Andersonstrongylus milksi (Whitlock, 1956) n. comb.
(Metastrongyloidea: Angiostrongylidae) with a
Discussion of Related Species in North
American Canids and Mustelids

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ABSTRACT: Specimens of Filaroides milksi Whitlock, 1956 removed from the same lung tissue as were the type specimens were re-examined. Because of morphological features similar to those found in the genus Andersonstrongylus Webster, 1978 and inconsistent with those in Filaroides van Beneden, 1850, F. milksi is removed from the latter and placed in Andersonstrongylus as A. milksi (Whitlock, 1956). All available specimens of A. milksi from North American and Belgian canids and mustelids were re-examined. The only valid report of A. milksi is that of Whitlock (1956) in dogs; other reports being either presumptive, misidentified or the material is no longer available. The filaroidid and angiostrongylid nematodes of North American skunks are either respectively Filaroides mephitis Webster, 1967 or Andersonstrongylus captivensis Webster, 1978.

The members of the genus Filaroides van Beneden, 1858 are all small fragile nematodes and it is only on rare occasions that complete specimens can be teased from the lung tissue in which they are embedded. Because of this, the morphological features necessary for identification are often destroyed. When present, they are so small that they may be overlooked or misinterpreted. This has led to some confusion in the systematics of this genus and its relatives.

Recently there has arisen some uncertainty over the identity of certain filaroidid and angiostrongylid nematodes in North American carnivores, in particular the occurrence of Filaroides milksi Whitlock, 1956 in various host species. A restudy of specimens teased from the same lung tissue from which Whitlock’s types were obtained revealed morphological characters inconsistent with the other members of the genus Filaroides but similar to those of Andersonstrongylus Webster, 1978. Accordingly, F. milksi is transferred to Andersonstrongylus as A. milksi n. comb.

Representative specimens from all known infections of A. milksi in North America were requested. Nematodes were cleared in a phenol-alcohol solution which was replaced with glycerin. Drawings were made with the aid of a Zeiss drawing tube.

Andersonstrongylus milksi (Whitlock, 1956) n. comb.
(Figs. 1, 4a)

Filaroides milksi Whitlock 1956.

DESCRIPTION: As in Whitlock (1956) with the exception of the caudal end of the male. Tail of male usually curved ventrally. Bursa present. Bursal rays short but distinct; ventral rays divided approximately ½ their length; lateral rays arising from a common stalk and separated at the ends; dorsal ray reduced to a single pair of minute sessile papillae.

TYPE HOST AND LOCALITY: Canis familiaris, Geneva, N.Y., USA.
Discussion

One of the main diagnostic characters used by Anderson (1978) to separate the two families Angiostrongylidae and Filaroididae is the presence (in the former) or absence (in the latter) of a bursa. Unfortunately, this exceedingly delicate structure can be difficult to detect in preserved material although it is generally easily seen in fresh specimens. Neither Georgi (1979) nor this study could demonstrate with any certainty, the presence of such a structure in the specimens of *A. milksi* obtained from the type lung tissue. However, Whitlock (1956) was quite definite in his finding of a bursa "... and it showed more distinctly with phase microscopy." The morphology and disposition of the bursal rays are similar to those of *Andersonstrongylus captivensis* Webster, 1978 (Fig. 2). Both the ventral and lateral ray groups are small but distinct. The dorsal ray is represented by a single pair of small papillae. It is upon these morphological features and Whitlock's statement that a bursa was present that *A. milksi* is removed from *Filaroides* (Filaroididae) and placed in *Andersonstrongylus* (Angiostrongylidae). The genus *Filaroides* contains only those abursate species in which the rays (when present) are relatively large, bulbous, undifferentiated papillae.

Since the original description by Whitlock (1956), *A. milksi* has been reported on numerous occasions as occurring mainly in dogs or skunks.

Mills and Nielsen (1966) and Greenway and Stockdale (1970) reported *A. milksi* from dogs, but the diagnoses were made from the examination of histological sections. Corwin et al. (1974) reported *A. milksi* in a dog from Michigan. No diagrams were presented and the only material now available from that infection are tissue sections. To date, there are no accurate diagnostic criteria to differentiate between the species in *Filaroides* and/or *Andersonstrongylus* on histological examination. Peckham et al. (1960) described *A. milksi* from an Iowa dog as having the male bursa "... reduced to 4 or 5 closely grouped papillae-like lobes." These specimens are no longer available. Cremers et al. (1978) reported *A. milksi* in a dog from Belgium. The author has examined these and has found that they are *F. hirthi* Georgi and Anderson, 1975.

Pence (1978) described nematodes from the hog-nosed skunk *Conepatus mesoleucus* from Texas. He noted that the male had a "... very rudimentary bursa bearing two pairs of large pedunculate, postanal papillae" and that the spicules were 54–77 (65) µm in length. After comparing the types of *Filaroides mephitis* Webster, 1967 with his specimens, he concluded that they were the same and that *F. mephitis* should therefore become a synonym of *A. milksi*. Pence apparently did not examine the types of *A. milksi*. However, specimens from *Conepatus mesoleucus* (Mus. Texas Tech. Univ. 1007, 1010) have been examined by the author and are in fact *Andersonstrongylus captivensis*, a species quite distinct from *Filaroides mephitis* (Fig. 3). Pence and Dowler (1979) recorded but did not describe *A. milksi* from Kansas badgers. Georgi (1979) described *A. milksi* from a striped skunk from New York. These also have been examined and are *A. captivensis* as is material from a second skunk from New York (courtesy of Dr. Georgi). Levine et al. (1965) recovered nematodes from the lungs of a skunk *Mephitis mephitis* from Iowa, USA which they identified as *A. milksi*. Although these specimens are apparently no longer available, based upon their description, the accompanying photograph, and the original designation, it can be assumed that they were *Andersonstrongylus* sp.
Figures 1–4. 1. *Andersonstrongylus milksi* n. comb. Lateral (a) and ventral (b) views of male tail NMCIC(P) 1980-137. Dotted line indicates bursa described by Whitlock (1956). 2. *Andersonstrongylus captivensis*. Lateral (a) and ventral (b) views of male tail NMCIC(P) 1977-258. 3. *Filaroides mephitis*. 
In summary, of all the reports of *A. milksi* in dogs, the only one which can be validated is the original by Whitlock (1956). All others are either presumptive (based upon tissue sections), misidentified, or the material is no longer available. It is quite possible that the common filaroidid nematode of dogs in North America is *F. hirthi* (see Georgi, 1979). Of the reports of *A. milksi* in wild carnivores, those of Pence (1978) and Georgi (1979; unpublished) are in fact of *A. captivensis*. The specimens reported upon by Levine et al. (1965) and by Pence and Dowler (1979) are no longer available for study.

Two species appear to infect skunk lungs. *Filaroides mephitis* is a common filaroidid nematode in various regions of North America (Webster, 1967; Dyer, 1979). *Andersonstrongylus captivensis*, originally found in ranch-raised striped skunks (Webster, 1978), has now been shown to occur in wild skunks as well in Texas and the eastern USA. These two species are quite distinct morphologically (Figs. 2, 3). When considering the size and the conformation of the caudal end of the males, there is no difficulty in distinguishing between the two. In addition, *F. mephitis* tends to be found in nests around the bronchioles while *A. captivensis* is widely distributed throughout the lung tissue.

*Andersonstrongylus milksi* and *A. captivensis* are very closely related morphologically. The spicules, although similar in morphology are slightly smaller in the former (Figs. 4a, b, c) and only one pair of the minute dorsal papillae could be found in the type material of *A. milksi* as opposed to two pairs in *A. captivensis*. It has been shown (Webster, 1980) that *A. captivensis* has a direct life cycle in striped skunks; i.e., without the usual metastrongyloid requirement of an intermediate host. Although this species is capable of readily producing patent infections lasting at least 3 months in experimentally infected skunks, only transient patent infections could be produced in mink (unpublished) or in dogs (Georgi, personal communication). To date there have been no reports on life cycle studies for *A. milksi*.

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**Literature Cited**


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