

## Nematode and cestode eggs scattered with cats-dogs feces and significance of public health in Samsun, Turkey

Ali Tümay GÜRLER<sup>1</sup>, Cenk Soner BÖLÜKBAŞ<sup>1</sup>, Gökmen Zafer PEKMEZCİ<sup>2</sup>, Şinasi UMUR<sup>1</sup>,  
Mustafa AÇICI<sup>1</sup>

<sup>1</sup>Ondokuz Mayıs University, Faculty of Veterinary Medicine, Department of Parasitology; <sup>2</sup>Department of Preclinical Science, Samsun, Turkey.

**Summary:** The objectives of this study were to determine the prevalence of nematode and cestode egg contamination in cats' and dogs' fecal samples collected from public grounds (public parks, streets, walks, shelter) in Samsun, Turkey and to evaluate the potential public health risks from parasites of concern. A total of 448 stool samples, 187 cat feces and 261 dog feces, were picked up off the ground. Sixty samples (32.1%) of cats and 74 samples (28.4%) of dogs were positive. *Toxocara* spp. (27.8%), *Trichuris* spp. (3.2%), hookworm (2.7%) and *Toxascaris leonina* (1.8%) eggs in cat samples and hookworm (13%), *Toxocara* sp. (10.3%), *Trichuris* sp. (6.9%), *Toxascaris leonina* (2.7%) and *Taenia* sp. (0.4%) eggs in dog samples were identified. *Toxocara* spp. + hookworm in 9 dog and 2 cat samples, *Toxocara* spp.+ *Trichuris* spp. in 2 cat and 1 dog samples, *Trichuris* spp. + hookworm 2 dog samples and *Toxascaris leonina* + kancalıkurt in one dog samples were found as mix infections. Furthermore, non-identified rhabditoid type eggs (2.2%) and *Isospora* sp. oocysts (1.8%) were found. Some of helminth species found in this study, *Toxocara* sp., hookworm and *Taenia* sp. were zoonotic importance. These results were the first record from the Black Sea Region.

Keywords: Cat, cestode, dog, nematode, Samsun.

### Samsun'da Kedi-köpek dışkıları ile sokaklara dağılan nematod ve sestod yumurtaları ve bunların halk sağlığı yönünden önemi

**Özet:** Bu çalışma, Samsun'da kedi ve köpeklere ait dışkıların nematod ve sestod yumurtaları ile kontaminasyon durumunu ve etrafa saçılan helmint enfeksiyonunun halk sağlığı açısından önemini araştırmak amacıyla gerçekleştirilmiştir. Araştırma kapsamında 187 kedi, 261 köpek olmak üzere toplam 448 dışkı örneği sokaklarda yerden toplanmıştır (parklar, sokaklar, yürüyüş yolları ve barınak). İnceleme sonunda 60 (%32,1) kedi, 74 (%28,4) köpek dışkı örneği enfekte bulunmuştur. Kedi dışkılarında *Toxocara* spp. (%27,8), *Trichuris* spp. (%3,2), kancalıkurt (%2,7) ve *Toxascaris leonina* (%1,8), köpek dışkılarında kancalıkurt (%13), *Toxocara* sp. (%10,3), *Trichuris* sp. (%6,9), *Toxascaris leonina* (%2,7) ve *Taenia* sp. (%0,4) yumurtalarına rastlanmıştır. Çalışmada miks enfeksiyonlar görülmüş, *Toxocara* spp.+ kancalıkurt 9 köpek ve 2 kedide, *Toxocara* spp. + *Trichuris* spp. 2 kedi ve 1 köpekte, *Trichuris* spp. + kancalıkurt 2 köpekte ve *Toxascaris leonina* + kancalıkurt bir köpekte kaydedilmiştir. Bunun yanında dışkı örneklerinde rhabditoid tip yumurtalara (%2,2) ve *Isospora* spp. oocistlerine (%1,8) rastlanmıştır. Araştırma sonunda teşhis edilen *Toxocara* spp., kancalıkurt ve *Taenia* spp., insan sağlığını etkileyebilecek zoonozlar olarak kaydedilmiştir. Bu kayıtlar Karadeniz Bölgesi'ne ait ilk verilerdir.

Anahtar Sözcükler: Kedi, köpek, nematod, Samsun, sestod.

### Introduction

In Turkey, especially in large cities, there are a lot of urban free-ranging cats and dogs. Although they are spayed or neutered regularly by municipal shelters that provide animal care and control, their numbers are increasing daily. These animals host a variety of helminth species (15,33). There are many studies about the helminths of cats and dogs living in Turkey and approximately 20 species in cats and 40 species in dogs, a total of 60 helminth species have been reported up to now (5,15,36,37). Some of these parasites, particularly taenids cause economic losses in slaughtered ruminants

and *Toxocara* spp. and hookworms are a public health threat.

The majority of the previous studies screening cat and dog helminths are performed in some particular cities, such as Ankara and Elazığ, and the prevalence of helminths in Turkey were found as 78.4-96% in cats (2,10) and 32.8-100% in dogs by both necropsy and fecal examination (18,31,33).

The aim of the study is to determine nematodes and cestodes eggs scattered with cats and dogs feces and investigate their significance of public health in Samsun, Turkey.

## Material and Methods

The study was conducted at Samsun, located at the Black Sea Region of Turkey, between northern latitude 41°16.2' and eastern longitude 36°19.8'. Fecal samples were collected from public grounds consist of public parks (291 samples), streets (75 samples), walking paths (42 samples) and shelter (40 samples) between September 2011 and June 2013. In order to detect nematode and cestode eggs, 187 cat fecal samples and 261 dog fecal samples, a total of 448 samples were picked up off the ground (Table 1). All samples were collected in plastic vials, which were marked with the animal species (cat or dog), location, time and date of collection. Samples were examined immediately after bringing to the laboratory or stored at 4°C for a maximum of two days. All samples were first examined macroscopically for cestod proglottids, and then evaluated microscopically by salt water flotation (436gr NaCl per 1 lt water). Eggs were identified based on their morphological characteristics according to literatures (35,38).

Table 1. Number of fecal samples by locations.  
Tablo 1. Alınan yerlere göre dışkı örneği sayıları.

Locations	Cat samples	Dog samples	Total samples
Public parks	133	158	291
Walking paths	12	63	75
Streets	42	-	42
Shelter	-	40	40
Total	187	261	448

## Results

In this study, 134 (29.9%) fecal samples of 448 were infected with nematode or cestode eggs. Identified eggs were composed of *Toxocara* spp., hookworm, *Trichuris* sp., *Toxascaris leonina* and *Taenia* sp. Identified nematode and cestode eggs from fecal samples in cats and dogs, and mix infections were shown in Table 2 and Table 3.

Table 2. Identified eggs in fecal samples of cats and dogs.  
Tablo 2. Kedi ve köpek dışkı örneklerinde bulunan türler.

Helminth species	cat (n=187)	Dog (n=261)	Total (n=448)
<i>Toxocara</i> spp.	52 (27.8%)	27 (10.3%)	79 (17.6%)
Hookworm	5 (2.7%)	34 (13%)	39 (8.7%)
<i>Trichuris</i> spp.	6 (3.2%)	18 (6.9%)	24 (5.4%)
<i>Toxascaris leonina</i>	1 (0.5%)	7 (2.7%)	8 (1.8%)
<i>Taenia</i> spp.	-	1 (0.4%)	1 (0.2%)
Total	60 (32.1%)	74 (28.4%)	134 (29.9%)

Table 3. Mix infections in fecal samples of cats and dogs.

Tablo 3. Kedi ve köpek dışkılarında tespit edilen miks enfeksiyonlar.

Mix infections	Cat (n=187)	Dog (261)	Total (448)
<i>Toxocara</i> spp. + hookworm	2 (%1.1)	9 (3.4%)	11 (2.5%)
<i>Toxocara</i> spp. + <i>Trichuris</i> spp.	2 (%1.1)	1 (%0.4)	3 (%0.7)
<i>Trichuris</i> spp. + hookworm	-	2 (%0.8)	2 (%0.4)
<i>Toxascaris leonina</i> + hookworm	-	1 (%0.4)	1 (%0.2)
Total	4(2.1%)	13 (4.9%)	17 (3.8%)

All of four locations were infected with nematode or cestode eggs. When results were evaluated according to locations, the most infected location was shelter and it was followed by public parks, walking paths and streets, respectively. Furthermore, Total, *Toxocara* spp. and hookworm infections of locations where fecal samples were collected were shown Table 4.

Table 4. Contaminations according to locations where fecal samples collected

Tablo 4. Dışkı örneklerinin toplandığı yere göre enfeksiyon durumu

Locations	Total samples	Total infection		<i>Toxocara</i> spp.		Hookworm	
		n	%	n	%	n	%
Public parks	291	88	30.2	58	19.9	15	5.2
Walking paths	75	11	14.7	3	4.0	-	-
Streets	42	8	19.0	8	19.0	-	-
Shelter	40	27	67.5	10	25.0	24	60.0
$\chi^2$		37.652*		12.208**		101.768*	

\*p<0.01 \*\*p<0.05

## Discussion and Conclusion

Dogs and cats carry a large number of helminth species. While the overall ratios of helminth infections in the world by fecal examination were notified as 26.6-35.5% in dogs and 20.5-83.3% in cats (22,26,30,40), they were 30.4-86.9% (32,43) in dogs and 72-78.4% in cats in Turkey (2,10). Nematodes were reported more frequently than cestodes by fecal examination in both of dogs and cats in Turkey (2,10,18,21) except a study (11). We reported that 32.1% of cats' fecal samples and 28.4% of dogs' fecal samples were infected with different nematod and cestod egg species. The infection rates were 2.7-13% for nematodes and 0.4% for cestodes in dogs and 0.5-27.8% for nematode in cats while it was not found cestode eggs in cat's fecal samples.

Turkey is consist of seven regions and most of the studies were recorded from Central Anatolia Region (32.8-100%) (1,3,4,14,25). Furthermore, the rates of other regions were 52,9-95,2% in the Eastern Anatolia Region (6,12,19,27), 30,4-98% in the Marmara Region (8,32), 41% in the Aegean Region and 64.3% in the Mediterranean Region (42). This study is the first record

from the Black Sea Region and this result (29.9%) had lowest rate of all of six regions in Turkey.

All of four locations where fecal samples collected were infected least one helminth eggs. While streets were contaminated only *Toxocara* spp. eggs, public parks were infected with all of five species. In public parks where the most number of cats' and dogs' fecal samples were collected, it was seen that dogs usually preferred to defecate around bushes while cats chose in playgrounds. On the other hand, on streets where could be collected only cat feces, samples were generally in a sand drift near the dustbins, while on walking paths, samples were usually collected near the paths.

*Toxocara* spp. cause Visceral Larva Migrans (VLM) in humans are one of the most common helminth species of cats and dogs (9,23,34). In Turkey, the prevalence of *Toxocara* spp. was 3.9-35.3% in cats (2,10), while 3.7-35.7 in dogs. We found that *Toxocara* spp. eggs were identified from 27.8% of cats' samples and 10.3% of dogs' samples. So it was seen that cats' feces had more risk than dogs especially in public parks (*Toxocara* spp. eggs were found 33.1% of cats' samples and 8.9% of dogs' samples) and shelter had more risk than other locations in point of VLM in Samsun. However, the ratios of *T. leonina* were lower (0.5% in cats and 2.7 in dogs) than previous study except Ünlü and Eren, 2007 (39), in which the ratio was 1%. It might be notable that both of two studies were carried out on coastal region where humid is high, thus, might be a reason.

Hookworms have pathogenic importance especially in puppies and kittens and some species also have zoonotic importance as they are a common cause of Cutaneous Larva Migrans (CLM) in people (39). The ratio of the parasite in dogs varies widely (1.2-57.1%) at fecal examination in Turkey (32,37), whereas there is no report by fecal examination in cats. In this study, the prevalence of hookworm was found higher in dogs (13%) than cats (2.7%) since only dog fecal samples could be collected from shelter. Infected larvae of hookworm need wet floor for contamination and the dog boxes which had concrete floor washed every day for cleaning in the shelter. So it might be the reason why the ratio of hookworm was found very high (60%) in this study.

*Taenia* spp. species are the one of the most common cestodes of cats and dogs (20,26). In Turkey, *Taenia* sp. notified as 2% (10) in cats and under 10% (4,6,37) in dogs, except Çerçi, 1992 (11) found the rate as 46.3% in which dogs received anthelmintic treatment before fecal sample collection. We found *Taenia* sp. eggs in one (0.5%) dog fecal sample collected from public park though no cestod proglottid was seen by macroscopic examinations. It might be risk for human if it was *Echinococcus granulosus*'s eggs.

*Trichuris* spp. is one of the common nematodes of dogs while was reported very rarely in cats (7,16,17, 29,41). In Turkey, the parasite was common in dogs (0.6-

6.6%) while there was only one case report in cat (6,11,24). The rate in dogs was 6.9% and was reported first time from cats as 3.2% in this study.

*Strongyloides stercoralis* is an intestinal parasite rarely found at low rates in carnivores and have both parasitic and free living generations. Threadworms was reported 0.2-0.4% in dogs and 0.3% in cats in the world while 0.5% for dogs and 0.6% for cats in Turkey (15,17,22). In this study, 2.7% of cats' fecal samples and 1.9% of dogs' fecal samples were infected with non-identified rhabditoid type eggs. Thus, these eggs might be free-living form of *S. stercoralis* which causes zoonotic helminth infection.

At the end of the study, five different helminth species in which consisted of zoonotic parasites (*Toxocara* spp., hookworms and *Taenia* spp.) were determined in cats and dogs by fecal examination and these results were the first record from the Black Sea Region in Turkey. It is clear that the prevalence of helminths in cats and dogs are still very high since effective methods to fight against these parasites have not yet been developed in Turkey. In order to reduce these rates and avoid to environmental contamination, spay and neuter programs in stray cats and dogs should be continued regularly and anthelmintic drugs should be used during post-operative nursing. In addition, for cleaning to places have contaminated risk, municipal officials should be informed for cleaning stools especially on playgrounds, around bushes or near dustbins, and owners for having a plastic bag to collect their dogs' stools while together.

## References

1. **Ataş AD, Özçelik S, Saygı G** (1997): *Sivas sokak köpeklerinde görülen helmint türleri, bunların yayılışı ve halk sağlığı yönünden önemi*. T Parazitol Derg, **21**, 305-309.
2. **Ayaz E, Değer S, Gül A, Yüksek N** (2001): *Van kedilerinde helmintlerin yayılışı ve halk sağlığı yönünden önemi*. T Parazitol Derg, **25**, 166-169.
3. **Ayçiçek H, Sarımehtemetoğlu O, Tanyüksel M, Özyurt M, Gün H** (1998): *Ankara Sokak köpeklerinde görülen bağırsak helmintlerinin yayılışı ve bunların halk sağlığı bakımından önemi*. T Parazitol Derg, **22**, 156-158.
4. **Aydenizöz M** (1997): *Konya yöresi köpeklerinde helmintolojik araştırmalar*. T Parazitol Derg, **21**, 429-434.
5. **Aypak S, Aysul N, Ural K, Birincioğlu S, Atasoy A, Derincegöz O, Epikmen T, Karageç T** (2012): *A case of diffuse peritoneal larval Mesocostoides corti (syn. M. cogae) cestodiasis in a dog in Turkey*. Kafkas Univ Vet Fak Derg, **18**, 885-888.
6. **Balkaya İ, Avcioğlu H** (2011): *Gastro-intestinal helminths detected by coprological examination in stray dogs in the Erzurum Province-Turkey*. Kafkas Üniv Vet Fak Derg, **17**, 43-46.
7. **Barutzki D, Schaper R** (2003): *Endoparasites of dogs and cats in Germany 1992-2002*. Parasitol Res, **90**, 148-150.
8. **Başaran E** (2002): *Kuzeydoğu Marmara Bölgesi'nde Kedi ve Köpeklerin Helmint Enfeksiyonları*. Uludağ Üniv Sağlık Bil Enst, Bursa.

9. **Becker AC, Rohen M, Epe C, Schnieder T** (2012): *Prevalence of endoparasites in stray and fostered dogs and cats in Northern Germany*. Parasitol Res, **111**, 849-857.
10. **Burgu A, Tınar R, Doğanay A, Toparlak M** (1985): *Ankara sokak kedilerinin ekto- ve endoparazitleri üzerinde bir araştırma*. Ankara Üniv Vet Fak Derg, **32**, 288-300.
11. **Çerçi H** (1992): *Ankara İli Elmadağ ilçesi kırsal yöre köpeklerinde görülen mide-bağırsak helmintlerinin yayılışı ve insan sağlığı yönünden önemi*. T Parazitol Derg, **16**, 59-67.
12. **Çiçek M, Yılmaz H** (2012): *Van yöresi insan ve köpeklerde Toxocariosis'in yayılışı*. Kafkas Üniv Vet Fak Derg, **18**, 531-536.
13. **Dinçer Ş, Cantoray R, Taşan E** (1980): *Elazığ sokak kedilerinde görülen iç ve dış parazitler ile bunların yayılış oranları üzerine araştırmalar*. Fırat Üniv Vet Fak Derg, **5**, 7-15.
14. **Doğanay A** (1983): *Ankara köpeklerinde görülen helmint türleri, bunların yayılışı ve halk sağlığı yönünden önemi*. Ankara Üniv Vet Fak Derg, **30**, 550-561.
15. **Doğanay A** (1992): *Türkiye'de kedi ve köpeklerde görülen parazitler*. Ankara Üniv Vet Fak, **39**, 336-348.
16. **Ferreira FS, Pereira-Baltasar P, Parreira R, Padre L, Vilhena M, Tavora Tavora L, Atougia J, Centeno-Lima S** (2011): *Intestinal parasites in dogs and cats from the district of Evora, Portugal*. Vet Parasitol, **179**, 242-245.
17. **Gates MC, Nolan TJ** (2009): *Endoparasite prevalence and recurrence across different age groups of dogs and cats*. Vet Parasitol, **166**, 153-158.
18. **Güçlü F, Aydenizöz M** (1995): *Konya'da köpeklerde dışkı bakılarına göre parazitlerin yayılışı*. T Parazitol Derg, **19**, 550-556.
19. **Güralp N, Dinçer Ş, Kemer R, Cantoray R, Taşan E** (1997): *Elazığ yöresi köpeklerinde görülen görülen gastro-intestinal helmint türleriyle bunların yayılış oranı ve halk sağlığı yönünden önemleri*. Ankara Üniv Vet Fak Derg, **24**, 241-249.
20. **Igarza AA, Curdi JL, Schmidt CG, Morgolles CC** (1992): *Parasitosis of stray dogs in north-eastern Spain*. Rev Sci Tech Off Int Epiz, **11**, 1047-1049.
21. **Kozan E, Kırçalı Sevimli F, birdane FM** (2007): *Afyonkarahisar ve Eskişehir illerindeki sokak köpeklerinde görülen gastrointestinal cestod ve nematod enfeksiyonları*. T Parazitol Derg, **31**, 208-2011.
22. **Lorenzini G, Tasca T, Geraldo ADC** (2007): *Prevalence of intestinal parasites in dogs and cats under veterinary care in Porto Alegre, Rio Grande do Sul, Brazil*. Braz J Vet Res Anim Sci, **44**, 137-145.
23. **McGlade TR, Robertson ID, Elliot AD, Read C, Thompson RCA** (2003): *Gastrointestinal parasites of domestic cats in Perth, Western Australia*. Vet Parasitol, **117**, 251-262.
24. **Merdıvenci A** (1970): *Türkiye Parazitleri ve Parazitolojik Yayınları*. Kurulmuş Matbaası, İstanbul.
25. **Mimioğlu M, Güralp N, Sayın F** (1959): *Ankara köpeklerinde görülen parazit türleri ve bunların yayılış nispeti*. Ankara Üniv Vet Fak Derg, **6**, 53-68.
26. **Nolan TJ, Smith G** (1995): *Time series analysis of the prevalence of endoparasitic infections in cats and dogs presented to a veterinary teaching hospital*. Vet Parasitol, **59**, 87-96.
27. **Orhun R, Ayaz E** (2006): *Van yöresi köpeklerinde bulunan endoparazitler ve halk sağlığı yönünden önemi*. T Parazitol Derg, **30**, 103-107.
28. **Overgaauw PAM, Knäpen F** (2000): *Dogs and nematode zoonoses*. 222-227. In: Macpherson CNL, Meslin FX, Wandeler AI (Ed), *Dogs, Zoonoses and Public Health*. CABI Publishing, NY.
29. **Palmer CS, Thompson RCA, Traub RJ, Rees R, Robertson ID** (2008): *National study of the gastrointestinal parasites of dogs and cats in Australia*. Vet Parasitol, **151**, 181-190.
30. **Ramirez-Barrios RA, Barboza-Mena G, Munoz J, Angulo-Cubilla F, Hernandez E, Gonzales F, Escalona F** (2004): *Prevalence of intestinal parasites in dogs under veterinary care in Maracaibo, Venezuela*. Vet Parasitol, **121**, 11-20.
31. **Saygı G, Özçelik S, Temizkan N** (1990): *Sivas sokak köpeklerinin ince barsaklarında bulduğumuz helmintler*. T Parazitol Derg, **14**, 81-93.
32. **Şenlik B, Çırak VY, Karabacak A** (2006): *Intestinal nematode infections in Turkish military dogs with special reference to Toxocara canis*. J Helminthol, **80**, 299-300.
33. **Taşan E** (1984): *Elazığ kırsal yöre köpeklerinde helmintlerin yayılışı ve insan sağlığı yönünden önemi*. Doğa Bil Derg, **8**, 160-167.
34. **Thevenet PS, Jensen O, Mellado I, Torrecillas C, Raso S, Flores ME, Minvielle MC, Basualdo JA** (2003): *Presence and persistence of intestinal parasites in canine fecal material collected from the environment in the Province of Chubut, Argentine Patagonia*. Vet Parasitol, **117**, 263-269.
35. **Thienpont D, Rochette F, Vanparijs OFJ** (1990): *Diagnose von Helminthosen Durch Koproskopische Untersuchung*. Janssen Pharmaceutica, Beerse.
36. **Tınar R, Coşkun ŞZ, Doğan H, Demir S, Akyol ÇV, Aydın L** (1989): *Bursa yöresi sokak köpeklerinde görülen helmint türleri ve bunların yayılışı*. T Parazitol Derg, **13**, 113-120.
37. **Umur Ş, Arslan MÖ** (1998): *Kars yöresi sokak köpeklerinde görülen helmint türlerinin yayılışı*. T Parazitol Derg, **22**, 188-193.
38. **Umur Ş, Köroğlu E, Güçlü F, Tınar R** (2006), *Nematoda*. 213-441. In: Tınar R (Ed): *Helmintoloji*. Nobel Basımevi, Ankara.
39. **Ünlü H, Eren H** (2007): *Aydın yöresi sokak köpeklerinde dışkı bakısına göre saptanan mide bağırsak helmintleri*. T Parazitol Derg, **31**, 46-50.
40. **Vanparijs O, Hermans L, Van der Flaes L** (1991): *Helminth and protozoan parasites in dogs and cats in Belgium*. Vet Parasitol, **38**, 67-73.
41. **Yamamoto N, Kon M, Saito T, Maeno N, Koyama M, Sunaoshi K, Yamaguchi M, Morishima Y, Kawanaka M** (2009): *Prevalence of intestinal canine and feline parasites in Saitama Prefecture, Japan*. Kansenshogaku Zasshi: **83**, 223-228.
42. **Yaman M, Ayaz E, Gül A, Muz MN** (2006): *Hatay ilinde bakısı yapılan kedi ve köpeklerde helmint enfeksiyonları*. T Parazitol Derg, **30**, 200-204.
43. **Zeybek H, Tatar N, Tokay A** (1992): *Ankara yöresi kırsal alan köpeklerinde görülen parazitler ve bunların yayılışı*. Etlik Vet Mikrobiyol Derg, **7**, 17-27.

Geliş tarihi: 03.03.2014/ Kabul tarihi: 27.05.2014

**Address for correspondence:**

Assis. Prof. Ali Tümay Gürler  
Ondokuz Mayıs University,  
Faculty of Veterinary Medicine  
Atakum, SAMSUN  
e-mail: tgurler@omu.edu.tr