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Giardia spp. and *Sarcocystis* spp. status in pet dogs of Shiraz, Southern part of Iran

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Abstract. A study was carried out in order to find out the status of *Giardia spp.* and *Sarcocystis spp.* in pet dogs and stray cats of Shiraz, Fars Province of Iran. Faecal samples of 147 pet dogs and 112 stray cats of different age groups, breeds, and sexes were tested. The stools were examined with the following techniques: direct faecal smears using normal saline, zinc sulfate flotation and formalin-ether concentration technique. Out of a total of 147 pet dogs examined, only one case (0.68%) of *Giardia spp.* was observed. A total of 3 (2.04%) pet dogs were found positive for *Sarcocystis spp.* Specimens from stray cats were also examined, however no *Giardia spp.* trophozoite or cyst was observed in these specimens.

INTRODUCTION

Giardia spp. is a flagellate protozoan parasite that is found in the intestinal tracts of human. This parasite has a global distribution in man and animals (Lane & Lloyd, 2002). It is also a frequently encountered parasite of domestic animals, especially livestock, dogs, cats, and numerous species of wild mammals and birds have been documented as hosts of *Giardia* (Thompson, 2004; Palmer *et al.*, 2008). A survey of the prevalence of *Giardia spp.* in domestic animals may identify a potential reservoir for human infection. The prevalence of infection is often higher in individuals from developing countries or the lower socio-economic groups where hygienic standards are compromised (Swan & Thompson, 1986).

As dogs and cats can harbour infections with either zoonotic or host-specific assemblages of *Giardia* (Palmer *et al.*, 2008), and molecular epidemiological studies have shown that dogs may be infected with their own, host-adapted genotype of *Giardia*, as well as with zoonotic genotypes (Thompson, 2004), it is therefore imperative to create baseline data on the occurrence of *Giardia* among these animals.

Sarcocystis species are intracellular protozoan parasites with an intermediate-definitive host life cycle based on a prey-predator relationship. These parasites are obligatory heterxenous, with herbivous intermediate host (eg. various species of reptiles, birds, small rodents, and hoofed animals) and carnivorous definitive host (Fayer, 2004; Roberts & Janovey, 2006).

Although having dogs and cats as pets are not encouraged in Iran because of religious beliefs, there are still some households which keep pet dogs and do not mind having stray cats in their houses (Mehrabani *et al.*, 1999; Sadjjadi *et al.*, 2001). Pets as a compendium animals have a close contact with household families; hence, they are more likely to transmit their diseases to human and cause public health problems in human populations. With regards to various studies on parasites of dogs and cats in the region (Fallah *et al.*, 1995; Mehrabani *et al.*,

1999, Sadjjadi *et al.*, 2001; Mehrabani *et al.*, 2002; Sadjjadi *et al.*, 2004; Negahban *et al.*, 2007; Zibaei *et al.*, 2007; Oryan *et al.*, 2008), a high prevalence of *Giardia* and its consequences in human population in the region have been reported (Pesaran *et al.*, 1992; Sadjjadi *et al.*, 2006). Despite the public health significance and possible zoonotic potential of *Giardia*, there was only one prevalence report of *Giardia* in domestic cats in the Capital of Iran (Zare *et al.*, 2006).

As for *Sarcocystis*, there are over 20 species of *Sarcocystis* for both cats and dogs (Dubey, 1990). There are reports on *Sarcocystis* in hoofed animals (Shekarforoush *et al.*, 2006) as well as seopositivity in human population (Gharagozlou *et al.*, 2004) but there is no report about *Sarcocystis* in dogs in the country. The present study was conducted in order to determine the status of *Giardia* as well as *Sarcocystis spp.* in pet dogs and stray cats in Shiraz, Southern part of Iran, where there is no report regarding these parasites in this region.

MATERIAL AND METHODS

Pet dogs and stray cat populations:
The stool samples of pet dogs and stray cats collected for examination were from animals in household environments and from those presented to veterinary clinic of the school with variable history. The socioeconomic status of households having pets were medium to high in the studied areas.

Fecal samples were obtained from pet dogs and stray cats in Shiraz metropolitan area. Samples were collected randomly of either sex with a wide range age and breed before treatment was administered. Each pet dog had a file history containing checkup details, treatment, vaccination and other clinical details in the clinic.

The majority of pets presented at the clinic were for routine examinations and vaccination or for minor ailments such as anorexia, keratitis and alopecia. Stray cats were randomly trapped from various residential areas of Shiraz, southern Iran.

During the period of study, a total of 147 pet dogs and 112 stray cats were examined. Most of the animals are referred to the clinic once a year.

Collection and examination of samples:
Whenever possible, more than one faecal sample was collected from each animal. Stool samples of pet dogs and stray cats were examined for the presence of *Giardia* and *Sarcocystis* spp. by direct fecal smears, zinc sulfate flotation and formalin-ether concentration technique as well as trichrome stain (Barlough 1979; Barr & Bowman 1992; Barr & Bowman 1994; Garcia *et al.*, 2006).

RESULTS

One hundred forty seven pet dogs and 112 stray cats of different ages, sexes and breed were examined during 12 months period in Shiraz area. Out of a total of 147 pet dogs, one male dog (0.67%) was found positive for the presence of *Giardia* (Table 1). The positive animal was a one-year old German shepherd pet dog. All vital signs in this pet dog were normal indicating that the animal was a carrier. Efforts was made to screen

Table 1. *Giardia spp.* status in pet dogs and stray cats of Shiraz, Southern part of Iran

	No. of animals tested	Positive No. (%)	Age year	Sex	Breed	Type of examination		
						Direct faecal smear	Zinc sulfate Flotation	Formalin – ether Concentration
Dogs	147	1 (0.67)	1	Male	German shepherd	–	–	+
Cats	112	–	–	–	–	–	–	–

Table 2. *Sarcocystis spp.* status in pet dogs and stray cats of Shiraz, Southern part of Iran

	No. of Positive	Positive %	Breed	Sex	Age months	Type of examination		
						DFS	ZSF	F-E C
Dogs (147)	1	0.67	Iranian	Female	5	+	+	+
	1	0.67	Shianlou	Male	4.5	–	+	+
	1	0.67	Poodle	Female	18	–	+	+
Total	3	2.04						

the stray cats for *Giardia* and *Sarcocystis*, but non of the stray cats were detected positive (Table 1).

Sarcocystis spp was also detected in 3 (2.04%) of the 147 pet dogs sampled (Table 2). All positive animals aged between 4 to 18 months and were of native Iranian, Poodles and Shianleu breed. Of the three positive animals, one was male (Shianleu) and the others were female.

DISCUSSION

The status of *Giardia spp.* infection of pet dogs and stray cats in Shiraz, Fars province of Iran has not been previously reported. The results of this study (Table 1) indicated that *Giardia* infection of pet dogs and stray cats is not common in the city. Only 1 pet dog (0.67%) was found positive for *Giardia spp.* which is very low compared to studies in other countries as well as in the capital city of Iran (Lane & Lloyd, 2002; Thompson, 2004; Zarebavani *et al.*, 2006; Palmer *et al.*, 2008). However, it was not possible to determine the species or genotypes of *Giardia* detected via microscopy.

The determination of species and genotypes can be achieved by using molecular techniques such as nested-PCR and PCR-RFLP to ascertain the source of infection. *Giardia* isolates recovered from humans fall into one of the two major genotypic assemblage A and B which each assemblege is divided into two groups. It has been possible to infect dogs with *G. duodenalis* from Assemblage A, group I; and that beavers are susceptible to infection with isolates of human origin (Monis & Thompson, 2003; Thompson, 2004.)

Surveys of the canine populations report a prevalence of approximately 10% in well-treated dogs, 36% to 50% in puppies and up to 100% in breeding kennels (Hahn *et al* 1985; Kirkpatrik, 1988; Barr & Bowman 1994). *Giardia* spp. infection is common and widespread in cats. A study conducted in New Jersey, Michigan and Minnesota revealed a range of 1.4% to 5% prevalence of infection in cats (Kirkpatrick, 1985). Prevalence of *Giardia spp.* varies widely depending on the geographic locality, detection method and population understudied. Although the overall prevalence varies from 0.6% to 67% (Hewlette *et al.*, 1982), approximately 4% of pet cats and 8% of pet dogs in North America may be expected to harbor *Giardia spp.* A recent study has shown that *Giardia* was the most prevalent parasite in dogs in Australia (Palmer *et al.*, 2008). A study on *Giardia spp.* of dogs in New Zealand revealed 7.7% infection in Palmerston North and 24.4% in Hamilton respectively; the infection rate in cats in the mentioned areas was 6.7% and 2.8% respectively (Tonks *et al.*, 1991). Surveys in other countries have shown that infection with *Giardia* is common and widespread in both dogs and cats (Barlough, 1979).

The reason in which prevalence of *Giardia* infection is low in pet dogs and stray cats in this area could be summarized as follows: the prevalence figure is not the actual level of infection, because in most cases only one faecal sample could be obtained from each animal because animals were not accessible. Furthermore, pet owners were recommended to treat their pets with Mebendazole. Mebendazole has also been used for treatment of giardiasis in

human (Sadjjadi *et al.*, 2001). An erratic pattern of cyst excretion has been demonstrated in mice (Grant & Woo, 1979) and dogs (Barolugh, 1979; Tonks *et al.*, 1991). The number of cysts in the feces fluctuates and sometimes cysts may be absent from the feces of infected animals. The infection is rapidly spread between animals in breeding kennels and catteries where dogs and cats are raised. While the animals which were sampled (dogs) does not have any close contact with each other, hence the infection is not readily spread. According to diet information, nearly all pet dogs and stray cats were in good environment and hygienic measures. None of the 147 pet dogs and 112 stray cats showed any signs of infection, such as foited diarrhea, anorexia, and steatorrhea.

None of the 43 pups of 147 pet dogs and 18 kittens of 112 stray cats was found positive for *Giardia*. Research indicated that *Giardia* infection in young animals is higher than those of adults. Swan & Thompson (1986) found that the prevalence of *Giardia* in young dogs and cats is higher in Western Australia. A similar predisposition to *Giardia* has been reported in young dogs (Watson, 1980). With regard to prepatent period of the parasite, some animals may be in this stage; so, there is no cyst excretion in feaces that could be detected in fecal examination.

In spite of these facts, the prevalence of *Giardia* in human in Shiraz and surrounding area is high. Survey on prevalence of *Giardia* on 1500 students of Shiraz University during 18 months period was conducted and the results indicated that 11.4% of students were infected with *Giardia*. Similar study in other parts of the country shows that prevalence of infection in human was 11.4%-85% (Pesaran, 1992; Sadjjadi *et al.*, 1994).

Although *Giardia* may occasionally cause disease in cats and dogs, the main question that arises is whether or not, these animals acquire the infection from human population or these animals can act as a reservoir to infect the human population. This question could best be resolved following the development of techniques using morphological, biochemical and developmental criteria *in vivo* and *in vitro* which could unequivocally distinguish between different isolates of human infection. Thus *Giardia* outbreaks are typically associated with person to person transmission especially in children (Wolfe, 1992) or with water supplies (Giboda, 1988), rather than by association with companion animals. Furthermore, the relative ease with which human, but not most dogs and cats strains by *Giardia* can be propagated *in vitro* tends to suggest that the populations are not identical.

Currently, little is known about *Sarcocystis* spp. status in dogs. The results of the present study indicated that 2.04 % of the pet dogs examined showed *Sarcocystis* spp. oocysts. In Spaine this parasite has been found in 2.5% of the canine (Martý´nez-Moreno *et al.*, 2004). A survey in Prague indicated that 0.6% of the dogs were infected with *Sarcocystis* (Dubná *et al.*, 2007).

The findings of the present study warrants further work to be carried out in order to clarify the status of *Giardia* and *Sarcocystis* spp. infections in a wide range of animals in Iran. Owners have to be aware of the dangers of parasitic diseases transmitted from pet dogs and stray cats to them. So, they could be advised to put on leash and providing clean water and food for their pets. Please give suggestions that are relevant. At this point preventive measures that are related to proper sanitary and good hygiene practices are more relevant.

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REFERENCES

Barr, S.C., Bowman, D.D. & Erb, H.N. (1992). Evaluation of two test procedures for diagnosis of Giardiasis in dogs. *American Journal of Veterinary Research* **53**: 2028-2031.

Barr, S.C. & Bowman, D.D. (1994). Giardiasis in dogs and *cats*. *Compendium on Continuing Education for Practicing Veterinarian* **16**: 603-610.

Barlough, J.E. (1979). Canine giardiasis: a review. *Journal of Small Animal Practice* **20:** 613-623.

Dubná, S., Langrová, I., Nápravník, J. Jankovská, I., Vadlejch, J., Pekár, S. & Fechtner, J. (2007). The prevalence of intestinal parasites in dogs from Prague, rural areas, and shelters of the Czech Republic. *Veterinary Parasitology* **45:** 120-128.

Dubey, J.P. & Greene, C.E. (1990). Enteric coccidiosis. In Greene CE (ed): Infectious Diseases of the Dog and Cat. Philadelphia, WB Saunders Co. pp. 835-846.

Fayer, R. (2004). *Sarcocystis spp*. in human infections.Clinical *Microbiology Review* **17:** 894-902.

Fallah, M., Taherkhani, H. & Sadjjadi, S.M. (1995). Echinococcosis in the stray dogs in Hamadan, west of Iran. *Iranian Journal of Medical Sciences* **20**:170-172.

Gharagozlou, M.J., Sadjjadi, S.M. & Bokaie, S. (2004). A survey on the presence of serum antibody against bradyzoites of ovine Sarcocystis protozoan (*Sarcocystis. spp*) in human subjects using immunoflourescence method. *Iranian Journal of Veterinary Research* **5:** 150-156.

Grant, D.R. & Woo, P.T.K. (1979). Comparative studies of *Giardia spp.* in small animal in Southern Ontario, III Duration and cyst production in natural and experimental infections *Canadian Journal of Zoology* **57**: 307-313.

Garcia, L.S. (2006). *Diagnostic Medical Parasitology* (5th edition). American Society for Microbiology, Washington DC, USA.

Hahn, N.E., Glaser, C.A., Hird, D.W. & Hirsh, D.C. (1988). Prevalence of *Giardia* in the feces of pups. *Journal of American Veterinary Medical Association* **192**: 1428-1429.

Hewlett, E.L., Andrews, J.S. Ruffier, J. & Schaefer, F.W. (1982). Experimental infection of mongrel dogs with *Giardia lambelia* cysts and cultured trophozoites. *Journal of Infectious Diseases* **145:** 89–93.

Kirkpatrick, C.E. (1988). Epizoootiology of endoparasitic infections in pet dogs and cats presented to a veterinary teaching hospital. *Veterinary Parasitology* **30:** 113–124.

Kirkpatrick, C.E. (1982). Giardiasis in a cattery. *Journal of American Veterinary Medical Association* **187:** 161–162.

Lane, S. & Lloyd, D. (2002). Current trends in research into the waterborne parasite *Giardia*. *Critical Review of Microbiology* **28:** 123–147.

Martínez-Moreno, F.J., Hernández, S., López-Cobos, E., Becerra, C., Acosta, I. & Martínez-Moreno, A. (2007). Estimation of canine intestinal parasites in Córdoba (Spain) and their risk to public health.*Veterinary Parasitology* **143**: 7-13.

Mehrabani, D., Oryan, A. & Sadjjadi, S.M. (1999). The prevalence of echioncoccosis/hydatidosis in stray dogs and herbivours in Shiraz, Iran. *Veterinary Parasitology* **81:** 217-220.

Mehrabani, D., Sadjjadi, S.M. & Oryan, A. (2002). Prevalence of gastrointestinal parasites in stray dogs in Shiraz, Southern Iran. *Journal of Applied Animal Research*, **22:** 157-160.

Monis, P.T. & Thompson, R.C. (2003). *Cryptosporidium* and *Giardia*-zoonoses: fact or fiction? *Infection, genetics and evolution : Journal of molecular epidemiology and evolutionary genetics in infectious diseases* **3**: 233-244.

Negahban, S., Daneshbod, Y., Atefi, S., Daneshbod, K., Sadjjadi, S.M., Hosseini, S.V., Bedayat, G.R. & Abidi, H. (2007). *Dirofilaria repans* diagnosed by presence of microfilaria in fine needle aspirates. A case report. *Acta Cytologica* **51:** 567-570.

Palmer, C.S., Thompson, R.C., Traub, R.J., Rees, R. & Robertson, I.D. (2008). National study of the gastrointestinal parasites of dogs and cats in Australia. *Veterinary Parasitology* **151**: 181-190.

Palmer, C.S., Traub, R.J., Robertson, I.D., Devlin, G., Rees, R. & Thompson, R.C. (2008). Determining the zoonotic significance of *Giardia* and *Cryptosporidium* in Australian dogs and cats. *Veterinary Parasitology* **154**: 142-7.

Pesaran, P. (1992). Prevalence of intestinal parasites in students of Shiraz University of Medical Sciences and Health services. Seminar on parasitic diseases in Fars province of Iran. 44-45.

Robert, L.S. & Janovy, J. (2005). *Foundations of Parasitology*. McGraw Hill Higher Education, Boston, USA.

Sadjjadi, S.M. & Massoud, J. (1994). Prevalence pattern of *Giardia lamblia* in the rural areas in the north of Iran. In: Thompson RC, Reynoldson JA, Lymbery AJ. Editors. *Giardia from Molecules to Diseases*. Oxon, Wallingford, UK: CABI Publishing: 365.

Sadjjadi, S.M., Alborzi, A.W. & Mostovfi, H. (2001a). Comparative clinical trial of mebendazole and metronidazole in giardiasis of children. *Journal of Tropical Pediatr*ics **47**: 176-8.

Sadjjadi, S.M., Oryan, A., Jalali, A.R. & Mehrabani, D. (2001b). Prevalence and intensity of infestation with *Toxocara cati* in stray cats in Shiraz, Iran. *Veterinarski Arhiv* **71**: 149-157.

Sadjjadi, S.M., Mehrabani, D. & Oryan, A. (2004). Dirofilariasis of stray dogs in Shiraz, Southern Iran. *Journal of Veterinary Parasitology* **18**: 181-182.

Sadjjadi, S.M., Rostami, J. & Azadbakht, M. (2006). Giardiacidal activity of lemon juice, vinifer and vinegar on *Giardia intestinalis* cysts. *South East Asian Journal of Tropical Medicine and Public Health* **37**, Suppl. 3: 24-27.

Shekarforoush, S.S., Shakerian, A. & Hasanpoor, M.M. (2006). Prevalence of *Sarcocystis* in slaughtered one-humped camels (Camelus dromedarius) in Iran. *Tropical Animal Health & Production* **38:** 301-3.

Swan, J.M. & Thompson, R.C.A. (1986). The prevalence of *Giardia* in dogs and cats in Perth Western Australia. *Australian Veterinary Journal* **63**: 110-112.

Thompson, R.C. (2004). The zoonotic significance and molecular epidemiology of *Giardia* and giardiasis. *Veterinary Parasitology* **126**: 15-35.

Tonks, M.C., Brown, T.J. & Ioans, G. (1991). *Giardia* infection of cats and dogs in New Zealand. *New Zealand Veterinary Journal* **39**: 33-34.

Watson, A.D.J. (1980). Giardiasis and colitis in a dog. *Australian Veterinary Journal* **56:** 444-447.

Wolfe, M.S. (1992). Giardiasis.*Clinical Microbiology Review* **5:** 93-100.

Zarebavani, M., Pezeshki, A., Jamshidi, Sh. & Rezaeian, M. (2006). Study of *Giardia* Infection in Cats. *Iranian Jounal of Public Health* **35:** 77-80.

Zibaei, M., Sadjjadi, S.M. & Sarkari, B. (2007). Prevalence of *Toxocara cati* and other intestinal helminths in stray cats in Shiraz, Iran. *Tropical Bioscience* **24**: 39-43.