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Prevalence of Spindle Cell Sarcomas among Wild Canada Geese from Southern Illinois

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ABSTRACT: Over a 6-yr period, two cases of neoplastic disease were diagnosed among 1,272 wild Canada geese (*Branta canadensis interior*) collected in Illinois (USA), Wisconsin (USA), and Ontario, Canada. One juvenile goose of each sex was involved. In both cases >35 discrete masses were observed subdermally, intramuscularly, and within the body cavity. The tumors, diagnosed as spindle cell sarcomas, are among the most commonly observed neoplasms in free-living North American waterfowl. Based on our data, we suggest that these neoplasms occur with extremely low prevalence (0.002%) in free-living Canada geese.

Key words: Neoplasia, sarcoma, spindle cell, prevalence, southern Illinois, Canada goose, *Branta canadensis*, case report.

Among birds, neoplastic diseases occur in about 2 to 20% of post-mortem examinations in domestic fowl (Schlumberger, 1957; Campbell, 1969), but only in ≤4% of examinations of captive wild birds (Jennings, 1968; Effron et al., 1977; Dillberger et al., 1987). Reported prevalence of neoplasia varies among avian taxa. Neoplasms are observed most frequently in Psittiformes and Galliformes, but rarely are observed in Columbiformes and Anseriformes (Blackmore, 1966; Rigdon and Leibovitz, 1970; Effron et al., 1977). Little is known of the prevalence of neoplasia among wild, free-flying birds. Most reports of neoplasia in wild birds originate from examinations conducted on specimens found dead or moribund (Locke, 1963; Siegfried, 1983; Howerth et al., 1986), so the true incidence of neoplastic disease in wild populations of birds is difficult to assess. We report on the prevalence of neoplasia in a population of wild Canada geese (*Branta canadensis*) and review published case reports and prevalence of the disease in other species and populations of wild waterfowl.

We examined 1,272 Canada geese (*B. c. interior*) collected for physiological condition studies in southern Illinois (USA) (1982 to 1988), east-central Wisconsin (USA) (1982 to 1988), and northern Ontario Canada (1984 to 1990). Necropsies were performed on an additional 150 Canada geese found dead or moribund and submitted by state and federal wildlife agency personnel for routine examination from 1982 to 1988. All carcasses were thoroughly examined to detect gross lesions indicative of infectious disease and trauma. We encountered two specimens with discrete multifocal lesions that were proliferative subdermally, intramuscularly, and within the body cavity. Samples of the lesions and surrounding tissue were dissected, preserved in 10% formalin, sectioned and stained with hematoxylin and eosin (H&E), for light microscopy. Two paraffin blocks of representative tumors from both cases were submitted to the Registry of Comparative Pathology, Armed Forces Institute of Pathology (AFIP) in Washington, D.C. (USA).

Case 1 (AFIP accession number 2330929) was a juvenile male weighing 3,278 g that was collected at Crab Orchard National Wildlife Refuge, Williamson County, Illinois (37°43′N, 89°05′W) on 11 January 1986. Thirty-three discrete, ovoid, creamy white masses were scattered throughout the pectoral, humeral, back, and leg muscles. These masses were firm but not hard, ranging in size from 6 to 85 mm diameter. Three similar masses, <22 mm diameter, were present in the body cavity. One mass was embedded in the wall of each cecum and one was embedded in the large intestine near the ileo-cecal junction.

Case 2 (AFIP accession number 2330934), a juvenile female (weight unknown) killed by a hunter on 31 December, 1988 near Union County Conservation Area in Union County, Illinois (37°25'N, 89°23'W), had a similar gross appearance. Eighteen masses, 5 to 45 mm diameter, occurred in the pectoral and leg muscles. Four masses, 26 to 75 mm, were located in mesentery of the body cavity attached to the ileo-cecal junction. None of these masses were located within the intestinal wall as evident in case 1. In contrast to case 1, an additional 22 masses, 5 to 50 mm diameter, occurred subdermally.

Both birds were about 6- to 7-mo old when killed, based on mean hatching dates of *B. c. interior* in northern Ontario (Gates, 1989). Both specimens were emaciated. There were no visible subcutaneous or internal fat deposits, and prominent sternal keels indicated breast muscle atrophy. Gross lesions were not detected in other organs and tissues examined.

Histopathology was identical in both cases. Normal skeletal muscle was interrupted by a basophilic mass of spindle-shaped cells with long broad nuclei in longitudinal section, and small round nuclei in cross-section. Mitotic figures were infrequent, <1 in each 400× field. Cytoplasm was pale and scant. Focal mononuclear cell infiltrates were scattered at the periphery of the masses. Neoplastic tissue that was attached to the exterior of the gastrointestinal tract at the ileo-cecal junction of case 2 was histologically identical to that removed from skeletal muscle. Submucosa was compressed, but unaffected; however, the muscularis was replaced with neoplastic cells. The serosa was necrotic.

The gross appearance of cases we report was similar to neurofibrosarcomas described by Locke (1963), to fibrosarcomas reported by Siegfried (1983), and to intramuscular lipomatosis/fibromatosis described by Daoust et al. (1991). We did not perform immunochemical staining or ultrastructural examination to detect collagen production that is necessary to confirm diagnosis of our cases as fibrosarcoma (Enzinger and Weiss, 1988). Microscopically, these cases had the typical appearance of spindle cell sarcomas; there was no evidence for involvement of nerve fiber fasciculus, nor was there infiltration of adipocytes. Most of the masses we observed in muscle and abdominal tissues were discrete, non-invasive, space-occupying lesions.

Reports of neoplasia in wild North American waterfowl are geographically widespread. In our review of 22 case reports of neoplasia (Locke, 1963; Siegfried, 1983; Doster et al., 1987; Daoust et al., 1991), we found that approximately equal numbers of males (6) and females (7) were involved when sex was reported. There were more cases of neoplasia reported among known adults (10) than among juveniles (6); however, this difference may reflect population age structure rather than age-related susceptibility. Neoplasms appeared to be particularly prevalent among Anserinae. Half (11) of the reported cases were Canada geese, with an additional seven cases reported in white-fronted geese (*Anser albifrons*), and one case reported in a tundra swan (*Cygnus columbianus*). The most common neoplasms (17 of 22 cases) reported in North American waterfowl were internal sarcomas involving fibrous (8 of 22) or adipose tissue (7 of 22). Two cases involving neoplasia of both fibrous and adipose tissue were reported by Daoust et al. (1991) in white-fronted geese.

Jennings (1968) estimated that the prevalence of neoplasia in wild birds in Great Britain was between 0.1 and 1.0%. Most case reports were from birds found dead or moribund and examined only because gross abnormalities were initially observed; the prevalence of neoplastic disease probably was over-represented because only dead or moribund birds were examined (Daoust et al., 1991). Case reports from more representative samples of wild populations often failed to include the total number of birds handled or examined

(Chaffee, 1974; Locke, 1963; Doster et al., 1987).

We detected neoplasms in 2 of 1,272 (0.002%) free-living Canada geese killed for physiological condition studies, killed by hunters, or killed by avian cholera. These birds were clinically healthy when shot, or died from acute avian cholera. We consider our sample to reasonably reflect the prevalence of neoplastic disease in a wild population of Canada geese.

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