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Source: Journal of Wildlife Diseases, 18(2) : 253-255

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-18.2.253

SARCOCYSTIS IN A BALD EAGLE *(HALIAEETUS LEUCOCEPHALUS)*[1]

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Veterinary pathologists frequently encounter sarcocysts in skeletal and cardiac muscle of various animals. The demonstration of sarcocysts as part of a coccidian life cycle gave significance to the presence of the ubiquitous sarcocyst (Levine, 1977, J. Parasitol. 63: 36-51). The pathogenic potential of *Sarcocystis* infections in intermediate hosts is well documented (Corner, et al., 1963, Can. Vet. J. 4: 252-264; Dubey, 1976, J. Am. Vet. Med. Assoc. 169: 1061-1078; Frelier et al., 1979, Am. J. Vet. Res. 40: 651-657).

The biology of avian *Sarcocystis* has not been extensively studied. Many reports consist of surveys for macroscopic cysts only, a practice that has led to low estimates of the prevalence of infection in birds. However, infected birds may have only microcysts in their musculature (Drouin and Mahrt, 1979, Can. J. Zool. 57: 1915-1921). Recently, Duszynski and Box (1978, J. Parasitol. 64: 326-329) successfully infected American opossums *(Didelphis virginiana)* with sarcocysts from three species of birds.

An immature (3.6 kg) female bald eagle *(Haliaeetus leucocephalus)* was referred to the Raptor Rehabilitation Program at the School of Veterinary Medicine, Auburn University. The eagle had been shot near Birmingham, Alabama, and had a comminuted fracture of the right radius and ulna. The feet had been wrapped in the field, when the bird was captured, to prevent injury to those handling the bird. Unfortunately, the feet were wrapped too tightly, and the blood supply was compromised. The eagle was hospitalized from October, 1979 to the time of its death, in March, 1980. During this time, it had been subjected to surgical repair of the fractured wing, surgical debridements of the feet, amputations of necrotic digits, and skin grafts of the metatarsal regions. The eagle was treated with both locally applied and systemic antibiotics during hospitalization. A varied diet, including raw skinned chicken necks, largemouth bass *(Micropterus salmoides),* chicks, mice, rats, rabbits, and an American coot *(Fulica americana),* was fed during hospitalization. The coot and the bass were caught in the wild. A vitamin-mineral supplement was also provided.

Gross postmortem findings consisted of moderate dehydration, atrophy of the pectoral muscles, and swollen pale kidneys with a prominent tubular pattern. Microscopically, there was necrosis of renal tubular epithelium with occasional mineralized foci. There were numerous sarcocysts in the myocardium with no myocardial degeneration or inflammation associated with the sarcocysts (Fig. 1). The cysts were up to 70

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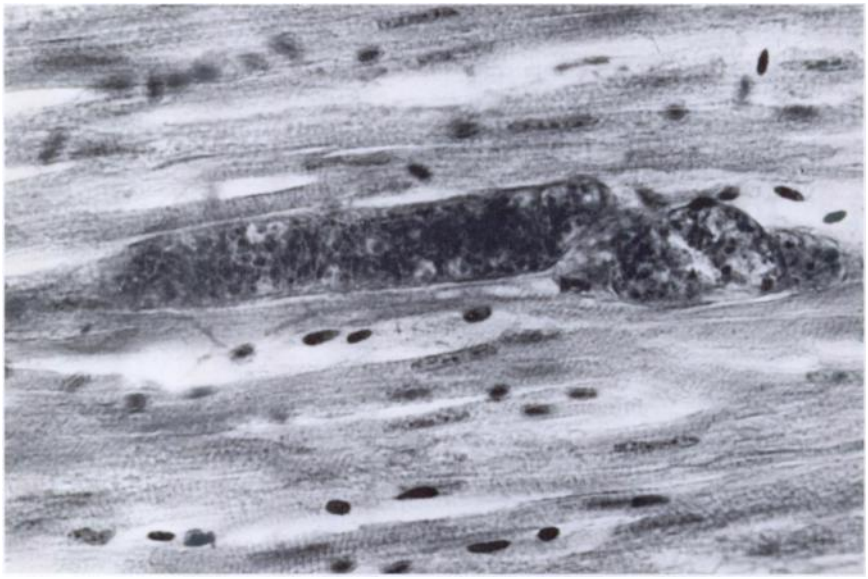

FIGURE 1. A sarcocyst in a myocardial fiber. ×750

μm in length but varied in size and shape depending on the plane of the section. They were thin walled, non-septate, and contained round to oval bodies 6 to 7 μm in diameter that had basophilic centers and appeared to be metrocytes which are characteristic of immature cysts of *Sarcocystis* spp. There were also encysted organisms in skeletal muscle fibers of the pectoral muscles (Fig. 2). These cysts were up to 90 μm in length, had a thin, smooth wall, and contained tightly packed spindle to crescent shaped bradyzoites about 2 μm in length. Metrocytes were not found in these cysts.

Although *Sarcocystis* has been identified in numerous avian species (Darling, 1915, J. Parasitol. 1: 113-120; Drouin and Mahrt, op. cit.; Munday, et al., 1979, J. Wildl. Dis. 15: 57-73; Vande Vusse, 1966, J. Parasitol. 52: 22), it apparently has not been reported previously in a bald eagle.

Cardiac muscle fibers of herbivorous mammals commonly contain sarcocysts (Smith et al., 1972. Veterinary pathology. Lea and Febiger, Philadelphia, Pennsylvania, pp. 694-698), but avian myocardium is less frequently infected (Munday et al., op. cit.). Sarcocysts have been reported in the myocardium of a hawk *(Leucoternis* sp.) (Darling, op. cit.) pintail *(Anas acuta)* (Erickson, 1940, Auk 47: 415-419), southern skua *(Stercoraria skua)* (Munday, et al., op. cit.), white-backed magpie *(Gymnorhina hypoleuca)* (Munday et al., op. cit.), and a hoary-headed grebe *(Podiceps poliocephalus)* (Munday et al., op. cit.). In a recent study (Drouin and Mahrt, op. cit.) both skeletal muscle and myocardium from 112 birds [1 shoveler *(Anas clypeata)*, 27 mallards *(Anas platyrhynchos)*, 27 pintails *(Anas acuta)*, 53 blue grouse *(Dendragopus obscurus)*, and 4 red-winged blackbirds *(Agelaius phoeniceus)*] were examined microscopically for sarcocysts. Seven of the 112 birds had sarcocysts in skeletal muscle, but none of the 112 had sarcocysts in the myocardium. In another study (Fayer and Kocan, 1971, J. Protozool. 18: 547-548), 142 common

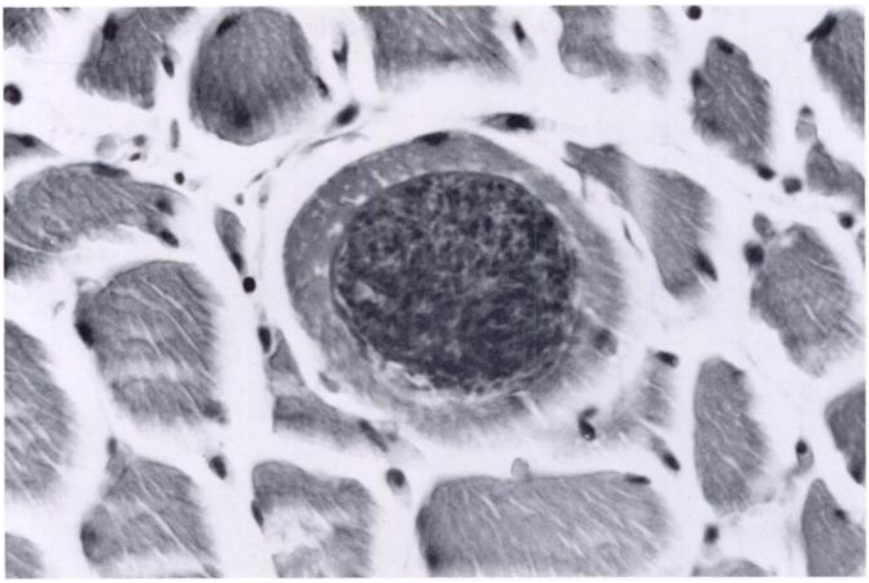

FIGURE 2. An unidentified cyst in a skeletal muscle fiber. ·750

grackles *(Quiscalus quiscula)* trapped in Maryland were examined microscopically for both skeletal muscle and myocardial sarcocysts. More than 90% of the mature birds examined had sarcocysts in skeletal muscle, but no myocardial sarcocysts were found.

The cysts found in the pectoral muscle of the bald eagle could not be positively identified as *Sarcocystis*, *Hammondia*, or *Toxoplasma* due to the small size of the bradyzoites and lack of metrocytes. Immature *Sarcocystis* cysts contain metrocytes, but *Hammondia* and *Toxoplasma* cysts do not. The bradyzoites in the cysts in the pectoral muscle were smaller than reported bradyzoite size for all 3 genera (Mehlhorn and Frenkel, 1980, J. Parasitol. 66: 59-67).

The finding of two types of coccidian cysts, *Sarcocystis* in the myocardium and an unidentified type in skeletal muscle, suggests that the eagle had a dual infection with two encysted organisms.

This report of *Sarcocystis* in a bald eagle as well as previous reports of *Sarcocystis* cysts in an Australian goshawk *(Accipiter fasciatus)* (Munday et al., op. cit.), a brown falcon *(Falco berigora)* (Munday et al., op. cit.), a great horned owl *(Bubo virginianus)* (Vande Vusse, op. cit.), and a hawk *(Leucopternis* sp.) (Darling, op. cit.) documents birds of prey as intermediate hosts.

It was not determined whether the eagle in this report became infected in the wild before hospitalization or whether the infection was obtained from the varied diet fed in captivity.

Special thanks to Dr. Ronald Fayer, Animal Parasitology Institute, U.S. Department of Agriculture, Beltsville, Maryland, for identifying the tissue cysts.

Received for publication 16 September 1980