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Geohelmints' egg contamination of the parks and sandpits in Lublin area

Zanieczyszczenie jajami geohelmintów skwerów i piaskownic na terenie Lublina

Constant growth of cities and density of population causes a decrease of the living space. Consequently, children are more prone to exposure and ingestion of infective eggs due to their contiguity with the contaminated surroundings as they are brought up in urban areas and forced to play outdoors mainly on specially adjusted playgrounds or parks. Unfortunately, such areas are usually places where people walk their pets to satisfy their physiological needs. Studies find out that soil contamination in city area is much higher than in the countryside [8]; however, parasites are more frequent among rural dogs [10].

This is the reason for, mostly disregarded, threat of diseases caused by parasites present in the local soil, particularly those parasites whose eggs after being expelled by an animal carrier, need to be consumed by people in order to initiate an illness. Health education along with the awareness of human coexistence with animals is on differentiated, yet unfortunately still low, level [13].

Toxocara canis is one of the most common parasites, which resides in the dogs along with its equivalent that occurs in the cats – Toxocara cati. Parasites are commonly found in puppies and kitten and those are the main reservoirs of infective eggs – hundreds of thousands of which are present in animal excrement. Both intrauterine and lactogenic infections are possible. Human being is not their host, however disease caused by their larval form (whose development is suspended in L2 phase) called toxocarosis may lead to dangerous, health-threatening complications [6].

Additionally, other parasites' eggs were found in the examined material. Many of them are dangerous to humans. Toxascaris leonina – a nematode, which is rarer than Toxocara canis and found in dogs' entrails. The threat of ingestion is much lower, however it may cause a disease similar to these induced by larva migrans (Toxocara spp.) among the immunosupressed organism [5].

MATERIALS AND METHODS

Research was carried out in the residential area of Lublin (Czechow, Czuby and LSM) with the use of modified Dada method [2]. 100 samples of local soil were collected, each 200g of weight. Samples were separated and arranged in thin layers, which were left for 24 hours to dry at room

temperature. Subsequently, the soil was sifted with a sieve (2 mm-diameter holes) and weighed out 10 g for the next four repetitions. Tween 80 solution (1%) was poured over the soil and the samples were centrifuged for 30 minutes with 100 Hz in Erlenmayer flasks. The newly-created suspension was transferred into a tube for centrifugation and it was centrifuged for 3 minutes at 1500 rpm. Supernatant liquid was decanted and 40 ml of saturated ZnSO4 (1500 g/1 l. H_2O) was poured into a test-tube and stirred with a glass rod. Once again, the sample was centrifuged for 3 minutes at 1500 rpm. The last stage consisted of arranging test-tubes on a table and filling them with saturated ZnSO4 solution until the convex meniscus appeared. The samples were then covered with a 20 x 20 mm cover glass and after 15 minutes they were ready for observation with the use of a microscope, in order to find geohelmints' eggs. The estimation of eggs' membership in a definite group of species was achieved on the basis of its morphological characteristics and size.

Additionally, an experiment was carried out to verify the accuracy of the described method – 2 ml of physiologic saline (containing Toxocara canis eggs, which were isolated from a mature uterus) was added to an uncontaminated sieved sand sample. The sample was analyzed according to the described method. Many eggs of the parasite were present in the resultant preparation – their identification was possible on the basis of its distinctive morphological factors.

RESULTS AND DISCUSSION

The aim of the study was to verify the degree of contamination of Lublin area with geohelmints' eggs, and to determine their memberships in a definite group of species. In Lublin area (3 housing estates: Czuby, Czechów, LSM), 100 samples of soil were collected from: parks, local lanes, other places of entertainment. Also, 60 samples of sand were collected from sandpits near local playgrounds. Samples (each 200 g of weight) were tested with the use of modified Dada method. Most frequent parasites present in the samples were: *Toxocara spp.*, present I n 7% of examined samples of soil and 20% of sand. In single cases (3 at soil and 2 at sand), eggs of *Trichuris spp* (family: *Trichuridae*) were also found in the samples (Table 1, Figure 1). Additionally, *Toxascaris leonina* was fund in 11.6% of sand samples and 11% of soil samples. There were also cases of whipworms *Trichuris spp.* (samples: sand 3.3% positive, soil 3% positive). There was also a single case of *Ancylostomatidae* eggs occurrence – another parasites infecting dogs (*Uncinaria stenocephala* or *Ancylostoma caninum*).

The efficacy of detection *Toxocara spp.* eggs in soil reaches about 65% [2] therefore the results presented in this paper may be regarded as understated. The research has proved that geohelmints' eggs are a serious and real threat in urban areas. What is more, actions should be taken in order to eliminate these parasite from the environment.

Gundłach's research in the area of Lublin in (1995) [4a] resulted in 36% of positive results in *Toxocara spp.* occurrence – the result may be classified as medium and similar to that of the research in the area of Poznań and Silesian districts [8, 10, 11, 12].

Another research carried out in the Institute of Agriculture Medicine in Lublin (years 1998–1999) proved the percentage of seropositive results may be even higher (56.1%) among people living in the country than those living in a big city (Lublin – 13%) [16].

Table 1. The number of parasites in the samples

District	Housing estate	The amount of soil samples					The amount of sand samples				
			Positive					Positive			
		Total	*Toxocara spp.*	*Toxascaris leonina*	*Ancylostomatidae*	*Trichuris spp.*	Total	*Toxocara spp.*	*Toxascaris leonina*	*Ancylostomatidae*	*Trichuris spp.*
Czechów	Lipińskiego	-					3	0	0	0	0
	Młodej Polski	-					3	0	0	0	0
	Moniuszki	-					3	0	1	0	0
	Nowowiejskiego	-					3	0	0	0	0
	Paderewskiego	-					3	0	0	0	0
	Wieniawskiego	-					3	0	1	0	0
Czuby	Błonie	6	0	0	0	0	3	1	1	1	1
	Górki	4	0	1	1	0	3	1	0	0	0
	Łęgi	6	0	0	0	0	3	1	0	1	0
	Nałkowskiej	7	0	2	0	0	-				
	Poręba	5	0	0	0	0	3	0	0	0	0
	Ruta	16	1	0	0	2	3	1	0	0	0
	Skarpa	7	1	2	0	0	3	1	1	0	0
	Widok	5	0	0	0	0	3	1	1	0	0
LSM	Piastowskie	7	0	0	0	0	3	0	1	0	0
	Prusa	8	1	3	0	0	3	1	0	0	0
	Krasińskiego	6	1	1	0	0	3	1	0	0	0
	Słowackiego	4	0	0	0	0	3	1	0	0	0
	Konopnickiej	10	1	0	0	0	3	1	1	0	0
	Mickiewicza	3	1	0	0	0	3	1	0	0	0
	Sienkiewicza	6	1	2	0	1	3	1	0	0	1
Total		100	7	11	1	3	60	12	7	2	2
%			7	11	1	3		20	11.6	3.3	3.3

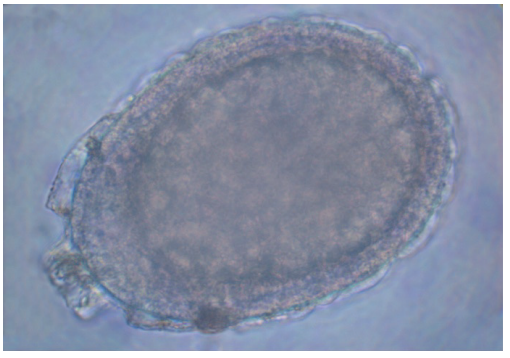

Figure 1. *Toxocara* spp. egg found in soil sample

Several similar researches were carried out in Lublin area, however this time positive results were slightly lower. It may be caused by the appearance of fences around sandpits and playgrounds, and a gradual rise of the awareness and concern regarding pets' state of health (more frequent deworming).

The presence of parasites that are dangerous to humans was observed in other countries of the world – the lowest soil contamination was stated in Kuala Lempur (Malaysia) – 1% *Toxocara spp.* [6] occurrence, and on the beaches of Warnemünde in Germany – 2% [13]. The highest degree of soil contamination was observed in Hawana (Cuba) – over 42% [3].

The defecation habits of cats and dogs in sandpits in urbanic public parks were observed in Japan [9, 15].

Extensiveness of toxocarosis among people is difficult to determine interchangeably. Currently, enzyme-linked immunosorbent assay (ELISA) with larval antigen of *Toxocara canis* is being used. Research carried out among clinically healthy patients proves 25% of positive reactions on average (17% among adults, 27% among children included) [4b]. Therefore, the problem of this parasitosis is of great significance; however, it is disregarded very often.

Although the degree of parks and sandpits contamination with the eggs of parasites lowered, there is still great probability of their interaction with humans. Both the managers and inhabitants of the city themselves, begin to notice the danger – hence the growth of the amount of playgrounds surrounded by fences, frequent replacement of sand in sandpits or its disinfection. However, this is only the very beginning. Owners have to remove their pets' excrement and be sure to deworm their animals systematically. Parents should teach their children proper personal hygiene – washing hands before each meal, right after their contact with animals and each time they visit playgrounds.

Eggs of nematodes – parasites of gastrointestinal tract – may, in appropriate conditions, retain infective abilities even for 14 years (proven on the example of *Ascaris lumbricoides*). Therefore, it is vital to raise the awareness among society of the threats caused by the contraction of toxocarosis, and to popularize prophylactic and diagnostic methods. Only the growth of awareness of the threat coming from infections caused by zoonosis may lead to its gradual elimination from the environment.

The studies demonstrated very high efficacy of emodepside plus paraquantel tablets against mature adults, .immature adults and L3 and L4 larval stages of *Toxocara canis* [1]. Albendazol PEG 6000 solid dispersions markedly increased the effectiveness of albendazole against the migratory activity of larvae [7].

CONCLUSIONS

The research showed that the degree of contamination with geohelmints' eggs dangerous to people, in urban areas, is considerable.

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SUMMARY

The aim of this study was examination of geohelmints' contamination of the parks and sandpits in Lublin area. The number of 100 samples of soil from parks, local lanes, other places of entertainment and 60 samples of sand from sandpits near local playgrounds were collected in the three residential area of Lublin (Czechow, Czuby and LSM). Every dry sample (200 g) was studied by Dada method – flotation with saturated ZnSO4 reaction. Most often, geohelmints' eggs were *Toxocara spp.* - 7% of examined samples of soils and 20.0% samples of sand and *Toxascaris leonina* – 11% of soil samples and 11.6% sand samples. In the examined samples single eggs of *Trichuris spp* eggs and *Ancylostomatidae* family were also observed.

STRESZCZENIE

Celem pracy było zbadanie poziomu zanieczyszczenia jajami geohelmintów skwerów i piaskownic Lublina. Na terenie miasta w trzech dzielnicach mieszkaniowych (Czuby, Czechów, LSM) zebrano 100 próbek ziemi ze skwerów, alejek osiedlowych i innych terenów rekreacyjnych oraz 60 próbek piasku pochodzącego z piaskownic na placach zabaw. 200 g próbki po wysuszeniu badano przy użyciu metody Dada, prowadząc flotację w nasyconym roztworze $ZnSO_4$. Najczęściej stwierdzanymi jajami pasożyta była *Toxocara spp.*, obecna w 7% badanych próbek gleby i 20,0% próbek piasku, oraz *Toxascaris leonina* – w 11% próbek gleby i w 11,6% próbek piasku. Wykryto także jaja *Trichuris spp* oraz pojedyncze jaja należące do rodziny *Ancylostomatidae*.