PREVALENCE OF Pharurus pallasii IN THE BELUGA WHALE (Delphinapterus leucas) OF CHURCHILL RIVER BASIN, MANITOBA

Authors: KENYON, ALAN J., and KENYON, BONNIE J.

Source: Journal of Wildlife Diseases, 13(4) : 338-340

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-13.4.338

PREVALENCE OF *Pharurus pallasii* IN THE BELUGA WHALE *(Delphinapterus leucas)* OF CHURCHILL RIVER BASIN, MANITOBA

ALAN J. KENYON and BONNIE J. KENYON, Sloan-Kettering Division, Biology Unit, Cornell University, Graduate School of Medical Science, Walker Laboratory, Rye, New York 10580, USA.

Abstract: Eight of 9 beluga whale (*Delphinapterus leucas*) in the Churchill River Basin were infected with *Pharurus pallasii*. The age range of infected whales was from under 1 year to 30 years. All adult infected animals had a large number of parasites in the accessory sinus, together with variable degrees of pulmonary granulomatous response. Histopathologic examination of lung revealed little host response to adult *P. pallasii*, but a strong inflammatory reaction to larval structures. Within the head, *P. pallasii* were found in the accessory sinus, ear canal and cerebral spinal fluid.

INTRODUCTION

Observations made by Cree during the period of operation of the Churchill Whaling Station indicated that at least three-fourths of the beluga whale *(Delphinapterus leucas)* in the Churchill River Basin (58°44'N, 94°04'W) have small nematodes in the bony structure of the head (Francis Spence, Pers. Comm.). We examined whales taken by the natives and found a high prevalence of infection (8 of 9) with a species previously described as *Stenurus (Metastrongyloidae: Pseudoliidae)*.[1] Species of *Stenurus* have been described in many cetacea: *S. ovatus* in the bottlenosed dolphin (*Tuirsops truncatus*), *S. minor in* the harbor porpoise (*Phocoena phocoena*), *S. globicephalus* in the pilot whale (*Globicephala melaena*), *S. alatus* in the narwhal (*Monodon monoceras*) and *S. pallasii* in the beluga whale.[5] The species in the beluga whale originally was classified as *Strongylus pallasii* by Van Beneden[6] in 1870. In the reclassification (revision) of cetacean lungworms by Baylis and Daubney,[2] it was referred to as *Stenurus articus*. The specimens obtained by us were identified as *S. pallasii*.[1] This species recently was called *Pharurus pallasii* by Arnold and Gaskin when they redescribed lungworms of odontocetes from Canadian waters.

The purpose of this case report is to provide some information on the prevalence of infection in beluga whale from the Churchill River together with observations on the pathology which may indicate a mode of transmission and effect on the host.

CASE HISTORY

Whale material was obtained from two geographic locations, Churchill River Basin, Manitoba and Repulse Bay, Northwest Territories (66°32'N, 86°15' W). In the Churchill area, material from eight adult whales was obtained from Cree hunters. In addition, material was obtained from a male calf (150 cm long) found dead (apparently stranded) in a small bay. The oldest whale in this group

[1] Dr. L. Penner, Department of Parasitology, University of Connecticut, Storrs, Connecticut 06268, USA

was a male determined to be approximately 30 years old (Brodie's method of interpretation of tooth layering).[4] In Repulse Bay three whales were examined: 1 of 3 was a male estimated to be 40 years old that had become entangled in a fish weir, and the 2 remaining were found dead on the beach. Nematodes were not found in these three whales, but in the latter two animals advanced autolysis may have hindered detection of parasites.

In Churchill, 7 of 8 adult whales and the calf contained *P. pallasii*. All infected whales had parasites in the "accessory sinus" (which is slightly anterior and dorsal to the point of mandibular articulation) ranging from just a few in the calf to masses of 50 or more in the adults. In instances when the whales were examined at necropsy within minutes after death, the parasites were extremely motile, with a strong writhing action. In 2 whales, *P. pallasii* was found in the ear canal. The head of one whale was frozen in dry ice and, while frozen, sawed into 2-3 cm cross-sections, starting at the maxillae and then proceeding posteriorly. Although no grossly detectable cellular reaction to the nematodes was observed, many were found in the cerebral spinal fluid of the anterior sections between the meninges and calvarium. The freezing process was conducted as rapidly as possible to prevent postmortem migration of these nematodes from adjacent structures.

The lungs of the 7 adult parasitized whales contained numerous small granulomatous lesions scattered over the pleural surface and throughout the parenchyma. The extent of lung involvement among the adults appeared to be unrelated to age. In the 30-year-old male, there were only a few nodules on the entire pleural surface, while in a 15-year-old male and a younger female, as many as 6 nodules were present in a 15 cm square area of pleura. Pulmonary tissue was fixed in 10% formalin (pH 7.0), and routinely processed with hematoxylin-eosin stain for histopathologic examination. Little or no host reaction occurred in response to adult parasites in the alveolar spaces, but a strong granulomatous reaction was observed around what appeared to be larval structures. This granulomatous reaction consisted primarily of lymphocytes and polymorphonuclear cells, with some alveolar macrophages and giant cells in the process of engulfing larval components. In some sections calcified nodules were present as well as evidence of acute and subacute inflammatory reactions (Fig. 1).

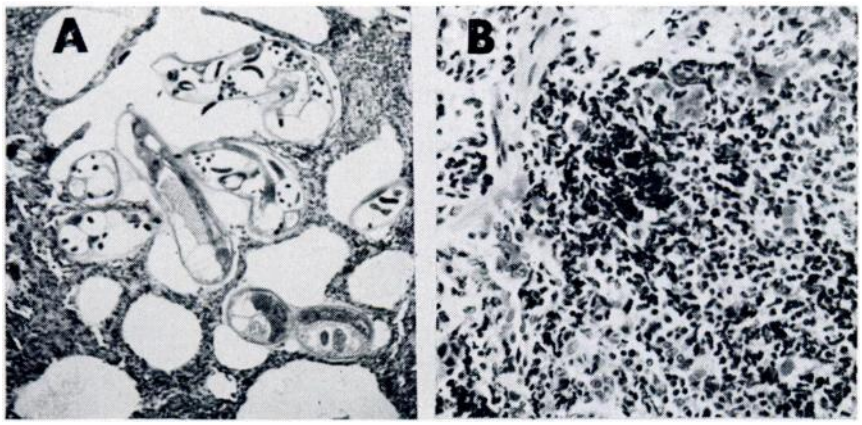

FIGURE 1. Nematodes (A) in alveolar spaces with little cellular reaction to the adult, whereas in many areas (B) granuloma formed around first-stage larvae and larval fragments. (40X, 400X)

DISCUSSION

Baylis and Daubney[2] remarked on the high degree of host specificity of these nematodes, and they also noted that almost every individual examined appeared to be infected. Since this parasite is viviparous, they speculated that transmission through air passages into blood vessels resulted in the likelihood of infection occurring *in utero*. Although there are no reports of *in utero* transmission, this possibility is consistent with the high prevalence observed in whales from the Churchill area and particularly in the stranded suckling whale described above. However, should the prevalence of infection in other areas, such as Repulse Bay, be greatly different, another mode of transmission may be more likely.

The significance of *P. pallasii* in the beluga whale and *S. globicephalae* in the pilot whale with respect to stranding remains unclear. Parasitologists[2] working with these species have described the habitat of *P. pallasii* as "hearing organs" (probably tympanic cavity) of the beluga whale. Since the eight cranial nerve and cochlear structures are well developed in odontocetes,[3] with perhaps significant tympanic nerve branches, it is not unreasonable to consider many behavioral ramifications in response to parasitic involvement. Furthermore, should adult forms as well as larval structures commonly appear in cerebral spinal fluid as described in the individual above, one might suggest transient variations in fluid pressure as an etiologic factor in altered behavior.

Acknowledgments

We wish to acknowledge the interest and support of Mr. E. B. Michaels and the University of Connecticut Research Foundation.

LITERATURE CITED

1. ARNOLD, P. W. and D. E. GASKIN. 1975. Lungworms (Metastrongyloidae: Pseudoliidae) of harbor porpoise *Phocoena phocoena*. Can. J. Zool. 53: 713.
2. BAYLIS, H. A. and R. DAUBNEY. 1925. A revision of lungworms of cetacea. Parasitology 17: 201.
3. BREATHNACH, A. S. 1960. The cetacean central nervous system. Biol. Rev. 35: 187.
4. BRODIE, P. R. 1969. Mandibular layering in *Delphinapterus leucas* and age determination. Nature, 221: 956.
5. DAILEY, M. D. and R. L. BROWNELL. 1972. A checklist of marine mammal parasites. In: *Mammals of the Sea*, ed. by S. Ridgeway. C. Thomas, Springfield, Illinois, pp. 528-589.
6. VAN BENEDEN, P. J. 1870. Les ceteaces, leur commensoux et leurs parasites. Bull. Acad. R. Sci. Belg., 29: 347.

Received for publication 13 April 1977