart worm infection, presumably *S. eurycerca* infection in a whooper swan in Korea.

During highly pathogenic avian influenza (HPAI) surveillance activities in wild birds, a dead whooper swan was found in an area of cropland near a stream and was submitted to the National Veterinary Research and Quarantine Service (NVRQS) for diagnosis. The affected animal was in relatively good condition, and no ectoparasites were observed on the carcass. At necropsy, various organs and tissues (e.g., the brain, lungs, heart, liver, spleen, kidneys, trachea, proventriculus, gizzard, and intestine) were fixed in 10% buffered formalin, embedded in paraffin, and sectioned at 4 μm. The sections were then stained with hematoxylin and eosin (HE) and Giemsa solution for histopathology and parasitology, respectively. Liver and intestine samples were cultured on both blood and MacConkey agars for bacterial isolation. Samples of the trachea, kidney, and cecal tonsil were inoculated in chicken embryos for viral examination.

In addition, the gastrointestinal contents were analyzed for pesticides by gas chromatography (HP6890N, GC/NPD, FPD; Hewlett Packard, Palo Alto, CA) and gas chromatography/mass spectrometry (HP6890N and HP5973N; Hewlett Packard) and examined for internal parasites. The limit of detection was about 0.2 ppm, although this differs among pesticides. Grossly, the heart was enlarged and had pale and dark red stripes. A white, elongated parasite was seen on the cut surface of the heart (Fig. 1). The stomach contained a moderate amount of sand- and soil-like material. No other gross lesions were observed.

Histopathologically, many lymphocytes and macrophages were multifocally infiltrated into the myocardium, and myocardial degeneration/necrosis, hemosiderin deposition, and microfilariae were observed in the areas of inflammation (Figs. 2 and 3). Adult heart worms were present in the myocardium and included many microfilariae in the uterus. Also, a small number of lymphocytes, hemorrhage, myocardial degeneration and mild mineralization were seen around the adult worms (Fig. 4). Microfilariae were not detected in any other organs. No other histopathological findings were observed in any organ or tissue of the affected animal.

No organisms (bacteria, viruses or other parasites) other than heart worms were identified in the affected bird. Organophosphate residue tests of the gastrointestinal contents were negative.

Similar to other filariae, *S. eurycerca* has a life cycle that involves an intermediate host [1, 4]. *S. eurycerca* is present in an infected bird as pairs of adult heartworms that shed microfilariae into the blood stream. The microfilariae are ingested by a biting louse (*Trinoton anserinum*), undergo development in the louse, and upon becoming third-stages
larvae, move into the bloodstream of a new host from the infected louse. The larvae invade the myocardium and develop to maturity [1, 3, 4]. Although many adult worms and microfilariae were observed in the myocardium, they were not seen in the lumen of the heart or the other organs in this study. The louse known to be the intermediate host was not detected on the affected bird.

Three avian filarioids (Pelecitus, Splendidofilaria, and Sarconema) may infect swans and geese of the Anatidae family [1]. Splendidofilaria species induce lesions in various organs and tissues, such as the heart, aorta, pulmonary arteries, abdominal cavity, kidney, trachea, esophagus, eyes, and skin. Various species of wild birds may be infected [1]. Pelecitus infections are also identified in various wild birds and microfilariae are observed in the myocardium in near joint of the legs, feet, or toes, as well as the subcutaneous area surrounding the neck and esophagus [1]. S. eurycerca produces lesions in the heart only, and birds that may be affected include certain swans (trumpeter, tundra, black, and mute swans) and geese (Canadian, snow, white-fronted, and bean geese) [1, 2, 4, 5, 8, 9]. Additionally, S. pseudolabiata has been discovered in the subcutaneous connective tissue of the neck [1]. In this study, neither gross nor histopathological changes were seen in any organ or tissue other than the heart.

Although little is known regarding the clinical signs of S. eurycerca infection, decreased body weight and acute depression have been reported. Heart enlargement with dark red and white streaks is observed in affected animals due to the migration of adult heart worms in the endocardium and myocardium [2, 7]. The degree and severity of disease are closely related to the number of adult heart worms, and death is caused by heart failure due to extensive myocardial damage resulting from hemorrhage, inflammation, and necrosis [2, 6, 7]. However, microfilariae are known to be nonpathogenic in affected animals. In this study, the pathological findings indicate that the whooper swan was infected with nematodes, presumably Sarconema eurycerca, resulting in non-suppurative myocarditis.

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REFERENCES


