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CONTAMINATION OF SANDPITS WITH SOIL-TRANSMITTED HELMINTHS EGGS IN AN URBAN ENVIRONMENT

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ABSTRACT

The aim of this study was to monitor the occurrence of the propagative stages of intestinal endoparasites in dog excrements collected within the close proximity of sandpits in an urban environment (Košice, Slovakia) and to determine the level of sandpits contamination with soil-transmitted helminths (STHs). A total of 201 dog faecal samples were examined for the presence of helminth eggs with 10.95 % of the samples being positive. In faeces the most prevalent eggs were those of Toxocara canis (7.46 %). The contamination of sand with STH eggs in 84 sandpits was also investigated. Toxocara spp. eggs were found in 21.43 % of the sandpits. The eggs from the family Ancylostomatidae and Toxascaris leonina were also present. Taenia type eggs and Trichuris sp. eggs occurred less frequently. In some samples, not only monoinfection but also co-infection with eggs of 2–3 helminth species were detected. In conclusion, the environmental contamination of sandpits with STHs eggs might pose a significant threat to the public health.

Key words: dog excrements; sandpits; soil-transmitted helminth eggs

INTRODUCTION

Dogs are the most popular pet animal. They play many roles in human society such as: guard dogs, hounds, sheepdogs, tracker dogs, guide dogs, and are also used in canistherapy, life-saving actions, transport, and last but not least, for fun and research [2, 8, 14]. On the other hand, intestinal nematodes affecting dogs have a relevant health-risk impact not only for animals but also for human beings. Both dogs and humans are typically infected by ingesting the infective stages, (i. e. larval eggs or larvae) which are present in the environment [15]. Dogs faeces are often infected with the cysts of intestinal parasitic protozoa (*Entamoeba histolytica, Giardia* spp.), the eggs of tapeworms (*Dipylidium* sp., *Echinococcus* sp.) and parasitic nematodes [11]. Dogs and cats are also major sources of environmental contamination by helminths eggs (e. g. *Toxocara* spp., *Ancylostoma* spp.). These helminths are able to cause para-

sitic infections also in man [9]. For example, *Ascaris lumbricoides, Trichuris trichiura, Ancylostoma duodenale* and *Necator americanus* (soil-transmitted helminths—STHs) are included in the World Health Organization list of Neglected Tropical Diseases [18]. The STHs infections are the most prevalent human infections worldwide [15, 17]. The most vulnerable to helminth infections are children [3, 4,12, 13]. The important source of parasitic infections are children playgrounds with sandpits [9, 10, 11, 16].

The aim of this study was to monitor the occurrence of propagative stages of intestinal endoparasites in dogs excrements collected within close sandpits proximity in the city of Košice, and to determine the level of contamination of sandpits with soil-transmitted helminths (STHs).

MATERIALS AND METHODS

Characterization of the locality

Košice (48° 43' 12" N, 21° 15' 29" E) is the second largest city in the Slovak Republic. It is situated in the valley of the river Hornád in the Košice basin at the eastern reaches of the Slovak Ore Mountains, near the border with Hungary. The population is approximately 240,000. It lies at 206 m above sea level. The climate is moderately warm with average temperatures of 19 °C in July and –3 °C in January. The average annual rainfall is 608 mm.

The town is divided into four districts: Košice I (covering the central and northern parts), Košice II (covering the southwest), Košice III (east), and Košice IV (south), and into 22 boroughs (wards). The survey was carried out from March to December 2018 in Košice III district, borough of the Dargov heroes. The borough consists of the local housing estates, built mainly in the form of panelled blocks of flats. Currently, 26,000 people live in this borough. There are little to no industrial structures or activities there and serves primarily as housing. In the period of investigation there were about 700 dogs registered in the borough.

Dog excrements

A total of 201 faecal samples of unknown dogs were collected at random from the public areas. After collection, the faecal samples were stored at 4 °C and examined for the presence of propagative stages of endoparasites within 24 hours. A flotation method with the Shaeter's flotation solution (specific gravity 1.3 $g.ml^{-1}$) was used for the coprological examinations. A total of 3 grams of a faecal sample were centrifuged with 10 ml of water for 5 minutes at 1200 rpm. After pouring off the supernatant, the Shaeter's flotation solution was poured up to 2/3 of the tube with the sediment, stirred and centrifuged once again. After 5 minutes, the test tube was replenished with the flotation solution until a meniscus formed and the tube was covered with cover glass. The cover glass was removed and put on the mount glass after an hour of egg flotation. The samples were examined under a light microscope (Leica, Germany) with ×20 and ×40 magnification.

Sand samples

A total of 84 sand samples were collected from children's sandpits. The sand samples were examined according to Kazacos [5]. To 100 g of pooled sand samples, 100 ml of water and 0.5 ml of the Tween 40 was added and decanted for 10 minutes. Then the sample was passed through a sieve and replenished with 100 ml of water. After an hour of sedimentation, the sand sample was centrifuged and then floated with Sheather's flotation solution and examined as described above.

RESULTS AND DISCUSSION

Out of 201 dog faecal samples collected around sandpits in Košice III district, 22 were positive for the presence of the propagative stages of endoparasites, representing the prevalence of 10.94 %. In some samples not only monoinfection but also co-infection with eggs of 2—3 helminth

Table 1. Occurrence of dog endoparasites in excrements collected close to sandpits

Helminth eggs	p/n	P [%]
Toxascaris leonina	3/201	1.49
Toxocara canis	15/201	7.46
Trichuris vulpis	5/201	2.48
Family Ancylostomatidae	3/201	1.49
Capillaria aerophila	1/201	0.50

n — number of examined samples; p — number of positive samples
P — prevalence

Table 2. Presence of soil-transmitted helminth eggs in fenced and unfenced sandpits

Helminth eggs	p/n	P (%)	Fenced		Unfenced	
			p/n	P [%]	p/n	P [%]
Toxascaris leonina	7/84	8.30	4/53	7.55	3/31	9.68
Toxocara spp.	18/84	21.43	11/53	20.75	7/31	22.58
Taenia type eggs	1/84	1.19	0/53	0	1/31	3.23
Family ***Ancylostomatidae***	9/84	10.71	6/53	11.32	3/31	9.68
Trichuris spp.	1/84	1.19	1/53	1.89	0/31	0

n— number of examined samples; p — number of positive samples; P — prevalence

species were detected. In the examined samples the eggs of Toxocara canis, Trichuris vulpis, Toxacaris leonina, Capillaria aerophila and eggs from the family Ancylostomatidae were detected. The occurrence of parasitic species is summarized in Table 1. Our results corresponded with those of Szabová et al. [14], Papajová et al. [11] and Antolová et al. [1].

The high prevalence of intestinal helminths in the dog populations indicated a contamination of the environment in which the animals move. Epidemiologically, toxocariasis caused by nematodes *T. canis* and T. cati is considered to be one of the most serious parasitic diseases of humans. Humans became infected usually per os by ingestion of soil with embryonated *Toxocara* eggs. *Toxocariasis* manifests itself in two distinct forms: visceral, larva migrans visceralis, and ocular, larva migrans ocularis [6, 7]. Soil contamination seems to be the most direct indicator of the risk to human populations, mainly to children. For this reason, also STHs contamination of sandpits in Košice III district were also studied. Totally 84 sand samples were collected from the children's sandpits from areas with frequent movement of dogs and examined for the presence of the parasites. The occurrence of parasitic eggs in the sandpits was as follows: *Toxocara* spp., *Toxascaris leonina, Trichuris* spp, *Taenia* type eggs and eggs from the family *Ancylostomatidae* (Table 2). The sandpits were classified as fenced (53) or unfenced (31). The unfenced sandpits were found to be significantly more contaminated than the fenced sandpits. In unfenced sandpits 43.39 % prevalence of the parasites were recorded, compared with the fenced sandpits where 28.30 % positivity was observed (Table 2). In some samples not only monoinfection but also co-infection with eggs of 2—3 helminth species were detected. Similar to samples of the soil around sandpits, co-infection with eggs of 2—3 helminth species were detected in some of sand samples. Our results correspond with those of the other authors. In the Slovak Republic, Szabová et al. [14] reported eggs of *Toxocara* spp. in 28.3 % of the sand samples from sandpits in Košice. In previous study Papajová et al. [11] found STHs eggs in 7.40 % examined sand samples from sandpits in the same town. Ondriska et al. [10] detected *Toxocara* sp. eggs in 27.0 % of the sandpits in Bratislava and in smaller towns in 6.8 % of the sandpits.

CONCLUSIONS

This study demonstrated that the environmental contamination of sandpits with STHs eggs might pose a significant threat to public health. The occurrence of intestinal parasites in dog's excrements indicate the necessity of the veterinary care for dogs and control of hygienic measures for dog owners.

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