

Soil contamination with *Toxocara* spp. eggs in the public parks from three areas of Khorram Abad, Iran

M Zibaei,¹ F Abdollahpour,¹ M Birjandi¹ and F Firoozeh²

¹Department of Parasitology, School of Medicine, Lorestan University of Medical Sciences, Khorram Abad, Iran,

²Department of Microbiology, Faculty of Veterinary Medicine, Tehran University, Tehran, Iran

Corresponding author: Mohammad Zibaei, Ph.D, Assistant Professor of Parasitology, Department of Parasitology and Mycology, School of Medicine, Lorestan University of Medical Sciences, Khorram Abad, Iran; e-mail: zibaeim@sums.ac.ir

ABSTRACT

Toxocariasis is a parasitic zoonose caused by the infection of larval nematode *Toxocara* species. A total of 285 soil samples from January to March 2009 in 18 public parks were collected to test for soil contamination with *Toxocara* eggs. Soil samples were investigated for the present of *Toxocara* eggs using sucrose flotation method. Distribution of *Toxocara* spp. eggs in samples collected from public parks was 63.3%. The highest number of eggs recovered from 200 g of soil was 128. A total 304 eggs were recovered and 42.1% fully developed to embryonated egg stages. The contamination rate in second region in the studied areas was higher than the other regions. A similar tendency was observed in parks size, so that parks higher than 10,000 m² were more highly contaminated. The present investigation clearly shows that public parks have been contaminated with *Toxocara* eggs in Khorram Abad, suggesting that care should be taken when using public parks.

Keywords: *Toxocara* spp., soil samples, public parks, Khorram Abad, Iran.

INTRODUCTION

Toxocariasis is a zoonotic disease caused by the larvae stage of *Toxocara canis* (*T. canis*) and *Toxocara cati* (*T. cati*). Humans are infected by ingestion of embryonated eggs in the soil or through contaminated hands and fomites or eating the meat of paratenic hosts containing encapsulated larvae.¹⁻³ The larval hatches in the intestine and migrates into different organs, mainly the liver and the lungs and then occasionally into the kidney, myocardium and central nervous system, giving origin to the VLM syndrome. It can also cause serious ocular damage by migration into the retina (OLM).⁴⁻⁷

Although cats and dogs are the usual *Toxocara* hosts, direct contact with these animals is not considered as a potential risk by some parasitologists because the eggs eliminated with the definitive hosts feces required a period of 4-6 weeks to become infective, therefore, contact with soil in public parks is a potential source of contamination.⁵⁻⁸ The epidemiological studies have noted the presence of *Toxocara* spp. infection in stray cats and dogs in various parts of Iran.⁹⁻¹¹ In Urima (Iran) 7.8% of the public parks studied showed *Toxocara* spp.¹² Previous reports have noted the present of *Toxocara* eggs in soil samples of public parks and children's playground in Londrina (100%), Kansas (20.6%), Hanover (30.8%), Basrah (15.5%) and Kobe (67.7%).¹³⁻¹⁷

The aim of this study was to provide information on the *Toxocara* spp. eggs contamination in soil samples in public parks in Khorram Abad and to determine the relationship with several factors.

MATERIALS AND METHODS

Survey area

Khorram Abad (48° 21', 30° 43') is the largest city in Lorestan Province in western Iran with 540,000 inhabitants. This area is humid with mean rainfall of 525 mm/year and the maximum mean yearly temperature of 17.2 C°.

The study was conducted between January and March 2009. Eighteen public parks in the residential areas were randomly selected and soil samples were collected. Selection of collecting areas was confined to three divisions. These are the divisions used by the Khorram Abad municipally.

Recovery of soil samples

A soil sample of 200 gm was collected at a depth of 3 cm (one sample of approximately 10 gm every 50 steps). The soil samples from same park were thoroughly mixed and stored in sealed and labeled polyethylene bags and taken to the laboratory. At the time of sample collection, we examined other factors that are thought to have a relation with *Toxocara* eggs contamination such as presence of feces of animals and parks size.

Detection of eggs

For egg detection, soil samples were dried overnight at room temperature and sifted through a 150 µm mesh sieve. About 2 gm of powdery soil (produced from about 200 gm of unsifted soil), was placed in a test tube and suspended in about 8 ml of 0.05% Tween- 20 solution. After centrifugation of the test tube at 1500 rpm for 10

Table-1: Prevalence of *Toxocara* species eggs in soil samples of public parks

Areas	No. parks Examined	No. positive parks (%)		No. eggs recovered/200g		
		<i>Toxocara</i>	<i>Feces</i>	Min.	Mean	Max.
1	7	0(0.0)	2(28.6)	0	0	0
2	8	3(37.5)	4 (50.0)	1	23.2	57
3	3	1 (33.3)	1 (33.3)	1	5.6	22
Total	18	4 (22.2)	7 (38.9)	1	4.8	57

minutes, the supernatant was removed and sucrose solution with specific gravity of 1.200 was added up to a level of 1 cm from the top of the tube. The contents of the tube were mixed well and centrifuged at 1500 rpm for 10 minutes. The tube was then filled to the top with the sucrose solution so that a small convex bubble formed and a coverslip could be placed on the tube. After a final centrifugation of the tube at 500 rpm for 5 minutes, the coverslip from the tube was put on a microscopic slide and examined at a magnification of 40 and 100 for *Toxocara* eggs. *Toxocara* spp. eggs found in this study were counted and classified according to their developmental stage i.e. monocell, 2 to pre-embryonated and embryonated.

Statistical analysis

Data analysis of the relationship between contamination rates and changes in environmental factors were evaluated by the chi- square test. Statistical significance was defined as $p < 0.05$.

Table-2: Number of *Toxocara* spp. eggs recovered from three areas and their stage of development

Areas	No. eggs recovered	No. eggs developed		
		Monocell	2 to pre-bryonated eggs (%)	Embryonated eggs (%)
1	0	0 (0.0)	0 (0.0)	0 (0.0)
2	210	30 (14.3)	79 (37.6)	101 (48.1)
3	94	22 (23.4)	54 (47.9)	27 (28.7)
Total	304	52 (17.1)	124 (40.8)	128 (42.1)

RESULTS

Of the 285 samples collected from 18 public parks, 4 (22.2%) public parks were positive for *Toxocara* spp. eggs. The highest contamination rate was in public parks in 2nd area (37.5%) in the studied areas. The egg count for the position soil samples varied from one to 57 with mean of 4.8 eggs/200 g of soil (Table-1). Animal feces (dogs and cats) were found in 132 of 285 (46.3%) parks samples. A significant differences was found in the proportion of the presence of feces in the soil and contamination rate ($p < 0.05$). Table 2 shows the total

number of eggs recovered in the three areas and their stage of development. A total of 304 *Toxocara* eggs were recovered and 128 (42.1%) of them were fully embryonated (Table-2). There were no significantly difference ($p > 0.05$) in embryonation rate among the different areas examined. The

highest rate of contamination (79.0%) was found in bigger public parks (Table-3). The difference between extant of public parks and contamination rate was statistically significant ($p < 0.05$).

DISCUSSION

The survey revealed that the contamination of public parks with *Toxocara* eggs was 22.2% in Khorram Abad, Iran. *Toxocara cati* eggs contamination of public places in Iran was first report by Motazedian *et al.*⁸ They reported that the contamination rate of public places in Shiraz was 6.3%. Tavassoli *et al* in Urmia notified a similar situation. The contamination of *Toxocara* spp. eggs in public parks reported 7.8% in Urmia, northwest Iran.¹² The prevalence of *Toxocara* eggs in our survey was higher than previous studies in Iran. This fact might be the consequence of a relatively higher stray cats and dogs in this region. On other hand, public parks were not surrounded by fence; therefore the animals can freely live in them. *Toxocara* eggs have been found in sand or

soil samples in Turkey (63.0%), Brazil (53.0%), Italy (64.0%), Spain (67.0%), Japan (92.0%) and Thailand (6.0%).^{5,18-22} The high prevalence of *Toxocara* eggs in soil samples from public parks in 2nd region of studied areas of Khorram Abad is evidence that stray cats or dogs were infected and defecated in these areas.

We examined some factors that might be related to the soil contamination. Contamination of the soil by *Toxocara* eggs affected to a considerable degree by extant of park. In the bigger parks (higher than 10,000 m²), there are many green areas in the parks; therefore there are suitable places for defecation for dogs and cats. The obtained data

Table-3: Relation between contamination of soil sample with *Toxocara* eggs and park size

Condition	positive parks (%)	statistical analysis(x^2)*
More than 10000 m ²	79	p<0.05
Less than 10000 m ²	42	

* Chi square

illustrating the presence of animal feces would be as an indicator for prevalence of *Toxocara* eggs in public parks. Dubna *et al* reported that 51.0% of fecal contamination public places in the Czech Republic were positive for *Toxocara* eggs.⁵ It is important to note that contamination of parks with feces increase the risk not only of *Toxocara* but also of other helminths. The results of the present study showed that 55.9% of eggs recovered from soils developed to embryonated stage. Zibaei and Uga reported that the percent recovery of embryonated *Toxocara* eggs from the sandpits of public parks in Kobe was 9.0%.¹⁷ This discrepancy is probably due to the seasonal change. Because of the climate condition in Khorram Abad city in winter is mild temperature with high humidity.

In conclusions, the results of present study showed that the some public parks of Khorram Abad were contaminated with feces of animals and *Toxocara* eggs, indicating that control measure as well as education of people is needed for protection from zoonotic infection.

ACKNOWLEDGMENTS

We are grateful to the office of the vice chancellor for research of Lorestan University of Medical Sciences for financial support. Furthermore, the authors would like to thank Prof. Uga for instrument and his guidance.

REFERENCES

- Schantz PM. *Toxocara* larva migrans now. *Amer J Trop Med Hyg* 1989; 41: 21-34.
- Despommier D. Toxocariasis: clinical aspect, epidemiology, medical ecology, and molecular aspects. *Clin Microbiol Rev* 2003; 16: 265-72.
- Azizi S, Oryan A, Sadjjadi SM, Zibaei M. Histopathologic changes and larval recovery of *Toxocara cati* in experimentally infected chickens. *Parasitol Res* 2007; 102: 47-52.
- Glickman LT, Schantz PM. Epidemiology and pathogenesis of zoonotic toxocariasis. *Epidemiol Rev* 1981; 3: 230-50.
- Coelho LMPS, Dini CY, Milman MHSA *et al*. *Toxocara* spp. eggs in public squares of Sorocaba, Sao Paulo state, Brazil. *Rev Inst Med Trop São Paulo* 2001; 43: 189-91.
- Chorazy ML, Richardson DJ. A survey of environmental contamination with ascarid ova, Wallingford, Connecticut. *Vector Borne Zoonotic Dis* 2005; 5: 33-9.
- Dubná S, Langrová I, Jankovská I *et al*. 2007. Contamination of soil with *Toxocara* eggs in urban (Prague) and rural areas in the Czech Republic. *Vet Parasitol* 2007; 144: 81-6.
- Motazedian H, Mehrabani D, Tabatabaee A *et al*. Prevalence of helminth ova in soil samples from public places in Shiraz. *East Mediterr Health J* 2006; 12: 562-5.
- Mirzayans S, Eslami A, Anwar M *et al*. Gastrointestinal parasite of dogs in Iran. *Trop Anim Hhealth Prod* 1972; 4: 35-60.
- Eslami A, Mohebbali M. Parasitisme des chiens de bergers et implication en sante public en Iran. *Bull Pathexot* 1988; 81: 94-6.
- Zibaei M, Sadjjadi SM, Sarkari B. Prevalence of *Toxocara cati* and other intestinal helminths in stray cats in Shiraz, Iran. *Trop Biomed* 2007; 24: 39-43.
- Tavassoli M, Hadian M, Charesaz S *et al*. *Toxocara* spp. eggs in public parks of Urmia city, West Azerbaijan province Iran. *Iranian J Parasitol* 2008; 3: 24-9.
- Chieffi PP, Muller EE. Prevalence of parasitic diseases by *Toxocara canis* in dogs, and the finding of eggs of *Toxocara species* in the soil of public places in the urban area of Londrina, State of Parana, Brazil. *Rev Saúde Pública* 1976; 10: 367-72.
- Dada BJO, Lindquist WD. Prevalence of *Toxocara* spp. eggs in some public grounds and highway rest areas in Kansas. *J Helminthol* 1979; 53: 145-6.
- Horn K, Schneider T, Stoye M. Contamination of public children's playgrounds in Hanover with helminth eggs. *Dtsch Tierärztl Wochenschr* 1990; 97: 122,124-125.
- Mahdi NK, Ali HA. *Toxocara* eggs in the soil of public places and schools in Basrah, Iraq. *Ann Trop Med Parasitol* 1993; 87: 201-5.
- Zibaei M, Uga S. Contamination by *Toxocara* spp. Eggs in sandpits in Kobe, Japan. *J Environ Cont Tech* 2008; 26: 32-7.
- Aydenizoz Ozkayhan M. Soil contamination with ascaris eggs in playgrounds in Kirikkale, Turkey. *J Helminthol* 2006; 80: 15-8.
- Giacometti A, Cirioni O, Fortuna M *et al*. Environmental and serological evidence for the presence of toxocariasis in the urban area of Ancona, Italy. *Europ J Epidemiol* 2000; 16: 1023-6.
- Ruiz de Ybanez MR, Garijo MM, Alonso FD. Prevalence and viability of eggs of *Toxocara* spp. and *Toxascaris leonina* in public parks in eastern Spain. *J Helminthol* 2001; 75: 169-73.
- Uga S. Prevalence of *Toxocara* eggs and number of fecal deposits from dogs and cats in sandpits of public parks in Japan. *J Helminthol* 1993; 67: 78-82.
- Wiwanitkit V, Waenlor W. The frequency rate of *Toxocara* species contamination in soil samples from public yards in an urban area "Payathai", Bangkok, Thailand. *Rev Inst Med Trop São Paulo* 2004; 46: 113-4.