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Research Note

Prevalence of *Dirofilaria immitis* Infection in Stray Dogs in Saitama, Japan

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Dirofilaria immitis, known as canine heartworm, is an important harmful parasite in dogs. Field surveys on this parasite in dogs have been undertaken by many researchers as a parasitic disease to animals and as a zoonotic infection in humans (Makiya *et al.*, 1987). Recently, additional attention is being paid to *D. immitis* infection as an endemic disease in wild canids, such as the raccoon dog for natural conservation (Hayasaki and Ohishi, 1982; Kagei *et al.*, 1983). Therefore, surveillance of the prevalence of *D. immitis* infection in dogs is now more important because the dog is the best host for this parasite. The usual method for diagnosis of *D. immitis* infection, detection of microfilariae in the peripheral blood, is unsatisfactory because about 25% of infected dogs have an amicrofilaremic (so-called occult) infection (Uga *et al.*, 1990; Tada *et al.*, 1991). Therefore, information on the prevalence obtained by necropsy is more reliable, but few such reports concerning the recent status have appeared. In the present study, a survey was performed by necropsy from 1988 to 1994 to measure the prevalence of *D. immitis* infection in stray dogs in Saitama Prefecture, Japan.

A total of 385 dogs collected at the Saitama Prefectural Pet Raiser's Guidance Center was examined. Dogs aged at least 1 year were studied. Dogs were sacrificed by euthanasia following the guideline of the Standards Relating to the Care and Management, etc. of Experimental Animals (The Prime Minister's Office), weighed, and their sex was recorded. At necropsy the heart and pulmonary arterial system were opened and searched for the presence of *D. immitis*. The worms in the right ventricle and pulmonary arteries were counted and their sex was identified.

Table 1 shows the annual prevalence of *D. immitis* infection among stray dogs in Saitama Prefecture. A total of 385 dogs was examined, and 227 (59%) dogs were infected. Mean infection rates in the male and female dogs were both 59%. There was little change with time in the annual prevalence.

Table 2 shows the distribution of prevalence rates of *D. immitis* infection in dogs of different ages. The mean prevalences were 36% for 1 to <2 yr, 52% for 2 to <3 yr, 66% for 3 to <4 yr, and 71% for ≥4 yr.

Table 3 shows the number of worms in individual infected dogs. Of the 227 infected dogs, about half had up to 10 worms. Only 17% of the dogs harbored more than 30 worms.

In Saitama Prefecture, Tanaka *et al.* reported in 1966 that of 134 dogs, 80 (59.7%) harbored worms at necropsy, and Kawanaka *et al.* (1977) reported that 9 (47.4%) of 19 dogs were infected in 1974. The highest prevalence of infection reported is 35

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Table 1 Annual prevalence of *Dirofilaria immitis* infection in dogs in Saitama Prefecture, Japan, found by detection of worms at necropsy

Year	No. of dogs with worms/no. of dogs examined		
	Total (%)	Male (%)	Female (%)
1988	25/42 (60)	12/18 (67)	13/24 (54)
1989	35/57 (61)	14/24 (58)	21/33 (64)
1990	50/75 (67)	23/37 (62)	27/38 (71)
1991	35/67 (52)	14/26 (54)	21/41 (51)
1992	36/61 (59)	16/28 (57)	20/33 (61)
1993	20/33 (61)	10/17 (59)	10/16 (63)
1994	26/50 (52)	12/22 (55)	14/28 (50)
Total	227/385 (59)	101/172 (59)	126/213 (59)

Table 2 Distribution of prevalence rates of *Dirofilaria immitis* infection in dogs of different ages

Year	No. of dogs with worms/no. of dogs tested at age (yr):			
	1 to <2	2 to <3	3 to <4	≥4
1988	2/7 (29)	10/15 (67)	4/10 (40)	9/10 (90)
1989	4/9 (44)	12/15 (80)	8/14 (57)	11/19 (58)
1990	4/13 (31)	11/18 (61)	17/20 (85)	18/24 (75)
1991	4/12 (33)	7/21 (33)	10/14 (71)	14/20 (70)
1992	10/20 (50)	8/15 (53)	7/12 (58)	11/14 (79)
1993	0/3 (0)	5/11 (46)	7/8 (88)	8/11 (73)
1994	0/2 (0)	1/8 (13)	5/10 (50)	20/30 (67)
Total	24/66 (36)	54/103 (52)	58/88 (66)	91/128 (71)

Table 3 Numbers of *Dirofilaria immitis* worms detected in individual infected stray dogs in Saitama Prefecture, Japan

Year	Numbers of dogs with			
	1–10	11–20	21–30	≥31 worms
1988	12 (48)	5 (20)	3 (12)	5 (20)
1989	24 (69)	5 (14)	3 (9)	3 (9)
1990	23 (46)	5 (10)	6 (12)	16 (32)
1991	13 (37)	10 (29)	7 (20)	5 (14)
1992	19 (53)	6 (17)	7 (19)	4 (11)
1993	12 (60)	5 (25)	1 (5)	2 (10)
1994	12 (46)	3 (12)	7 (27)	4 (15)
Total	115 (51)	39 (17)	34 (15)	39 (17)

Figures in parentheses indicate % to the total in each year.

(89.7%) of 39 dogs in a study done in Tokyo (Ohishi *et al.*, 1973). All areas in Japan except for certain parts of Hokkaido and the islands of Miyako and Ishigaki are hyperendemic for the heartworm, with infection rates of 20–60% (Asato *et al.*, 1985; Uga *et al.*, 1990; Tada *et al.*, 1991). The prevalence obtained in our present study was within this range.

During the last decade, a method for prevention of canine heartworm disease by administration of a macrocyclic lactone derivative has come to be used worldwide (Campbell, 1985). Although the prevalence of *D. immitis* infection in older dogs in hyperendemic areas has not changed, the infection may be decreasing in younger dogs.

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