

SURVEY OF DIROFILARIASIS IN ARKANSAS<sup>1</sup>J. W. JONES, M. V. MEISCH AND F. L. FARMER<sup>2</sup>*Department of Entomology, University of Arkansas, Fayetteville, AR 72701*

**ABSTRACT.** A card survey was sent to 340 veterinarians in the Urban, Delta, Highland and Coastal Plain regions of Arkansas. Veterinarians were asked to indicate numbers of dogs tested, confirmed *Dirofilaria immitis* positive, diagnostic techniques, frequency and period tested. A significantly greater percentage of dogs tested *D. immitis* positive in the Delta region as compared with the Urban region. There were no significant differences in the percentage of treated dogs on prophylaxis or the types of diagnostic tests among regions.

*Dirofilaria immitis* Leidy, dog heartworm, is a mosquito-borne filarial nematode that affects a number of hosts including dogs, foxes, wolves and occasionally cats. The dog heartworm is cosmopolitan and particularly abundant in the tropics and subtropics. In the United States it has been reported from every state. *Dirofilaria immitis* is enzootic in the Atlantic and Gulf Coastal zones and extends throughout the Mississippi River valley. Extensive foci occur wherever large populations of dogs are perennially accessible to large populations of mosquitoes.

*Dirofilaria immitis* is of major veterinary importance in Arkansas. It appears that the greatest number of infections occur in eastern, central and southern regions of the state, although there are no supporting data to confirm this. Eyles et al. (1954) sampled dogs in the Memphis, Tennessee area for *D. immitis* and found 20.6% of the 204 dogs sampled were positive for microfilariasis. *Dirofilaria immitis* incidence in coyotes (*Canis latrans*), determined by necropsy, was found to be 65.8% in northeast Arkansas (King and Bohning 1984). No other *D. immitis* incidence estimates have been attempted in Arkansas. Cases are recorded as totals for 5 regions of the state in the Arkansas Animal Morbidity Report, but this does not take into account the number of reporting veterinarians in each region nor the number of dogs examined by each veterinarian. A survey on dog heartworm was distributed to Arkansas veterinarians for a comprehensive survey of the problem.

Veterinarians were selected from around the state of Arkansas to participate in a survey to

document the prevalence, diagnostic methods and prophylaxis treatment procedures for *D. immitis*. Potential participants were obtained from the Arkansas Veterinary Association, which classified veterinarians by type of practice such as mixed animal practice (large and small), small animal practice exclusively, large animal practice (bovine, equine, porcine) exclusively, or poultry practice exclusively. Commercial veterinarians were selected from the mixed and small animal categories only and out of 340 selected, 185 veterinarians responded (54%).

The state was divided into 4 regions (Arnold et al. 1989, Fig. 1). County combinations were based on economic activities, history, physical setting, settlement patterns and culture. The 4 regions were Highland, Coastal Plain, Delta, and Urban. A survey questionnaire was sent to participating veterinarians in these regions.

The questionnaire consisted of 5 multiple choice questions placed on a postal card. Veterinarians were asked to indicate numbers of dogs tested, confirmed *D. immitis* positive, diagnostic techniques, frequency tested and period tested (Appendix 1). The responses were to cover the period of January 1 through December 31, 1990. Analysis of data was accomplished by General Linear Models Procedure with a significance level of  $P = 0.05$  (Dowdy and Wearden 1991).

A response rate of 54% (185 of 340 veterinarians) was obtained. This is considered a very good response rate given the difficulty of obtaining data from professionals (Dillman 1978). Responses were analyzed as percent infected dogs (mean number of dogs diagnosed positive for *D. immitis*/mean number of dogs screened). The Delta region had the highest overall mean infection rate with 26.1%. This is significantly higher ( $P \leq 0.05$ ) than that found in the Urban area (12.9%). The Delta region has large areas of riceland in addition to a slow draining, flat terrain, which can generate large numbers of mosquitoes (Meisch and Coombes 1976). The Coastal Plain had the second highest mean infection rate (20.8%) followed by the Highland region (17.5%); however, these differences are

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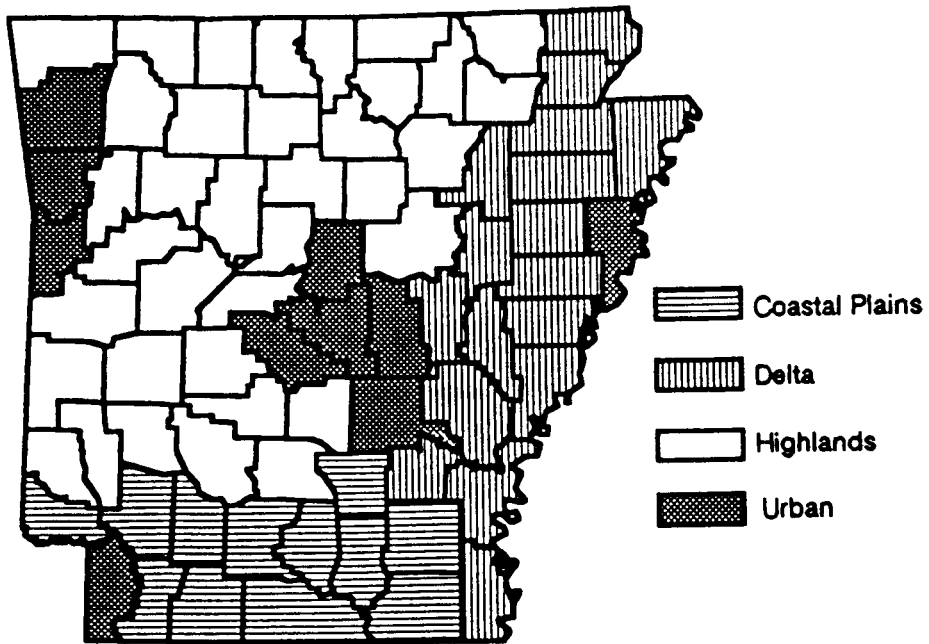


Fig. 1. Arkansas survey regions.

Table 1. Mean infection rate diagnosed corresponding to preferred diagnostic test.

Test	Number	Mean percent infection
Antigen	26	19.2
Wet smear	93	17.3
Millipore filter	48	15.5
Modified Knott	17	13.3

not statistically significant ( $P > 0.05$ ). The Urban area had the lowest mean infection rate (12.9%). Urban areas offer a high density of *D. immitis* reservoirs. Possible explanations for the low Urban infection rate are the lower concentration of vectors in urban areas or the percentage of dogs on prophylaxis may be higher in urban areas. Responses indicated that a higher percentage of urban dogs (34.3%) were on prophylaxis prior to screening than those found in other areas (18.9–29.4%); however, this difference is not significant. Responses regarding the percent of dogs on prophylaxis were highly variable, and there may have been some confusion as to the response requested.

Dogs were routinely tested for heartworm during regular vaccinations/examinations by 150 (81%) of the veterinarians. The mean infection rate at practices that test routinely (15.4%) was significantly less ( $P \leq 0.05$ ) than the rate of those that did not (22.7%). Practices not testing

routinely would test only those dogs that are symptomatic or otherwise ill and so would be expected to exhibit a higher infection rate.

The wet smear was recorded as the primary routine test used in diagnosis for 93 (50.3%) of the veterinarians. This was expected as this method gives the most rapid results. It sacrifices some accuracy for speed; however, it is accurate enough for veterinarians to diagnose all but occult cases and very low titers of microfilaria in the blood.

The filter examination was chosen as the primary routine test by 48 (25.9%) of the veterinarians. This procedure is rapid, simple and is comparable in accuracy to the Knott test. The antigen detection test was the third most common routine test with 26 (14.1%) veterinarians using it followed by the Modified Knott test with 17 (9.2%) and one (0.5%) veterinarian used the microcapillary hematocrit as routine. There were no significant differences ( $P > 0.05$ ) in the mean percentage infection rate diagnosed by veterinarians using different diagnostic tests (Table 1).

A large number of dogs in the state seldom receive veterinarian care. They are unlikely to receive any type of prophylactic treatment and so may have higher infection rates than those under care. However, dogs may be *D. immitis* symptomatic before owners have them examined thus increasing the chance of encountering

*D. immitis* positive dogs. Conclusions formulated in this survey apply primarily to dogs that receive veterinarian care.

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Appendix 1. *Dirofilaria immitis* questionnaire distributed to Arkansas veterinarians.

1. Number of dogs screened for *Dirofilaria immitis* between October 31, 1989 and November 1, 1990: (check one)

- 1-75 \_\_\_\_\_ 301-375 \_\_\_\_\_ 601-675 \_\_\_\_\_ 901-975 \_\_\_\_\_
- 76-150 \_\_\_\_\_ 376-450 \_\_\_\_\_ 676-750 \_\_\_\_\_ 976-1050 \_\_\_\_\_
- 151-225 \_\_\_\_\_ 451-525 \_\_\_\_\_ 751-825 \_\_\_\_\_ 1051-1125 \_\_\_\_\_
- 226-300 \_\_\_\_\_ 526-600 \_\_\_\_\_ 826-900 \_\_\_\_\_ >1125 \_\_\_\_\_

2. Total number of *D. immitis* cases diagnosed between October 31, 1989 and November 1, 1990 (check one)

- 1-40 \_\_\_\_\_ 161-200 \_\_\_\_\_ 321-360 \_\_\_\_\_ 481-520 \_\_\_\_\_
- 41-80 \_\_\_\_\_ 200-240 \_\_\_\_\_ 361-400 \_\_\_\_\_ 521-560 \_\_\_\_\_
- 81-120 \_\_\_\_\_ 241-280 \_\_\_\_\_ 401-440 \_\_\_\_\_ 561-600 \_\_\_\_\_
- 121-160 \_\_\_\_\_ 281-320 \_\_\_\_\_ 441-480 \_\_\_\_\_ >600 \_\_\_\_\_

3. Routine test used to detect microfilaria: (rank tests in order of frequency used; i.e. 1, 2 etc. and NA if not used)

- wet smear \_\_\_\_\_ modified Knott's stain \_\_\_\_\_
  - millipore filter \_\_\_\_\_ microcapillary hematocrit \_\_\_\_\_
  - antigen detection test \_\_\_\_\_
  - other \_\_\_\_\_
- (Please write in test)

4. What percentage of these dogs were previously on prophylaxis for heartworm?

(Please write in percent) \_\_\_\_\_

5. Are dogs routinely tested for heartworm in conjunction with regular vaccinations/examinations? Y N (circle one)