

The prevalence of *Dirofilaria immitis* in dogs with different breed, ages and sex

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Summary: This study was performed to investigate the prevalence of *Dirofilaria immitis* in stray dogs with different ages, sexes and breeds. A total of 142 dogs were examined in this study. Blood samples were examined with nativ, modified Knott's and antigen ELISA techniques. Of the total of 142 dogs, 31 were positive for *D. immitis* with a prevalence value of 22%. In addition 35.5% of positive dogs determine to have occult *D. immitis* infections. The highest prevalence of *D. immitis* infections were observed in ≥ 7 age group (%53,3), and this prevalence was followed by 4-6 (%20,5) and 0.6-3 age group (%17). The difference between ≥ 7 age group and other age groups (0.6-3 and 4-6 age groups) were found significant ($P < 0.05$), whereas no statistically difference was observed between 0.6-3 and 4-6 age groups ($P > 0.05$). Our results suggest that heartworm treatment and prophylaxis should be considered in Burdur region.

Key words: Age, breed, *Dirofilaria immitis*, dog, prevalence, sex.

Farklı ırk, yaş ve cinsiyetteki köpeklerde *Dirofilaria immitis*'in prevalansı

Özet : Bu çalışma, farklı yaş, ırk ve cinsiyetteki sokak köpeklerinde *Dirofilaria immitis*'in prevalansını tespit etmek amacıyla yapılmıştır. Çalışmanın materyalini değişik yaş, ırk ve cinsiyette toplam 142 köpek oluşturmuştur. Köpeklerden alınan kan örnekleri natif, Modifiye Knott ve antijen ELISA yöntemi ile incelenmiştir. Araştırma süresince incelenen 142 köpeğin 31'inde (%22) *D. immitis* enfeksiyonu saptanmıştır. *Dirofilaria immitis* ile gizli enfeksiyonların oranı % 35.5 (11/31) olarak ortaya çıkmıştır. *Dirofilaria immitis* enfeksiyonunun yayılışına yaşın etkisi incelendiğinde enfeksiyonunun en yüksek ≥ 7 yaş grubunda (%53,3) görüldüğü, bunu % 20,5 ile 4-6 yaş gurubu ve % 17 ile 0,6-3 yaş grubunun izlediği belirlenmiştir. Yaş gruplarından ≥ 7 yaş grubu ile 0.6-3 ve 4-6 yaş grupları arasındaki farklılık önemli bulunurken ($P < 0.01$), 0.6-3 yaş grubu ile 4-6 yaş grubu arasındaki farklılık önemsiz bulunmuştur ($P > 0.05$). Bu çalışmanın sonuçlarına göre, Burdur yöresinde *Dirofilaria immitis* enfeksiyonlarına karşı gerekli kontrol ve mücadele tedbirlerinin ortaya konması gerekmektedir.

Anahtar sözcükler: Cinsiyet, *Dirofilaria immitis*, ırk, köpek, prevalans, yaş

Introduction

Dirofilaria immitis is commonly found in the pulmonary arteries and right ventricle of dogs and other canids where they cause canine heartworm disease. It also occurs in cats and human beings (13,25). The geographical distribution of heartworm infection is associated with availability of mosquitoes, the intermediate host. Mosquito population dynamics are influenced by environmental factors such as suitable components of still water and warm temperatures (21). Hypertrophy of heart, liver congestion, cirrhosis and ascites are commonly symptoms of heartworm infection in dogs (11,14,26).

In recent years, several epidemiological studies have been performed in different countries. The parasite is widely distributed in Africa, Asia, Australia, Latin America and Mediterranean countries (3,6,10,12,17,24). Turkey is suitable country for development of this

parasite due to climatic conditions and abundant intermediate hosts. Heartworm infections were reported different region of Turkey in previous studies (4,5,18,19,22,27,29-32). This study was performed to investigate the status of *D. immitis* infection by native, antigen detecting ELISA and Knott technique among stray dogs with different ages, breed and sex.

Materials and Methods

Study was performed on total of 142 dogs (85 female and 57 male) from various villages in Burdur from December 2008 to September 2009. The dogs examined were randomly selected.

A 10 ml of whole blood was drawn from the cephalic vein of each dog, half of the sample was stored with heparin and the other half was allowed to clot. Serum was harvested following centrifugation of clotted blood and was stored at -20 C° until analysis. All samples

were obtained during the day. Blood samples were examined with native and modified Knott technique for determine microfilariae.

DiroCHEK- Lab Pack Heartworm Antigen kits (Synbiotics Corp., 96-0230) were used to examine serum samples. The test is based on an Elisa and was evaluated spectrophotometrically (Bio-Tek Instruments, ELX800), using a 630 nm filter (Reference wave length: 450 nm) according to manufacturer's instructions. Cut off value was calculated by adding 0.020 to negative control's optic density.

Pearson's chi-square (χ^2) test was performed to compare prevalence among sex, age and breed categories.

Results

Thirtyone (22%) of the 142 samples tested with antigen detecting ELISA kits showed a positive reaction for *D. immitis* in this study. Microfilariae were detect of 64.5% (20/31) and 54.8% (17/31) of dogs with Knott technique and native respectively. Occult infection rate was seemed as 35.5% of dogs examined (11/31).

The seroprevalence rates in males and females were 22.8% and 21.2%, respectively (Table 1). There was no significant difference between these groups ($P>0.05$). Seroprevalence was the highest (53.3%) in the ≥ 7 year-old age group, followed by 20.5% in the 4-6 year-old age group and 17 % in the 0.6-3 year-old age group. The difference between ≥ 7 year-old age group and the other groups is significant ($P<0.05$) but the difference between 4-6 year-old group and 0.6-3 year-old group is not significant ($P>0.05$).

Seroprevalence was similar between clean-bred and cross-bred groups (Table 1). There was no significant difference between these groups ($P>0.05$).

Table 1. The prevalence of *D. immitis* correlated with age, sex, breed.

Tablo 1. *D. immitis*'in prevalansının yaş, ırk ve cinsiyet ile ilişkisi.

	Examined dogs		Infected dogs	
	No	No	%	
Sex				
Female	85	18	21.2	
Male	57	13	22.8	
P			0.873 ⁻	
Age (Year)				
0,6-3	88	15	17	
4-6	39	8	20.5	
≥ 7	15	8	53.3	
P			0.007 [*]	
Breed				
Clean-bred	47	9	19.1	
Cross-bred	95	22	23.1	
P			0.586 ⁻	

⁻: $P>0.05$ ^{*}: $P<0.01$

Discussion

Thirtyone (22%) of the 142 samples tested with antigen detecting ELISA kits showed a positive reaction for *D. immitis* in this study.

Dirofilaria immitis has been reported by many researchers in dogs in Turkey. Different prevalence rates (0.2–46.2 %) reported in previous studies in Turkey should be related to environmental and climatic conditions, vector population, choice of diagnostic method and situation of infection (patent or occult) (1, 8, 18, 20, 28, 32).

Our studies' prevalence is higher than the other studies in Turkey. Because climate is critical factor in the prevalence of heartworm infection. Especially, the environmental temperature is important factor for *D. immitis* maturation to infective third-stage larvae (L3) in the mosquito (15). The population of mosquito species was increased from July to September in Turkey (2). Burdur which the climate allows the development of a large population of mosquitoes is localised in temperate region of Turkey. All dogs are stray dogs, for this reason, these dogs could be more contact with the intermediate mosquitoes.

The circulating microfilariae were not found in peripheral blood in some dogs with adult heartworm. This type of infection is known occult infection (7). Serological techniques are used to detect of occult infection in dog (15).

ELISA test is commonly used for diagnosis of *D. immitis*, especially for occult infections (9, 18, 32). That's why, in our study we preferred DiroCHEK- Lab Pack Heartworm Antigen kits.

In previous study, the occult infection was reported in dogs in Turkey as 1.52 – 29.6% (5,19,32). In present study, the occult infection rate was detected in dogs as 35.5% in Burdur.

Selbey et al. (23) found that male dogs had the highest relative risk for heartworm infection. They are more likely to be bitten by mosquitoes. Montoya et al. (17), also indicated that the generally higher infection rate in male dogs could be postulated to their stronger attraction to mosquitoes. In the present study, infection rate in male dogs is higher than female dogs although statistically no significant differences in seroprevalence were observed between male and female dogs ($P>0.05$).

Montoya et al. (17) were suggested that age of dog was important risk factor of heartworm infection. The infection was more prevalent in old dog than that of younger one because of long exposure period in endemic areas (16,18). In present study, the highest (53.3%) seroprevalence was in the ≥ 7 year-old age group followed by 20.5 % in the 4-6 year-old age group and 17 % in the 0.6-3 year-old age group. The difference between ≥ 7 year-old age group and the other groups is significant ($P<0.01$) but the difference between 4-6 year-

old group and 0.6-3 year-old group is not significant ($P>0.05$).

The breed of dog may be important for dirofilariosis. The prevalence of heartworm infection is usually higher in larger dog species than that of small ones (17,31). In present study, classification was not like this study, we only clasificate as clean-bred and cross-bred and there was no significant difference between breed groups ($P>0.05$).

Patent and occult infection rate were detected as 22% and 35.5%, respectively. According to these results, heartworm treatment and/or prophylaxis are needed in this area.

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References

1. **Ağaoğlu Z, Akgül Y, Ceylan E, Akkan H.** (2000): Van yöresi kopeklerinde *Dirofilaria immitis*'in yaygınlığı. *Yüzüncü Yıl Univ.Vet. Fak. Derg*, **11**, 41-43.
2. **Aldemir A, Başgelmez A.** (2006): Population dynamics of adults and immature stages of mosquitoes (Diptera: Culicidae) in Gölbaşı District, Ankara. *Turk J Zool*, **30**, 9-17.
3. **Araujo RT, Marcondes CB, Bastos LC, Sartor DC.** (2003): Canine dirofilariosis in the region of Conceicao Lagoon, Florianopolis, and in the Military Police Kennel, Sao Jose, State of Santa Catarina, Brazil. *Vet. Parasitol*, **113**, 239-242.
4. **Ataş AD, Özcelik S, Saygı G.** (1997): Sivas sokak köpeklerinde görülen helmint türleri, bunların yayılışı ve halk sağlığı yönünden önemi. *Türkiye Parazit Derg*, **21**, 305-309.
5. **Bahkçı E, Sevgili M.** (2005): Elazığ ve çevresindeki köpeklerde *Dirofilaria immitis*'in seroprevalansı. *Fırat Univ Sağlık Bil Derg*, **19**, 103-106.
6. **Bidgood A, Collins GH.** (1996): The Prevalence of *Dirofilaria immitis* in dogs in Sydney. *Aust. Vet. J*, **73**, 103-104.
7. **Bowman DD, Lynn RC, Eberhard ML, Alcaraz A.** (2003): *Georgi's Parasitology for Veterinarians*. Eighth edition, Saunders, Elsevier, USA, p.115-244.
8. **Coskun SZ, Tinar R, Akyol CV, Aydın L, Demir C.** (1992): Dogal enfekte kopeklerde *Dirofilaria immitis* mikrofilerlerine ivermektinin etkisi. *Uludag Univ. Vet. Fak. Derg*, **11**, 121-128.
9. **Courtney CH, Zeng Q.** (1993): Sensitivity and specificity of two heartworm antigen tests. *Canine Prac*, **18**, 20-22.
10. **Cringoli G, Rinaldi L, Veneziano V, Capelli G.** (2001): A prevalence survey and risk analysis of filariosis in dogs from the Mt. Vesuvius area of Southern Italy. *Vet. Parasitol*, **102**, 243-252.
11. **Eckert J.** *Helminthosen von hund und katze*. Rommel, M., Eckert, J., Kutzer, E., Körting, W. and Schneider, T. eds. *Veterinarmedizinische Parasitologie*. Parey Buchverlag Berlin, p.524-631, 2000.
12. **Fan ChK, Su KE, Lin YH, Liao ChW, Du WY, Chiou HY.** (2001): Seroepidemiologic survey of *Dirofilaria immitis* infection among domestic dogs in Taipei City and mountain aboriginal districts in Taiwan (1998-1999). *Vet. Parasitol*, **102**, 113-120.
13. **Kassai T.** *Veterinary Helminthology*. Butterworth-Heinemann, Linnarce House, Jordon Hill, Oxford, pp. 121-124, 1999.
14. **Kozan E, Sevimli FK, Birdane FM.** (2007): Afyonkarahisar ve Eskişehir illerindeki sokak köpeklerinde *Dirofilaria sp.*'nin yayılışı. *Ankara Univ Vet Fak Derg*, **54**, 117-119.
15. **McCall JW, Guerrero J, Genchi C, Kramer L.** (2004): Recent advances in heartworm infection. *Vet Parasitol*, **125**, 105-130.
16. **Montaya JA, Morales M, Juste MC, Banares A, Simon F, Genchi C.** (2006): Seroprevalence of canine heartworm disease (*Dirofilaria immitis*) on Tenerife Island: on epidemiological update. *Parasitol Res*, **100**, 103-105.
17. **Montoya JA, Morales M, Ferrer O, Molina JM, Corbera JA.** (1998): The prevalence of *Dirofilaria immitis* in Gran Canaria, Canary Islands, Spain (1994-1996). *Vet. Parasitol*, **75**, 221-226.
18. **Öge H, Doğanay A, Öge S, Yıldırım A.** (2003): Prevalence and distribution of *Dirofilaria immitis* in domestic dogs from Ankara and vicinity in Turkey. *Dtsch Tierarztl Wochenschr*, **110**, 69-72.
19. **Öncel T, Vural G.** (2005): Seroprevalence of *Dirofilaria immitis* in stray dogs in Istanbul and Izmir. *Turk J Vet Anim Sci*, **29**, 785-789.
20. **Pamukcu AM, Erturk E.** (1961) : 1933-1960 yılları arasında Ankara ve yöresinde kopeklerde gorulen hastalıklara toplu bir bakıs. *Ankara Univ. Vet. Fak. Derg*, **8**, 323-346.
21. **Quinn PJ, Donnelly WJC, Carter ME, Markey BKJ, Torgerson PR, Breathnach RMS.** (1997): *Microbial and Parasitic Disease of the Dog and Cat*. London, 267-271.
22. **Sarnıç H, Alkan M.** (1986): Köpeklerde *Dirofilaria immitis* olguları ve insan sağlığı yönünden önemi. *Türkiye Parazit Derg*, **11**, 169-174.
23. **Selbey LA, Corwin RM, Hayes HM.** (1980): Risk factors associated with canine heartworm infection. *J. Am. Vet. Med. Assoc*, **176**, 33-35.
24. **Song KH, Lee SE, Hayasaki M, Shiramizu K, Kim DH, Cho KW.** (2003): Seroprevalence of canine dirofilariosis in South Korea. *Vet. Parasitol*, **114**, 231-236.
25. **Soulsby E.JL.** (1982): *Helminths, Arthropods and Protozoa of Domesticated Animals*. Baillere Tindall, London, pp. 307-311.
26. **Şahal M, Özlem M, Tanyel B, Öcal N, Sel T.** (1997): Köpeklerdeki dirofilariosis olgularında kan, idrar ve abdominal sıvıda biyokimyasal değişiklikler. *Ankara Üniv Vet Fak Derg*, **44**, 267- 276.
27. **Şahin T, Sevgili M, Çamkerten I.** (2004): Şanlıurfa yöresi köpeklerinde *Dirofilaria sp.*'nin yayılışı. *Türkiye Parazit Derg*, **28**, 140-142.
28. **Taşan E.** (1984): Elazığ kırsal yöre köpeklerinde helmintlerin yayılışı ve insan sağlığı yönünden önemi. *Doğa Bilim Dergisi*, **8**, 160-167.
29. **Tinar R, Coşkun SZ, Doğan H, Demir S, Akyol CV, Aydın L.** (1989): Bursa yöresi köpeklerinde görülen helmint türleri ve bunların yayılışı. *Türkiye Parazit Derg*, **13**, 113-120.

30. **Umur Ş, Arslan MO.** (1998): Kars yöresi sokak köpeklerinde görülen helmint türlerinin yayılışı. *Türkiye Parazitol Derg*, 22, 188-193.
31. **Voyvoda H, Paşa S, Ozensoy Toz S, Ozbel Y, Ertabaklar H.** (2004): Aydın'ın bazı ilçe ve köyleri ile İzmir'in Selçuklu ilçesindeki köpeklerde leishmaniosis ve dirofilariosis'in prevalansı. *Turk J Vet Anim Sci*, 28, 1105-1111.
32. **Yıldırım A, İça A, Atalay O, Düzlü O, İnci A.** (2007): Prevalence and epidemiological aspects of *Dirofilaria immitis* in dogs from Kayseri Province, Turkey. *Res Vet Sci*, 82, 358-363.

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