

Prevalence and intensity of infestation with *Toxocara cati* in stray cats in Shiraz, Iran

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ABSTRACT

A cross-sectional survey was undertaken to study the prevalence and intensity of infestation with *Toxocara cati* in 108 stray cats, including 44 males and 64 females, from December 1996 to May 1997 in Shiraz city, southern Iran. A total of 57 cats (52.8%) were infected with *T. cati*. There was no significant difference between the rate of infection between males and females, young and adult cats, or the prevalence of infection in different geographical areas. The number of recovered worms per cat or intensity of infection ranged from one to a maximum of 50 worms per animal, with an average of 6.53 *T. cati* in each cat.

Key words: toxocariasis, *Toxocara cati*, visceral larva migrans, cat, Iran

Introduction

Toxocara cati is a common parasite of cats and Felidae, and has a cosmopolitan distribution (YAMAGUCHI et al., 1996; VANPARIJS et al., 1991; BAKER et al., 1989; REP, 1975; ENGBAEK et al., 1984; McCOLM and HUTCHISON, 1980; SADIGHIAN, 1970; MIRZAYANS, 1971). It is one of the helminthic zoonoses which causes visceral larva migrans in human beings (BUIJS, 1993). Paratenic hosts, such as man and small rodents, can infect themselves

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unintentionally by swallowing infective eggs (BEAVER, 1969; BEAVER et al., 1984). Infected cats are of high potential risk to infect human beings, especially children. The larvae hatch in the intestine and then invade the host's viscera, given the name Visceral Larva Migrans (VLM). Infection with *T. cati* is known to be of wide geographical distribution.

The rate of infection in the human population depends on the history of pica, the abundance of pet animals, personal public health, prevalence of *Toxocara* in animals, and the rate of infection in the environment (CHARLESTON, 1977; KAZURA, 1996). About 10% of world's population are seropositive (LAPPIN, 1993). *T. cati* is mostly prevalent throughout tropical, subtropical and temperate regions (BUIJS, 1993). VLM is one of the most important parasitic diseases of man transmitted by carnivores in Iran (KABIRI et al., 1979; FARIVAR and RAFAT, 1991; DALIMI and MOBEDI, 1992). The adult *T. cati* lives in the small intestine of cats and is morphologically similar to *Ascaris lumbricoides*, although smaller by about a quarter to half of its size. The eggs, which require a period of maturation outside the host, are infective for cats and human beings. The risk of man coming into contact with contaminated soil is plausible as 15% (adults) and 90% (puppies) of dogs and 24% to 67% of cats carry adult parasites (VANPARIJS and THIENPONT, 1973). Catching an infection directly from cats or through fresh droppings is unlikely due to the long period required for egg maturation. The eggs are washed from the soil's surface into the deeper layers, and because of their resistance to climatic changes they may remain viable for several years (BUIJS, 1993). Due to the close association and proximity of man with his domestic animals (in particular, cats), there exist possibilities of human infection with helminth parasites of these animals. Although the larvae of non-human ascarids, such as *T. cati*, are capable of limited development in human hosts, this may, in some circumstances, lead to serious public health problems, e.g., encephalitis and granulomatous lesions (WOODRUFF et al., 1981). Since cats constitute a potential source of *T. cati* infection in man (McCOLM and HUTCHISON, 1980; MARKELL et al., 1992) and a systematic study on the prevalence of this parasite has not taken place among stray cats in the Shiraz area, it was therefore decided to undertake a study on the prevalence and intensity of this parasite

in cats in this area, where the sero-prevalence of *Toxocara* in children is more than 20% (SADJJADI et al., 2000).

Materials and methods

From December 1996 to May 1997, with permission of the authorities post-mortem examinations were carried out on 108 stray domestic cats that were collected from different locations of Shiraz city, southern Iran. Cats were from shelters, without owners and were to be euthanatised. After sedation and euthanasia with tiopenthal, cats were examined macroscopically. All helminth parasites were collected and preserved for later identification. Before performing autopsy the animals' sex and weight were recorded, and the age of cats was estimated on the basis of their dental development.

All cats were autopsied less than two hours after being euthanatised so that all adult worms were still alive prior to fixation in 10% formalin solution. *T. cati* worms were separated from other helminths and the males and females were identified by microscopic examination. The worms were cleared, and stained using FAAL (formalin alcohol azocarmin lactophenol). The mature male and female worms were identified according to the morphological features described by (YAMAGUTI, 1961). Presence of ova was the criterion for distinguishing the mature female worms (SOULSBY, 1982). The ova were assessed by simple observation at X 400 magnification by examining the general appearance of the shell and its cellular contents. Only those ova that were specifically located in the tapering portion of the uterus (near the vulva at the anterior end of the worm) were considered for this purpose. Those eggs that were both regular in shape and which possessed the characteristic pitted shell design were regarded as *T. cati* eggs of. The uniformity of the cellular content of the ova was also considered. The worm burdens in this study were recorded directly at autopsy by counting. The length of both male and female worms and the maturity status of ova as a proportion of the overall female worm maturity were also recorded in this study.

All statistical tests were expressed as significant at 95% confidence level. These analyses were performed using the "SPSS" (Statistical Package

for Social Science). For simplicity, only “P” values have been quoted. The Chi-square test was used to study the relationship between the prevalence of these parasites and the age and sex of the cats. The relationship between host sex and age to the overall worm burdens in cats was examined using the analysis of variance test.

Results

A total of 76 cats, more than 6 months and 32 less than 6 months of age, were examined during this experiment (Table 1). The prevalence of

Table 1. Prevalence of *Toxocara cati* in stray cats according to age

Age	Infected*	Non infected*	Total
	No. (%)	No. (%)	No. (%)
> 6 months	38 (50.00)	38 (50.00)	76 (70.37)
< 6 months	19 (59.37)	13 (40.63)	32 (29.63)
Total	57 (52.78)	51(47.22)	108 (100.00)

* Chi-square = 0.46; P = 0.9

T. cati in these 108 stray cats, was 52.78%. *T. cati* was always confined to the upper half of the small intestine (i.e., the anterior 60 cm). The study also showed no significant difference in the prevalence of infection to *T. cati* according to the areas where the cats were captured. Out of 44 male and 64 female cats, 24 (54.55%) and 33 (51.56%) were infected with *T. cati*, respectively (Table 2). There were no significant differences in the

Table 2. Prevalence of *Toxocara cati* according to sex of stray cats

Sex	Infected*	Non infected*	Total
	No. (%)	No. (%)	No. (%)
Male	24 (54.55)	20 (44.45)	44 (40.74)
Female	33 (51.56)	31 (48.44)	64 (59.26)
Total	57 (52.78)	51 (47.22)	108 (100.00)

* Chi-square = 0.1; P = 0.9

Table 3. Intensity of infestation with *Toxocara cati* in stray cats according to sex

Sex	N° infected	Mean N° of nematodes	sd	Min.	Max.
Male	24	6.37	10.10	1	42
Female	33	6.63	8.76	1	50
Total	57	6.52	9.26	1	50

* P = 0.9

prevalence of infection between male and female cats. The mean intensity of infection with *T. cati* was 6.52, with a range of from 1 to 50 worms per cat. There was no significant difference in the intensity of infection between male and female cats (Table 3). The intensity of infection was also studied

Table 4. Intensity of infestation with *Toxocara cati* according to age of cats

Age	Infected	Mean N° of nematodes	sd	Min.	Max.
> 6 months	19	7.21	9.58	1	42
< 6 months	38	6.18	9.21	1	50
Total	57	6.52	1	1	50

* P = 0.7

according to different geographical areas of Shiraz city. Older cats showed a higher intensity of infection than younger ones; however, the difference was not significant (Table 4).

Discussion

Our study confirms that compared to most other localities worldwide the prevalence of *T. cati* infection in cats in Shiraz is high. The high prevalence of *T. cati* in stray cats in Shiraz (52.8%) indicates that the meteorological condition are suitable for the spread of and survival of the nematode eggs. Infection of cats with *T. cati* can occur either through ingestion of infective eggs or from eating rodents containing larvae in their tissues. Since the cats habitually bury their faeces, the spread of infection through the medium of infective eggs is less likely to occur than

from the predatory habits of cats. The eggs of *Toxocara* are resistant to low temperature and high humidity (UGA et al., 1996) but desiccation and direct sunlight will decrease the infectivity (WOODRUFF et al., 1981).

It is probable that infection can occur at any age, either by eggs or tissue containing the larvae, although the highest incidence of infection occurs in kittens and young cats (CHARLESTON, 1977). NICOL et al. (1981) in London and SHAW et al. (1983) in Perth, Western Australia, reported a higher prevalence of *T. cati* in kittens than in cats. However, the prevalence of infection in the present study was higher in younger cats compared to older animals, but the difference was not significant. SWERCZEK et al. (1971) reported the cause of high incidence of *Toxocara* in kittens as being transmammmary passage. Studies on *T. cati* have shown that intra-uterine infection seldom occurs and that infection mostly results from the ingestion of infective eggs or of earth worms, cockroaches and rodents containing larvae in their tissues (O'LORCAIN, 1994). Although absolute comparisons cannot be made among available data, many factors, including geographical and climatic differences together, and methodological alterations, can affect results. Our study confirms the findings of O'LORCAIN (1994) who reported no difference between the rate of infection in male and female cats. Many stray cats are found in different residential areas of this city and in other residential areas of this country, and their population is rapidly increasing. This can significantly contribute to the dissemination of the viable *Toxocara* ova into the environment. A mild, temperate climate such as that found in Shiraz would also seem to enhance further embryonation of *Toxocara* ova in the soil and their transmission to humans. Mean worm burden in central Scotland was 3, with a range of 1-9 per cat. *T. cati*, was most frequently encountered (33.3% of the cats harboring at least one worm) and was always confined to the upper half, i.e., the anterior 60 cm of the small intestine (McCOLM and HUTCHISON, 1980). Mean worm burden was 2.77 ± 6.24 with a range of 0-46 and a prevalence of 41.99% in 181 cats (O'LORCAIN, 1994) in Dublin, Ireland. Worm burdens greater than 50 worms were not found for *T. cati* (O'LORCAIN, 1994). The maximum worm burden in South Africa, Dublin, Tokyo and Belgium has been reported as 13, 500, 128 respectively, (BAKER et al., 1989; O'LORCAIN, 1994; OISHI and KUME, 1973; VANPARIJS et al., 1991). In our study the maximum worm burden was 50 in

one cat. Each female worm lays a total of 200,000 eggs per day. Therefore, with a high prevalence of infection each cat is capable of infecting a high proportion of the population. Results showed that the *T. cati* habitat was in first half of the small intestine, with correlation to the McCOLM and HUTCHISON (1980) studies in Scotland. The high prevalence of *T. cati* in cats in Shiraz could indicate that school children and younger children are seriously at risk and, if all the preventive and treatment regimes are not taken to account, the prevalence rate may drastically increase still further. The high rate of sero-positive children to *Toxocara* infection in this region, where the population of infected stray cats is high, is important (SADJJADI et al., 2000). It is obvious that the worldwide distribution of stray cats would have an impact on sanitation and it is necessary that public health authorities, pet owners and veterinarians in crowded urban centers pay more attention to this phenomenon, and that the general public is educated in the hazards and zoonotic aspects of this parasite.

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SADJJADI, S. M., A. ORYAN, A. R. JALAI, D. MEHRABANI: Učestalost i jačina invazije obličem *Toxocara cati* u mačaka lotalica u Shirazu, Iran. *Vet. arhiv* 71, 149-157, 2001.

SAŽETAK

Istraživanje je provedeno na 108 mačaka lotalica i to 44 mužjaka i 64 ženke u razdoblju od prosinca 1996. do svibnja 1997. na području grada Shiraza u Iranu. Potvrđeno je da je čak 52,8% pretraženih životinja bilo invadirano obličem *Toxocara cati*. Nije utvrđena značajna razlika u učestalosti invazije s obzirom na spol i dob te mjesto istraživanja. Broj oblića kretao se od 1 do 50, u prosjeku 6,53 oblića po mački.

Ključne riječi: toksokaroza, *Toxocara cati*, visceralna larva migrans, mačka, Iran
