

A Survey on *Dirofilaria immitis* Occurrence in Stray Dogs of Tabriz (Iran)

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Abstract

To determine the prevalence of microfilariae *Dirofilaria immitis* (canine heart worm) infection in Tabriz (East-Azərbayjan province, Iran), blood samples from 63 male and 37 female stray dogs of six age groups (< 1 years, 1-3 years, 3-5 years, 5-7 years, 7-9 years and > 9 years) were analyzed by means of the Knott method. *Dirofilaria immitis* infection was found in 30 of 100 tested dogs (30%). Male dogs (33.3%) were more infected than females (24.3%), but this difference was not significant. Higher prevalence was found in > 9 years old dogs than in other age groups, but this difference was not statistically significant. It would be useful to apply prevention measures to control *Dirofilaria immitis* infection in the canine population of Tabriz.

Dirofilariosis, dog, sex, age

Dirofilariosis is a disease of world wide distribution, but the most endemic areas are those with moderate, tropical and subtropical climates where mosquito populations are high and stable. Other regions with cold weather, with hot summers and with rivers, lakes and widely irrigated lands are also suitable for the development of the disease. Female mosquitoes serve as an intermediate host by sucking blood from a dog with circulating *Dirofilaria immitis* microfilaria (Montoya et al. 1988). *Dirofilaria immitis* is commonly found in the pulmonary arteries and the right ventricle of dogs and other canines where it causes canine heartworm disease, but it also occurs in cats and humans. Several mosquito species are responsible for the transmission of the disease. The disease often has no clinical signs in mild infection, but with severe infection the affected animals show disorders in the circulatory system and in some cases progressive endarteritis may occur due to the mechanical effects of the parasite. Adult heartworms can cause several clinical symptoms and pathological changes in infected dogs, such as oedema, heart failure or even death (Soulsby 1982). The diagnosis of canine heartworm infection is based upon the detection of *D. immitis* circulating in blood or upon the detection of serum antibodies by serologic methods (Peribanez et al. 2001).

Endemic occurrence of *D. immitis* has been reported in the USA, Canada, South America, Africa, Australia, Asia and Europe (Yildirim et al. 2006). The prevalence of heartworm infection in dogs appears to have increased in recent years. This is due to a lack of prevention procedures and weak knowledge of dogs' owners (Lee et al. 1996).

This study was conducted to investigate the prevalence and epidemiological aspects of dirofilariosis in stray dogs from Tabriz in the northwest of Iran, which is one of the enzootic regions of *D. immitis*.

Materials and Methods

Study area

The study was conducted in Tabriz (northwest Iran). Tabriz is located in the East-Azərbayjan province (36°43'–39°25'N and 45°3'–48°19'E). The region is mountainous, with an altitude of 1351.4 m. The climate is temperate with relatively hot and dry summers and cold winters.

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Animals

In a period of one-year, from 2005 to 2006, a total of 100 blood samples were taken from the cephalic vein of 63 male and 37 female stray dogs by vacuum tube including anticoagulant (sodium citrate). The age of animals was recorded. The animals were divided into six age groups (< 1 years, 1-3 years, 3-5 years, 5-7 years, 7-9 years and > 9 years) .

Laboratory procedures

In the parasitology laboratory, all blood samples were examined using the Knott method (Soulsby 1982). Morphometric identification of microfilariae was based on criteria reported by Ettinger (2000). The length and width of microfilariae in each sample were measured using an ocular micrometer with $\times 400$ magnification.

Necropsy

In order to diagnose occult dirofilariosis, after obtaining the local Ethics Committee approval 13 dogs were selected randomly subjected to necropsy and then pulmonary arteries and hearts were searched for the presence of adult *D. immitis*.

Statistical analysis

Pearson's chi-square (χ^2) test and Fisher test was performed to compare prevalence related to sex and age categories. Statistical comparisons were carried out using SPSS 10.0 statistical software.

Results

Table 1. The prevalence of microfilariae of *Dirofilaria immitis* in blood of dogs

Sex	No. tested	No. positive	% of positive
Male	63	21	33.3
Female	37	9	24.3

Table 2. The prevalence of microfilariae of *Dirofilaria immitis* in blood of dogs according to age

Age groups	No. tested	No. positive	% of positive
< 1 year	5	-	-
1-3	15	2	13.3
3-5	24	7	29.16
5-7	28	10	35.7
7-9	18	7	38.8
> 9	10	4	40

Of a total of 100 stray dogs tested, 30 were positive for *D. immitis* infection (30%). Parasite *D. immitis* was found in 21 of 63 (33.3%) male and 9 of 37 female (24.3%) dogs, but without statistical difference between the sexes (Table 1).

The prevalence of *D. immitis* in dogs > 9 years old was higher than in other age groups, but without significance (Table 2).

For conformation of Knott method, 13 dogs were selected randomly and necropsied. The results of Knott method and necropsy finding were

compared. Only in one dog negative for *D. immitis* by Knott method adult worms were found by necropsy.

Discussion

The results of this study showed that 30% of stray dogs in Tabriz were infected with microfilariae of *Dirofilaria immitis*. In Iran, different prevalences were reported in previous studies: 60.8% in Shahsavar, 26.7% in Meshkin-Shahr and 8.4% in Tabriz (Sadighian 1969; Javidi 2003). All the mentioned studies used the Knott test method. The differences obtained in our and previous studies might be related to factors such as mosquito population density, mosquito fertility, mosquito species and environmental temperature. Close to Iran, *D. immitis* was reported from Turkey with the prevalence of 9.3% in Ankara (Oge et al. 2003) and 9.6% in Kaysari (Yildirim et al . 2006). The highest infestation in Asia was reported in Japan with 62.8% prevalence (Tada et al. 1991). The prevalence in our study is higher than in Turkey and Korea (10.2%) but lower than in Japan (47%) and Taiwan (55%) (Tada et al. 1991; Lee et al. 1996; Fan et al. 2001; Yildirim 2006).

The results of the present study revealed that there is no significant difference in sex.

This finding is similar to other studies in Iran and USA, but a study reported from USA and another one from Spain showed significantly higher prevalence in male dogs (Montoya et al. 1988; Wixsom et al. 1991). Since dirofilariosis has a higher prevalence rate in outdoor male dogs, this difference is probably due to different management methods of dog keeping.

The results of this study also showed that dogs above the age of 9 years were more infected than other age groups, but this difference was not significant. Similar findings were reported previously by several researchers in Iran and other countries (Fan et al. 2001; Javidi 2003). Risk of infection in dogs probably lasts for whole life and the likelihood of acquiring *D. immitis* infection increases with the time of exposure to the mosquitoes. Thus, older dogs have more time and opportunities to become infected with heartworm (Yildirim 2006).

The results of Ranjbar-Bahadori's study (2007) showed that Knott method has a high sensitivity and specificity compared to commercial antigen detection kit. That study showed that although sensitivity of antigen detection test was higher compared to the Knott method, the differences were not significant.

In our study, only microfilariae of *D. immitis* were found in dogs from Tabriz, but other authors reported presence of both microfilariae *Diptalonnema reconditum* and *Dirofilaria immitis* in dogs from the same area (Javidi 2003).

In conclusion, infestation by *Dirofilaria immitis* in stray dogs in Tabriz is high and therefore treatment and prophylaxis are needed to decrease the risk of the disease. This research serves as a base line for future studies on treatment or prophylaxis of dirofilariosis in dogs in Tabriz.

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