İstanbul Üniv. Vet. Fak. Derg.
28 (1), 219 - 225, 2002

J. Fac. Vet. Med. Univ. Istanbul
28 (1), 219 - 225, 2002

FLEA INFESTATIONS OF DOGS IN ISTANBUL, TURKEY

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İstanbul'da köpeklerde pire enfestasyonları

Özet: Pireler, 1999 ve 2000 yıllarında Haziran ayından Ekim ayına kadar İstanbul'da bazı pet klinik-lerine getirilen pire ile enfeste 50 köpekten toplandı. Köpeklerden 4'ü (dişi) 2.5-9 aylık ve 46'sı (27 erkek + 19 dişi) bir yaşında veya bir yaşından büyüktü. Köpeklerden 4'ü Cocker, 16'sı Terrier, 5'i Setter, 7'si Poodle, 4'ü Pekingese, 2'si Pointer, 1'i Golden retriever, 1'i Tibetan spaniel ve 10'u melezdi. Köpekler evde bakılan veya zaman zaman dışarı çıkan hayvanlardı. Pireler, elektronik pire tarağı (Epivet™ Flea zapper) ile toplandı. Pire ile enfeste 50 köpekten 37'si (%74) *Ctenocephalides felis felis*'le, 2'si (%4) *C.canis*'le, 1'i (%2) *Pulex irritans*'la saf enfestasyonlu; 9'u (%18) *C. f. felis* ve *C. canis*'le, 1'i (2%) *C. f. felis*, *C. canis* ve *P. irritans*'la karışık enfestasyonlu idi. Toplam 574 pire toplandı. Toplanan 574 pireden 544'ü (%94.8) *C. f. felis*, 28'i (%4.88) *C. canis* ve 2'si (%0.35) *P. irritans*'dı. Enfestasyon yoğunluğu (pire sayısı/enfeste köpek sayısı) *C. f. felis* için 11.6, *C. canis* için 2.33, *P. irritans* için 1 ve bütün türler için 11.5 idi. Köpeklerin her iki cinsiyetinden toplanan pirelerde erkek dişi oranı *C. f. felis* için 1:1.88, *C. canis* için 1:3 ve bütün türler için 1:1.91 idi. Ev içi şartlarının *C. f. felis*'in gelişmesine, diğer türlerinkinden daha uygun olabileceği düşünüldü.

Anahtar Kelimeler: Fpirelea, Ctenocephalides felis, Ctenocephalides canis, Pulex irritans, köpek, İstanbul, Türkiye

Summary: Fleas were collected from 50 flea-infested dogs, which were brought to some pet clinics in İstanbul from June to October in the years 1999 and 2000. The ages of 4 dogs (females) were ranging between 2.5 and 9 months and the remaining 46 dogs (27 males + 19 females) were one year or over. The breeds of dogs were 4 Cocker, 16 Terrier, 5 Setter, 7 Poodle, 4 Pekingese, 2 Pointer, 1 Golden retriever, 1 Tibetan spaniel and 10 crossbreed. The dogs were indoor or indoor/outdoor animals. Fleas were collected from the dogs using an electronic flea comb (Epivet™ Flea zapper). Thirty-seven (74%) of the 50 flea infested dogs had pure infestations with *Ctenocephalides felis felis;* 2 (4%) with *C. canis;* 1 (2%) with *Pulex irritans*. Nine (18%) dogs had mixed infestations with *C. f. felis* and *C. canis* and 1 (2%) with *C. f. felis*, *C. canis* and *P. irritans*. A total of 574 fleas were collected, of which 544 (94.8%) were *C. f. felis*, 28 (4.88%) *C. canis* and 2 (0.35%) *P. irritans*. The intensity of infestations (No of fleas/No of infested dogs) was 11.6 for *C. f. felis*, 2.33 for *C. canis*, 1 for P. irritans and 11.5 for all over species. The sex ratio (male:female ratio) of fleas from both sexes of dogs was 1:1.88 for *C. f. felis*, 1:3 for *C. canis* and 1:1.91 for all species . It was considered that indoor conditions might be more suitable for the development of *C. f. felis* than those of other species.

Key Words: Flea, Ctenocephalides felis, Ctenocephalides canis, Pulex irritans, Dog, Istanbul, Turkey

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Introduction

Some literature (1, 2, 3, 4, 5, 6, 7, 8, 10, 13, 14, 15, 16, 17, 19) on flea infestations of dogs in Turkey and in various countries is summarized in Table 1. As seen in Table 1, two flea species, *Ctenocephalides felis felis* (the cat flea) and *C. canis* (the dog flea), were found in almost all studies; *Pulex irritans* (the human flea) in most; *Archaeopsylla erinacei* (the hedgehog flea) in several and *Echidnophaga gallinacei* (the sticktight flea of poultry), *Xenopsylla cheopis* (the oriental or tropical rat flea), *Ceratophyllus fasciatus* (the northern rat flea), *C. gallinae* (the European chicken flea) in a few studies.

In Turkey, *C. canis*, *C. f. felis* and *P. irritans* were found to infest dogs in Ankara (7) and Konya (2). In the northern parts of Greece, which is geographically close to İstanbul, *C. canis*, *C. felis* and *P. irritans* and *X. cheopis* were recognized on dogs (14). However, no study on this subject has been done in İstanbul.

Material and Method

The study was performed on dogs brought to some pet clinics in İstanbul from June to October in the years 1999 and 2000. Fleas were collected from 50 flea-infested dogs. The ages of 4 dogs (females) were ranging between 2.5 and 9 months and the ages of 46 dogs (27 males + 19 females) were one year or over. The breeds of dogs were 4 Cocker, 16 Terrier, 5 Setter, 7 Poodle, 4 Pekingese, 2 Pointer, 1 Golden retriever, 1 Tibetan spaniel and 10 crossbreed. The dogs were indoor or indoor/outdoor animals. An electronic flea comb* was used to remove fleas from the dogs and fleas were put into 70% alcohol. Following this procedure fleas were put into 10% KOH (for 4-7 days) until their genital organs became visible. The identification was done according to the literature (7, 11, 12). The statistical analyses couldn't be performed because of the different living condition ,ages and breeds of dogs.

Results

The results are given in Table 2, 3 and 4. Thirty-seven (74%) of the 50 flea infested dogs had pure infestations with *Ctenocephalides felis felis;* 2 (4%) with *C. canis;* 1 (2%) with *Pulex irritans*. Nine (18%) dogs had mixed infestations with *C. f. felis* and *C. canis;* 1(2%) with *C. f. felis, C. canis* and *P. irritans*. A total of 574 fleas were collected, of which 544 (94.8%) were *C. f. felis*, 28 (4.88%) *C. canis* and 2 (0.35%) *P. irritans*. The intensity of infestations (No of fleas/No of infested dogs) was 11.6 for *C. f. felis*, 2.33 for *C.canis*, 1 for *P.irritans* and 11.5 for all species. The sex ratio (male:female ratio) of fleas form both sexes of dogs is 1:1.88 for *C. f. felis*, 1:3 for *C. canis* and 1:1.91 for all species from.

* E pivet™ Flea Zapper, produced by Mepro Epilady™ in Israel.

Tablo 1. Studies on flea infestations of dogs in Turkey and in some other countries

Ref., its year	Country-City		Total	Cff	Cc	Pi	Ae	Eg	Xc	Cs
(2), 1997	Turkey.1-Konya	NID	23	39.1%	100%	21.7%	-	-	-	-
		NF	329	6.4%	91.2%	2.4%	-	-	-	-
(7), 1971	Turkey.2-Ankara	NID	50	30%	92%	34%	-	-	-	-
		NF	553	5.4%	86.6%	8%				
		SR		1:1.73	1:2.50	1:1.44				
(14), 1995	Northern Greece	NID	129	40.3%	71.3%	0.78%	-	-	0.78%	-
(8), 1998	France	NID	392	89.3%	10.2%	0.51%	0.51%	-	-	-
		NF	1071	86.6%	11.2%	0.8%	1.3%			
(19), 1997	Ireland.1	NID		17.5%	75.7%		3.9%			
(3), 1972	Ireland.2	NID	50	4%	86%	24%	-	-	-	-
		NF	148	1.3%	81.1%	17.6%	-	-	-	-
(4), 1995	South west England	NID	60	78.3%	20%	-	1.67%	-	-	-
		NF	117	72.6%	25.6%	-	1.7%			
		SR		1:2.4	1:2.33		-			
(17), 1985	North Germany	NID	84	57.1%	42.9%	-	17.9%	-	-	1.19%*
(15),1978	Denmark	NID	-	62%	28.5%	-	8%	-	-	-
(6), 2001	Mexico Cuernavaca	NID	546	83.2%	18.9%	-	-	-	-	-
(10), 1987	USA Florida	NID	100	99%	-	20%	-	2%	-	-
		NF	-	92.4%	-	7.5%	-	0.1%		
(5), 1991	Australia-Queensland	NF		78%	1%			21%		
(16), 1988	Afghanistan, Kabul	NID	40	-	85%	12.5%	-	-	-	7.5%**
(13), 2000	Northern Libya	NF	624	21.1%	3.4%	75.5%				
(1), 1966	Egypt	NF	10682	84.3%	5.14%	10.2%	-	0.27%	0.06%	-
		SR		1:2.3-4.0	1:2.4-4.0	1:0.7-1.5				
	Presence ***			14 / 15	14 / 15	9 / 15	5 / 15	3 / 15	2 / 15	2 / 15
	Primary species			8 / 15	6 / 15	1 / 15	-	-	-	-
	Secondary species			4 / 15	5 / 15	5 / 15	-	1 / 15	-	-

Abbr.: NID: No of infested dogs, NF: No of fleas, SR: Sex ratio of fleas (Male:female ratio), Cff: Ctenocephalides felis, Cc: Ctenocephalides canis, Pi: Pulex irritans, Ae: Archaeopsylla erinacei, Eg: Echidnophaga gallinacei, Xc: Xenopsylla cheopis, Cs: Ceratophyllus spp

*Ceratophyllus gallinae, **C. fasciatus, ***Presence of parasite=No of studies in which the species found / total no of studies

Tablo 2. Number of infested dogs and number of fleas

		NIMD (%)	NIFD (%)	Total (%)		NFIMD* (%)	NFIFD* (%)	Total* (%)
Cff		19 (70.4)	18 (78.3)	37 (74)		76+143=219	66+135=201	142+278=420
Cc		1 (3.70)	1 (4.35)	2 (4)		2+3=5	2+3=5	4+6=10
Pi		-	1 (4.35)	1 (2)		-	0+1=1	0+1=1
Cff+Cc		6 (22.2)	3 (13.0)	9 (18)	Cff	23+36=59	24+40=64	47+76=123
					Cc	2+8=10	1+4=5	3+12=15
					Tot.	25+44=69	25+44=69	50+88=138
Cff+Cc+Pi		1 (3.70)	-	1 (2)	Cff	0+1=1	-	0+1=1
					Cc	0+3=3	-	0+3=3
					Pi	1+0=1	-	1+0=1
					Tot.	1+4=5	-	1+4=5
Total	Cff	26 (96.3)	21 (91.3)	47 (94)	Cff	99+180=279 (93.6)	90+175=265 (96)	189+355=544 (94.8)
	Cc	8 (29.6)	4 (17.4)	12 (24)	Cc	4+14=18 (6.04)	3+7=10 (3.62)	7+21=28 (4.88)
	Pi	1 (3.70)	1 (4.35)	2 (4)	Pi	1+0=1 (0.34)	0+1=1 (0.36)	1+1=2 (0.35)
	Tot.	27 (100)	23 (100)	50 (100)	Tot.	104+194=298 (100)	93+183=276 (100)	197+377=574 (100)

*Male+female=Total number, Abbr. NIMD: No of infested male dogs, NIFD: No of infested female dogs, NFIMD: No of fleas in male dogs, NFIFD: No of fleas in female dogs. Abbrs. of species names is the same in Table 1

Tablo 3. The intensity of infestation for each species

		Male Dogs				Female Dogs				Total			
		NF	NID	II	MMN	NF	NID	II	MMN	NF	NID	II	MMN
Cff	Male	99	23	4.30	1-23	90	18	5	1-21	189	41	4.61	1-23
	Female	180	26	6.92	1-37	175	21	8.33	1-41	355	47	7.55	1-41
	Total	279	26	10.7	1-47	265	21	12.6	1-50	544	47	11.6	1-50
Cc	Male	4	3	1.33	1-2	3	2	1.5	1-2	7	5	1.4	1-2
	Female	14	7	2	1-3	7	3	2.33	1-3	21	10	2.1	1-3
	Total	18	8	2.25	1-5	10	4	2.5	1-5	28	12	2.33	1-5
Pi	Male	1	1	1	1	0	0	-	-	1	1	1	1
	Female	0	0	-	-	1	1	1	1	1	1	1	1
	Total	1	1	1	1	1	1	1	1	2	2	1	1
Total.	Male	104	25	4.16	1-23	93	19	4.89	1-21	197	44	4.78	1-23
	Female	194	27	7.19	1-37	183	23	7.96	1-41	377	50	7.54	1-41
	Total	298	27	11	1-47	276	23	12	1-53	574	50	11.5	1-53

Abbr.: NF: No of fleas, NID: No of infested dogs, II: Intensity of infestation (No of fleas / no of infested dogs), MMN Minimal-maximal no of fleas. Abbrs. of species names is the same in Table 1

Tablo 4. Numerical distribution of males and females in the flea populations and their sex ratios

	In Male Dogs				In Fem. Dogs				Total			
	Total	Male	Female	Sex r.	Total	Male	Female	Sex r.	Total	Male	Female	Sex r.
No of Cff	279	99	180	1:1.82	265	90	175	1:1.94	544	189	355	1:1.88
(%)	(100)	(35.5)	(64.5)		(100)	(34.0)	(66.0)		(100)	(34.7)	(65.3)	
No of Cc	18	4	14	1:3.5	10	3	7	1:2.33	28	7	21	1:3
(%)	(100)	(22.2)	(77.8)		(100)	(30)	(70)		(100)	(25)	(75)	
No of Pi	1	1	0	-	1	0	1	-	2	1	1	-
(%)	(100)	(100)	(0)		(100)	(0)	(100)		(100)	(50)	(50)	
Total	298	104	194	1:1.87	276	93	183	1:1.97	574	197	377	1:1.91
(%)	(100)	(34.5)	(65.1)		(100)	(33.7)	(66.3)		(100)	(34.3)	(65.7)	

Abbr.: Sex r.: Sex ratio (Male : Female) Abbrs. of species names is as same in Table 1

Discussion

A number of studies performed on flea infestations of dogs in various countries and in Turkey are summarized in Table 1. As seen in Table 1, two flea species, *Ctenocephalides felis felis* and *C. canis* were seen in almost all studies (14 of 15 studies); *Pulex irritans* in most (9 of 15); *Archaeopsylla erinacei* in several (5 of 15) and *Echidnophaga gallinacei, Xenopsylla cheopis, Ceratophyllus fasciatus, C. gallinae* in a few studies. The most prevalent and/or predominant species of fleas in dogs was found to be *C. f. felis* in 8 of 15 studies, *C. canis* in 6 of 15 and *P. irritans* in 1 of 15. The secondary prevalent and/or predominant species was *C. canis* in 5 of 15 studies, *P. irritans* in 5 of 15, *C. f. felis* in 4 of 15 and *E. gallinacei* in 1 of 15. In the studies performed in Turkey, *C. canis, C. f. felis* and *P. irritans* were found in Ankara and Konya. The primary species was *C. canis* in both studies in Turkey, secondary species *P. irritans* in Ankara and *C. felis* in Konya. In the northern parts of Greece, which is geographically close to İstanbul, the flea species recognized on dogs in order of decreasing prevalence rates were as follows: *C. canis, C. felis* and *P. irritans* and *X. cheopis* (Table 1). In our study performed on indoor or indoor/outdoor dogs, the species of fleas identified were *C. f. felis, C. canis* and *P. irritans,* in order of decreasing prevalence and predominance (Table 2).

Our study and the others seen in Table 1 show that primary or secondary species of fleas on dogs is generally *C. f. felis* or *C. canis* and mostly secondary or rarely primary one is *P. irritans. Echidnophaga gallinacei* is of secondary importance in some countries. Other species may probably incidentally infest dogs sharing the same habitat of other hosts. Many abiotic and biotic factors such as minimal and maximal environmental temperature, relative humidity, the presence of sufficient nutrient for larvae, the presence of other suitable hosts for adults, etc. influence survival, development and reproduction of fleas (18). The reason for why the cat flea, *C. f. felis,* is more prevalent and/or predominant in dogs in some studies but the dog flea, *C. canis,* in others can be connected with the need of their relatively different factors for development. So far, no satisfac-

tory explanation has yet been given for differences in the prevalence and predominance of flea species of dogs. Haarloev and Kristensen (9) recorded that dogs living in Copenhagen were significantly more often infested with *C. f. felis* than those living in rural regions, on which the commonest species was *C. canis*, without given any explanation. Our findings in this study, too, are not sufficient enough to explain why *C. f. felis* is more prevalent and/or predominant on dogs. However, considering that the dogs in this study were indoor or indoor/outdoor it may be suggested that indoor conditions are more favorable for the development of *C. f. felis* than the development of other species.

The sex ratio in the specimens from both sexes of dogs was 1:1.88 for *C.f.felis*, 1:3 for *C.canis* and 1:1.91 for all over species (Table 4). This ratio in specimens from dogs was 1:1.72 for *C. f. felis*, 1:2.2 for *C.canis*, 1:1.44 for *P.irritans* in Ankara (7), 1:2.4 for *C. f. felis*, 1:2.33 for *C. canis* in England (4) and 1:2.3-4 for *C. f. felis*, 1:2.4-4 for *C. canis*, 1:0.7-1.5 for *P. irritans* in Egypt (1).

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