Case Report
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The First Report of *Dirofilaria immitis* from a Dog in Ilgaz, Çankırı

Çankırı Ilgaz'da Bir Köpekten İlk Dirofilaria immitis Raporu

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ABSTRACT

In this study, *Dirofilaria immitis (D. immitis)* detected in the necropsy of an Izci Kopegi Zagar breed dog in Ilgaz, Çankırı was reported. After being attacked by stray dogs, the owner of an 8-year-old male Izci Kopegi Zagar from Ilgaz, Çankırı presented to the veterinary clinic with serious injuries. The dog did not get well even after receiving treatment. Two nematodes were found in the dog's right heart chamber after postmortem investigation. Light microscopic examination revealed that these parasites were adult female *D. immitis*. As far as the authors' knowledge, this is the first observation of dogs residing in Ilgaz, Çankırı. Furthermore, it was noteworthy that the affected dog only had two female parasites. Due to occult infection, veterinarians are recommended to perform serological tests as well as blood examinations on dogs suspected of having heartworm.
Keywords: *Dirofilaria immitis*, dog, Zagar, Ilgaz, Çankırı, Türkiye

ÖZ

Bu çalışmada, Ilgaz, Çankırı'da İzci Köpeği Zagar ırkı bir köpeğin nekropsisinde tespit edilen *Dirofilaria immitis (D. immitis)* rapor edilmiştir. Ilgaz, Çankırı'da sokak köpeklerinin saldırısına uğrayan 8 yaşındaki erkek İzci Köpeği Zagar'ın sahibi yaralı olarak veteriner kliniğine başvurmuştur. Tedaviye rağmen köpek iyileşmemiştir. Postmortem incelemede köpeğin sağ kalbinde iki nematod bulunmuştur. Işık mikroskobu ile incelenmesi sonucunda bu parazitlerin erişkin dişi *D. immitis* olduğu görülmüştür. Yazarların bilgisine göre bu çalışma Ilgaz, Çankırı'da yaşayan köpeklerden ilk kayıttır. Ustelik enfekte köpekte sadece iki dişi parazitin bulunması kayda değer bulunmuştur. Occult enfeksiyon sebebiyle veteriner hekimlerin kalp kurdu yönünden şüpheli köpeklere kan muayenesinin yanı sıra serolojik test de uygulaması önerilir.
Anahtar Kelimeler: *Dirofilaria immitis*, köpek, Zagar, Ilgaz, Çankırı, Türkiye

INTRODUCTION

Dirofilaria immitis (*D. immitis*) (Spirurida: Onchocercidae), infects some animals, including dogs, cats, and other wild carnivores (1). These animal species act as the final hosts in life cycle of parasites (1,2). Adult parasites primarily settle in the right heart (atrium and ventricle), pulmonary artery, and vena cava of the final hosts. They are also found in the peritoneal cavity, central nervous system, eyes, and lungs of the final hosts (1,2). In endemic places, *D. immitis* can accidentally infect humans, leading to a condition known as human pulmonary dirofilariosis which is an emerging zoonotic disease (3).

Some mosquito species are intermediate hosts in the parasite biology (1). They are infected with microfilariae by sucking blood from the infected final host. Microfilariae develop into infective stage larvae (L3) in the female mosquitoes within 13 days. The L3 is transferred to the final host during sucking blood by infective mosquitoes (1,2). The L3 reach the fourth stage under the skin of the final host within 3-12 days and then they arrive at the right heart through venous circulation. They develop into adult parasites in the right side of the heart within 70-120 days postinfection. After copulation, the female *D. immitis* begins producing microfilariae in the 6th month after infection and can continue producing microfilariae for a long time. Microfilariae pass to the uterus via placenta and they may cause prenatal infection (1,2). Sometimes microfilariae may not be present in the bloodstream of dogs infected with *D. immitis*, which is a situation called occult heartworm infection (4).

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Heartworm infection is a systemic disease affecting heart, lungs, liver, and kidneys in dogs. It may be subclinical in general, but 25 adult parasites are sufficient to cause clinical signs (1,2). During necropsy, adult parasites in the heart are considered typical in terms of morphology (1,2,5). The female has a blunt posterior end and is 25-31 cm in length and 1-1.3 mm in width. The male has a spirally curved posterior end and is 12-20 cm in length and 0.7-0.9 mm in width. Microfilariae are approximately 205-280 µm long and can be observed in the light microscopic examination of venous blood samples (1,5). However, the species of microfilariae should be distinguished from those of other filariform parasites of dog such as *Dirofilaria repens* and *Acanthocelionema* spp. using some morphological criteria, including the staining characteristics of the excretory and anal orifice. Serological tests can be performed in addition to microscopic examination of blood samples (1).

Çankırı is located between 32° 30' and 34° east longitudes and 40° 30' and 41° north latitudes in the north of Central Anatolia. It has an altitude of 723 meters above sea level. It is geographically surrounded by Bolu, Karabük, Kastamonu, Çorum, Ankara, and Kırıkkale provinces. The province has a continental climate. Winters are cool and summers are warm in the central, Ilgaz and Yapraklı districts of Çankırı. Precipitation occurs almost every season in this region, and the average annual rainfall varies between 392-538 (kg/m^2) (6).

Izci Kopegi Zagar is one of the native dog breeds in Türkiye (Official Gazette of the Republic of Türkiye, registration date: 25.08.2021, number: 28036) (2). These dogs are also called by different regional terms such as kopay, kopoy, tavşanci, izsüren, and çakir in different regions of Türkiye, including Thrace, West and central Anatolia. Izci Kopegi Zagar is a smart, loyal and energetic dog breed and is especially used for hare hunting. Its coat is typically black or brown. The height of this breed is approximately 49-52 cm, and the weight is approximately 18-20 kg (2,7). In this study, *D. immitis* was observed in the necropsy of an Izci Kopegi Zagar in Çankırı/Ilgaz. To the knowledge of the authors, this is the first report of *D. immitis* in a dog in this region.

CASE REPORT

In December 2024, an 8-year-old male Izci Kopegi Zagar living in Ilgaz, Çankırı was brought to the veterinary clinic by its owner. The dog was seriously injured after being attacked by roaming dogs. Despite the treatment, the dog could not recover. During necropsy, two large, white parasites were detected in the right heart chamber. The parasites were brought to Parasitology Department of Kırıkkale University Faculty of Veterinary Medicine. The parasites were rinsed with sterile saline solution and subsequently were preserved in 70% alcohol. Morphological identification was performed under a light microscope (Leica ICC50) after clearing them in lactophenol with related reference (5). Light microscopic examination indicated that these parasites were adult female *D. immitis*. The parasites were measured as 25.9-26.5 cm long. There was a small round mouth at the anterior end (Figure 1A and B), without lips. The vulva is 2.4-2.6 mm longer than the anterior end (Figure 1C and D), just behind the posterior end of oesophagus. The blunt posterior end of female parasites was observed in Figure 1E and F.

Clinical cases of heartworm infection have increased in dogs. This increase mainly depends on certain epidemiological factors, including the presence of potential vectors and infected animals,

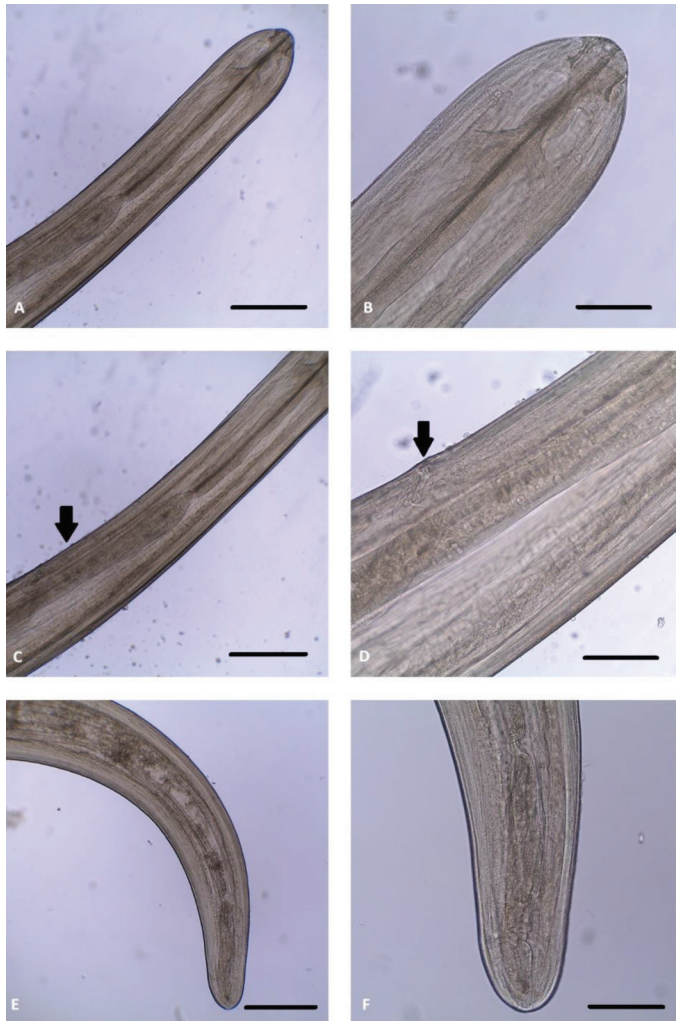

Figure 1. Adult female *Dirofilaria immitis*. A: Anterior part of the parasite, B: Small round mouth in the anterior end, C: The vulva is 2.4-2.6 mm longer than the anterior end (arrowhead), D: The genital pore (arrowhead), E: Posterior part of the parasite, F: Blunt posterior end of the parasite. Bar =500 µm (A, C, E), 200 µm (B, D, F)

and the absence of regular chemoprophylaxis in dogs (8). Depending on the diagnostic technique performed (serologic tests, blood examination or polymerase chain reaction), *Dirofilaria* spp. have been detected at varying rates in dogs (8-13). *D. immitis* has been reported between 0.08-40% from dogs in Türkiye (9,12,13), including in some neighbouring provinces of Çankırı (Ankara and Kırıkkale) (10,11). According to authors' knowledge it is the first report of *D. immitis* in dogs from Ilgaz, Çankırı.

Occult heartworm infection characterised amicrofilaremia can be seen in infected dogs due to several reasons, including the presence of only male or only female (single sex) parasites, the parasites not yet having become adults, the adult parasite becoming sterile depending on treatment, and the microfilariae being controlled by immunological mechanisms in the final host (4). Serological tests should be preferred to detect occult heartworm infection. Occult heartworm infection has been detected between 26.5-29.6% of positive dogs (8,9,14). In this study, only two female parasites were found in the right heart.

Some mosquito species play the role of intermediate hosts in *D.*

immitis life cycle. *D. immitis* DNA has been mostly detected in *Aedes vexans* and *Culex pipiens* in Kayseri, 51.7% and 42.1%, respectively (15). Similarly, *Dirofilaria* spp. DNA has been reported in *Ae. vexans* (6.66%) in Aras Valley, located in north-eastern Türkiye (16). Çankırı is one of the areas in the Kızılırmak river basin where rice farming is intensively carried out (17). There is no information on which mosquito species can transmit *D. immitis* in this region. In a previous study, *Anopheles maculipennis* s.s was determined as the most common mosquito species in this region (17). *Anopheles maculipennis* is determined as vector of *D. immitis* in different countries in Europe (18). Similarly, *An. maculipennis* sl is claimed as a potential vector of *D. immitis* and *D. repens* due to their DNA being found in head-thorax pools of this species sampled in Aras Valley (17). However, vector competence differs in vectorborne parasites, including *Dirofilaria* species and is influenced by various factors. Thus, further studies are required to determine which mosquito species serve as vectors for *D. immitis* in this region.

CONCLUSION

In conclusion, vector-borne infections are expected to increase with global warming. In this study, *D. immitis* was seen for the first time in an Izci Kopegi Zagar necropsy in Ilgaz, Çankırı. Moreover, the presence of two female parasites in this dog was considered noteworthy. Due to the possibility of occult heartworm infection, it is recommended that veterinarians perform serological tests as well as blood examinations on suspected dogs in endemic areas.

*Ethics

Informed Consent: The dog owner was informed of the study and a signed consent form was obtained.

Footnotes

*Authorship Contributions

Design: S.Y., K.Y., Data Collection or Processing: S.Y., K.Y., Analysis or Interpretation: S.Y., K.Y., Literature Search: S.Y., K.Y., Writing: K.Y.

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