

CANINE FILARIASIS IN SOUTHWESTERN OHIO¹

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Abstract. Prevalence of canine filariasis was determined in 2101 dogs surveyed between February 1976 and February 1977 in southwestern Ohio. Prevalence of *D. immitis* was 1.9% while no *D. reconditum* were found. Dogs from veterinary clinics had a prevalence of 1.2% (n=1679), while a 4.5% (n=422) prevalence was reported from animal shelter dogs. A significantly higher prevalence was reported in male dogs, dogs with short hair, and those that were kept out-of-doors most of the time. The incidence of infection in those dogs who had been reported out-of-Ohio within the year prior to checking was 3.5% as compared to 3.2% in dogs that had not been out of Ohio. Thus, *D. immitis* infection is endemic in the area.

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Two species of microfilaria parasites, *Dirofilaria immitis* and *Dipetalonema reconditum* have been reported in dogs in the United States. Presently, the highest prevalence of the microfilarial parasites in dogs is in the southern United States, although significant prevalence is no longer limited to those states. The extended range has been attributed to increased transportation of dogs to and from enzootic areas (Otto 1969) and the presence of suitable mosquito species as intermediate hosts (Ludham *et al* 1970). However, in the studies in other geographical regions, particularly the Northern region, few attempts were made to determine if the parasite is endemic in the regions or if infections are introduced by dogs that had been infected in high incidence areas and then transported to the survey area. This investigation was undertaken to determine (1) the prevalence and types of microfilarial parasites in southwestern Ohio, (2) if the parasites are endemic, and (3) what factors are associated with the infection.

MATERIALS AND METHODS

Presences of microfilariae in the peripheral blood of the dog was used as an indicator of dog heartworm infection. Dog blood samples were obtained from 21 veterinary clinics in the Dayton, Ohio area (20 from Montgomery County,

one from Warren County, Ohio) and an animal shelter. Blood samples from the animal shelter were obtained 3 days a week, and from the clinics every 2 weeks, beginning in February, 1976, and ending in February, 1977. Shelter samples were obtained between 7 and 9 A.M. while clinic samples were taken at random times during the day. Dog breed, size, weight, age, hair length, basic habitat, time the blood was drawn, and whether the dog had been out-of-state within the year was recorded for each dog when blood was drawn. The age of the dog was determined by the dental development of the dog. Dogs were classified as small if less than 20 pounds, medium when between 21-50, and large when greater than 50 pounds. Hair length was classified as follows: short being the length of a Coonhound, medium length hair—German Shepherd, and long hair—St. Bernard.

Samples of blood (1-3 ml) were drawn from either the jugular or radial vein of the dogs. The blood was then stored in a 13 x 75 mm Vacutainer[®] vial with a 15% aqueous solution of EDTAP (Dipotassium Ethylenediamine Tetraacetate [C.P.]), an anticoagulant, in a 4-6°C refrigerator until analyzed.

For microfilaria determination, 1.0 ml of blood was placed in a 12 ml centrifuge tube along with 9 ml of a 2% formalin solution. The blood and formalin solution was examined by the Modified Knott's Concentration Technique (Henderson 1967).

RESULTS

A total of 2010 dogs were examined; 952 were males and 1148 were females. Of this total, 1158 were American Kennel Club recognized breeds, and 943 were dogs of mixed breeding. The majority of dogs tested ranged in age from 1 to 5 years.

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TABLE 1
Prevalence of *Dirofilaria immitis* in dogs from
Southwestern Ohio with respect to several
dog classification factors.*

Dog Classification	No. Dogs examined	Number Positive	% Positive
<i>Source</i>			
Animal shelter	422	19	4.50
Clinics	1679	20	1.20
Total	2101	39	1.90
<i>Breed</i>			
Pure-bred	1158	18	1.55
Mixed	943	21	2.23
<i>Size</i>			
Small	619	7	1.13
Medium	902	20	2.22
Large	571	12	2.10
<i>Age</i>			
<1	247	3	1.21
1-5	1207	28	2.32
5-10	480	8	1.67
<i>Sex</i>			
Male	952	24	2.52
Female	1148	15	1.31
<i>Hair Length</i>			
Long	502	6	1.19
Medium	786	11	1.39
Short	809	22	2.72
<i>Habitat</i>			
House and			
House/Yard	1169	7	0.59
Outdoor	928	32	3.45
<i>Blood Obtained</i>			
A.M.	1501	27	1.80
P.M.	598	12	2.00
<i>Dog Travel</i>			
In-State	1020	33	3.24
Out-of-State	142	5	3.52

*Data collected from February, 1976 to February, 1977.

Of the 2101 dogs tested, none were positive for *D. reconditum* and 1.9% were positive for microfilariae, *D. immitis* (table 1). The prevalence among the animal shelter dogs was 4.5% and was significantly higher than the 1.2% prevalence among the dogs from the veterinary clinics, ($P < 0.005$) (table 1). Dogs that were left out-of-doors had a significantly higher prevalence of filariasis (3.45%) than did the dogs that were kept primarily in-doors (0.59%) ($P < 0.025$) (table 1). The prevalence among those dogs that had been out-of-state within the year prior to checking was 3.52% and those dogs that had not been out-of-state was 3.24% (table 1). These infective differences were not significant ($P > 0.05$).

The Chi-square analysis showed that at the 10% level there was a significantly greater prevalence in dogs with short hair than in dogs with medium-length hair or dogs with longer hair ($0.10 > P < 0.05$). Males had a significantly higher prevalence than females ($P < 0.05$) (table 1). There was no statistical difference between the prevalence of infection and dog breed, size, and age ($P < 0.05$), although the prevalence was greater among dogs of mixed breed, larger dogs and dogs over 1 year old.

DISCUSSION

Considering all dogs from which blood samples were obtained, the incidence of canine filariasis in the Dayton, Ohio area was 1.9%, 4.5% in shelter dogs and 1.2% in cared for dogs. This incidence is low when compared to most results of similar surveys reported for other midwestern states (Alls and Greve 1974, Marquardt and Fabian 1966, McKinney 1962, Prouty 1972, Zydeck *et al* 1970) but particularly for 4 studies conducted in Ohio (Groves and Koutz 1964, Rabalais *et al* 1978, Rabalais and Votava 1972, Strietel *et al* 1977). In a survey on Ohio dogs of unknown origin, but obtained primarily from the Ohio State University, 2.1% of 340 dogs checked were positive for *D. immitis* and 6.8% were infected with *Dipetalonema* sp. (Groves and Koutz 1964). Of 274 dogs tested in northwestern Ohio, (Hancock, Henry, Putna, Wood and Lucas counties) 9.5% had circulating microfilariae, 5.1% were infected with *D. immitis*, 4.4% were infected with *D. reconditum* and 0.4% were infected with both (Rabalais and Votava 1972). More recently, a reevaluation of the prevalence in 160 dogs in this same northwestern Ohio region indicate that *D. immitis* prevalence remained stable but *D. reconditum* was not diagnosed (Rabalais *et al* 1978). A study of only shelter dogs in Columbus, Ohio exhibits a lower prevalence on the basis of blood examination but a similar incidence by heart examination (Strietel *et al* 1977). Of particular significance in this study in which a large number of dogs were examined, was the fact no *D. reconditum* was found, yet it is reported close by.

The most important factor in filarial infections was the source of the dogs examined or their exposure to vectors. The animals obtained from the animal shelter showed a significantly greater prevalence, presumably because of greater exposure to vectors prior to being housed at the shelter than dogs cared for by the owner. The relationship is further illustrated when comparing the incidence of infection between dogs that spend the majority of their time out-of-doors and those that are classified as house dogs. Likewise, the higher prevalence in male dogs is probably due to the fact that males roam more than females and as roamers then are more exposed to infection. The higher prevalence in male dogs has been reported in some surveys (Hirth *et al* 1966, Strietel *et al* 1977, Tritch *et al* 1973, Wallenstein and Tibola 1960) but not in others (Lindsey 1961, Thrasher *et al* 1963). Higher prevalence of infection in short-haired dogs results apparently because it is easier for a mosquito to feed from these dogs than long-haired or medium-length haired dogs. This is significant considering short haired dogs were exposed to vectors less frequently than longer haired dogs. Most previous studies have shown no significance difference in infection rates between long- and short-haired dogs (Otto 1969, Thrasher *et al* 1963), although one has (Strietel *et al* 1977).

On the basis that no statistical difference was found between the infection prevalence of dogs that had been out-of-Ohio and those that had not, it can be concluded that *D. immitis* is endemic in the area of Montgomery and Warren Counties. Those animals reported being out-of-state and positive were either infected prior to leaving the area or became infected while out of Ohio. The number of dogs tested that had been out-of-state and were positive was so small that it is doubtful that these dogs serve as a reservoir for infection of native dogs. Sufficient suitable mosquito vector species occur in the general area of the survey to transmit the disease. Nine species of mosquitoes of the 27 reported to be carriers of *D. immitis* (Ludham *et al* 1970) are reported in Montgomery and Warren Counties were dogs were checked (Par-

sons 1977). At least 15 species are found when the nearby counties of Butler, Hamilton, Clark, Greene, and Highland are included (Parsons 1977).

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