PARASITOLOGICAL INVESTIGATION OF CHILDREN'S SAND BOXES AND DOG FAECES FROM PUBLIC AREAS IN OLD HOUSING DISTRICTS OF PRAGUE

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DEDICATED TO ACADEMICIAN B. ROSICKÝ ON THE OCCASION OF HIS 60TH BIRTHDAY

Abstract. Eggs and oocysts of 11 species of parasites were recorded in 21 of 50 sand boxes (200 samples) and in 86 (18.2 %) of 500 dog faeces samples from parks and grassy areas in Prague. Toxocara canis was found in 12 sand boxes and in 4.2 % of faeces samples and T. cati in one sand box and one sample of dog faeces.

Animal sources of parasitoses in an urbanized environment are of great significance and this problem has been given attention particularly in recent years. Since the dog parasites are of primary importance, our studies were aimed at the examination of sand samples from children's boxes in Prague parks and samples of dog faeces from the same localities. A similar topic was dealt with in the paper by Dubin et al. (1975) who obtained samples of sand and dog faeces from two parks in Philadelphia.

The contamination of soil samples with helmint eggs was also studied, for example, by Lenkauskaitë and Podenaite (1970) in Lithuania, Borg and Woodruff (1973) in parks in England, Chieffi and Müller (1978) in urbanized regions of Londrina in Brazil and Bozdéch et al. (1979) in parks of Prague.

There are only a few papers dealing with helminth eggs contamination in dog faeces collected in parks and streets of large towns. Besides the mentioned paper by Dubin et al. (1976), this problem was studied also by Guillen and Sanchez-Covisa (1977) in Madrid.


The examination of dog faeces and soil samples collected from public places for the presence of eggs of parasites should be included in the complex care of living environment in large urban agglomerations.

MATERIAL AND METHODS

Fifty children's sand boxes and 500 samples of dog faeces were examined from January to June 1979. The samples were collected in 5 localities, including parks and grassy areas with children's sand boxes in each of the 10 districts of Prague. One mixed sand sample and 10 samples of dog faeces were collected in each locality.
The sand samples were collected from April to June. Each sample weighed 2–3 kg and they were collected in a chess-board manner at distances of 30–50 cm, according to the extent of the studied area, and up to the depth of 2–3 cm. The sand was thoroughly mixed and a 500 g sample was divided into 4 equal samples processed in the laboratory. In this way, 200 sand samples were studied by the method of Spindler (1929) modified by Vasilikova and Gefer (1948) (described in the book by Vasilikova 1953).

Fresh faeces were collected in two periods. The first set of 300 samples from January to March and the second set of 200 samples from April to June. Each sample was examined macroscopically and 2–3 g were examined by a flotation ovoscopic method using a solution after Brezo (1959).

RESULTS

1. Examination of sand samples

Twenty-one of the 20 examined sand boxes were contaminated with eggs or oocysts of parasites. There occurred eggs of 9 helminth species — Dipylidium caninum (Linne, 1758), Capillaria plica (Rudolphi, 1819), Thoximex aerophila (Creplin, 1839), T. leonina (Linstow, 1902), Toxocara canis (Werner, 1782), T. cat (Schränk, 1788), Trichocephalus vulpis (Froelich, 1789), Uncinaria stenocephala (Railliet, 1884), Strongylodes sp. and oocysts of two species of coccidia — Isospora canis Nemeser, 1959 (or I. felsis Wenyon, 1923) and I. ohionensis Dubey, 1975 (or I. rivol (Grassi, 1879)). It is possible that the oocysts originated also from cats, though the cat faeces occurred only rarely in the localities under study.

The most abundant species was T. canis (in 12 sand boxes), then I. ohionensis (rivol) (in 5 sand boxes), I. canis (felsis) (in 3 sand boxes), T. leonina, T. vulpis and U. stenocephala (in 2 sand boxes) and C. plica, Strongylodes sp., T. aerophila, T. cat and D. caninum (in one sand box).

Eggs of several helminth species and oocysts of coccidia were found only in 5 sand boxes. Four species were found in two sand boxes (T. vulpis, T. aerophila, I. canis (felsis), T. cat, C. plica, T. canis, T. leonina, U. stenocephala), three species in one sand box (I. canis (felsis), D. caninum, T. vulpis) and two species occurred in two sand boxes.

A comparison of parasitological examination of sand samples with the type and situation of the locality where they were collected revealed that the contamination of sand boxed was higher in smaller parks than in large ones and sand boxes at the periphery were more contaminated than those in the centre of Prague.

Table 2. Relationship between the number of contaminated sand samples and the type and situation of the locality

<table>
<thead>
<tr>
<th>Locality</th>
<th>No. of samples examined</th>
<th>No. of contaminated samples</th>
<th>No. of samples contaminated with T. canis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large parks</td>
<td>19</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Smaller parks</td>
<td>31</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Green areas</td>
<td>21</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 3. Results of dog faeces examination

<table>
<thead>
<tr>
<th>Locality</th>
<th>No. of samples examined</th>
<th>No. of positive samples</th>
<th>% of positive samples</th>
<th>No. of species found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prague 1</td>
<td>50</td>
<td>16</td>
<td>13.2</td>
<td>1</td>
</tr>
<tr>
<td>Prague 2</td>
<td>50</td>
<td>12</td>
<td>11.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 3</td>
<td>50</td>
<td>10</td>
<td>10.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 4</td>
<td>50</td>
<td>8</td>
<td>8.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 5</td>
<td>50</td>
<td>6</td>
<td>6.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 6</td>
<td>50</td>
<td>4</td>
<td>4.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 7</td>
<td>50</td>
<td>2</td>
<td>2.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 8</td>
<td>50</td>
<td>1</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 9</td>
<td>50</td>
<td>1</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Prague 10</td>
<td>50</td>
<td>1</td>
<td>1.0</td>
<td>1</td>
</tr>
</tbody>
</table>

Total: 500 samples, 13.2% positive, 11 species found.

% of positive samples: 4.2, 2.6, 2.2, 1.4, 1.2, 0.8, 0.8, 0.6, 0.2, 0.2.
Tables 3, 4, 5

Of a total of 500 samples examined, 66 (13.2 %) were positive. There occurred 11 parasite species: T. canis (4.2 %), T. leonina (2.6 %), T. vulpis (2.2 %), Strongyloides sp. and U. stenocephala (1.4 %), T. aerophila (1.2 %), I. canis and I. chionomis (0.8 %), T. hydatigena (0.6 %), D. canisinus (0.2 %) and T. cati (0.2 %).

A mixed infection was found only in 9 of the 500 faeces samples examined. One sample contained four species (I. chionomis, I. canis, T. aerophila, T. vulpis) and one species (T. hydatigena, T. aerophila, U. stenocephala). The remaining 7 samples contained eggs of two helminth species each.

Table 4. Results of dog faeces examination according to sex

<table>
<thead>
<tr>
<th>Locality</th>
<th>No. of samples examined</th>
<th>No. of positive samples</th>
<th>No. of species found</th>
<th>T. canis occurrence in samples</th>
<th>T. cati occurrence in samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I.***</td>
<td>II.***</td>
<td>I.**</td>
<td>II.**</td>
<td>I.</td>
</tr>
<tr>
<td>Prague 1</td>
<td>20</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Prague 2</td>
<td>20</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Prague 3</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Prague 4</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Prague 5</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Prague 6</td>
<td>20</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Prague 7</td>
<td>20</td>
<td>20</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Prague 8</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Prague 9</td>
<td>20</td>
<td>20</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Prague 10</td>
<td>20</td>
<td>20</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>200</td>
<td>40</td>
<td>20</td>
<td>11</td>
</tr>
</tbody>
</table>

* Group I -- period from January to March, ** Group II -- period from April to June

The occurrence of hookworm eggs and oocysts of coccidia in the samples is almost even in both periods of collection (see Material and Methods). Group I contained 13.3 %, Group II 15 % and the two groups together 13.2 % of positive samples.

As to the type and situation of the localities, higher incidence was found in smaller parks and green areas than in large parks, and higher positivity occurred in the town than at its periphery.

3. Occurrence of eggs and oocysts of parasites in sand and faeces according to localities

Sand samples were found to be contaminated in 21 of the 50 localities examined and faeces samples were positive in 32 localities. In 17 localities, only faeces were positive in 6 localities only sand was contaminated and in 15 localities, the parasites were found in both sand and faeces. Altogether 38 localities were found to be contaminated with helminth eggs and oocysts of coccidia.

T. canis eggs were found only in sand in 9 localities, only in faeces in 9 localities, and in both sand and faeces in 3 localities (i.e., in 21 localities altogether). T. cati eggs were found only in faeces in one locality and only in sand in one locality, i.e., in 2 localities altogether.

4. Species representation in eggs and oocysts of parasites in sand and faeces

A total of 11 species of parasites were identified, only 10 of them occurring both in sand and faeces: oocysts of 2 coccidian species -- I. canis (ictis), I. chionomis (ricolata) and eggs of 8 helminth species -- D. canisenus, T. aerophila, T. leonina, T. canis, T. cati, T. vulpis, U. stenocephala, and Strongyloides sp. C. plio was found in sand samples and T. hydatigena in dog faeces only.

DISCUSSION

In a majority of papers dealing with coprophagous examination of dogs, T. canis and T. cati are the most important species from the epidemiological viewpoint. Mischl (1958) found the following species in 214 samples of dog faeces: T. canis in 20.6 %, D. canisinus in 5.8 %, Tanais plectonis (Blok, 1781) in 16.8 %, T. vulpis in 15.9 %, Mesostoma liebstdoris (Goeze, 1782) in 6.9 %, T. leonina and U. stenocephala in 5.9 %, and B. granulosus (Bechx, 1789) in 0.91 %. Walthery and Pitsios (1971) recorded D. canisinus and T. leonina in 5.8 %, T. aerophila in 5.7 %, D. canisinus and B. granulosus in 2.6 %, and D. canisinus and U. stenocephala in 2.6 % of the 559 dogs examined coprophagously. Khadle et al. (1973), who examined coprophagically 117 pet dogs, recorded T. canis, D. canisinus, and B. granulosus in 5.7 %, while a similar study of 464 dogs and found that eggs of 9 helminth species in 43.6 % and 14.6 % were infected with T. canis and T. leonina, 8.3 % with Strongyloides sp., 7.6 % with coccidia and 4.3 % with Anoplocephala and Dicyemoides. A mixed infection was found in 64 dog faeces. Yokovin and Benkóvský (1972) examined 387 samples of dog faeces and found helminth eggs and oocysts of coccidia in 31.3 %. T. canis was recorded in 11.6 %. The same authors (Yokovin and Skolarová 1977) examined 2086 samples of dog faeces in the years 1971-1973 and recorded helminth eggs in 492 (29.7 %) samples. T. canis was found in 8.55 %, Tanais sp. (probably plectonis) in 5.47 %, D. canisinus in 6.33 %, coccidia of the genus Leucosyn in 2.5 % and T. vulpis, T. leonina and Anoplocephala canina (Bouliani, 1898) in the same 11.6 %. Mixed infections with two helminth species, most often T. canis and D. canisinus, were recorded in 4.8 % of positive samples. Dubin et al. (1975) collected dog faeces in 2 localities and reported nevadostosis infection in 38 % and 73 %. The most abundant species was T. canis (12-24 %). Also Gaulin and Sanchez-Covici (1977) reported T. canis as the most frequent parasite in dog faeces.

A. canisinus is widespread in the countries of subtropical and tropical zone. Matsunari et al. (1970), who examined 4972 dog faeces, found 2100 of them to be positive. A. canisinus occurred in 22.3 % of T. canis in 28.2 %, T. vulpis in 25.01 %, D. canisinus in 7.56 %, U. stenocephala in 1.13 %, and T. leonina in 1.57 %. Streitfeld and Dubey (1974) registered Anoplocephala sp. in 65.8 %, T. cati in 19.2 %, and T. leonina in 10.3 % of the 500 dogs examined coprophagously. Also Mastro and Munro (1973) found A. canisinus in 83, Strongyloides in 12, Toxocara in 6 and Trichuris in 3 samples.
of the 169 samples of dog faces examined. In the wild races, *U. atrocaudatus* is more abundant than *U. concolor* (Rap 1972). The presence of helminth eggs in soil samples was studied by Borg and Woodruff (1972) who found *T. canis* and *T. cati* in 34.4% of 500 soil samples. A positive reaction to skin tests was detected in 41.1% of 170 dogs living near four homes, but 10.7% living near three homes. Dubin et al. (1973) found nematode eggs in 19% and 49% of 60 soil samples collected from two parks. The parasite density per dog at any one time (1973–74) was 14.7 and 3.96, respectively. In 1974, the presence of dog faeces from 12 houses near a 12 km2 area in 21.2% of 5 soil samples in the same period. This study was conducted by Sturgis et al. (1977). They recorded *Toxocara* sp. eggs in 12.1% of the 973 soil samples examined. Dada and Lindquist (1979) recorded *Toxocara* sp. eggs in 282 soil samples from public areas in Canas.

In our studies, we have taken the samples from children's sandboxes, as they are most frequently visited by children at the age of 2–4 years in which the *T. canis* infection is most probable. The samples of dog faces collected around the sandboxes provide an information on the infection in the dogs studied in the region and possible soil contamination in the vicinity of the sandboxes. It is of interest that helminth eggs and oocysts of coccidia were found in the sand in spite of the fact that only in one locality the dog faces were found at 2 m from the sand box and in the others this distance was 7 and more metres. The faces were found more in the periphery of parks than in their centres, particularly along the paths, less frequently near the benches and on grass areas, very rarely under shrubs, and they were quite absent in the immediate vicinity of sandboxes (see above). The occurrence of eggs and oocysts of parasites in dog faces in individual localities depended on the hygienic level of the dog owners (controls of dogs by a veterinary service) and on the frequency with which the dogs visited the parks, related with their stay outside Prague.

It is necessary to stress the importance of sanitary education of the inhabitants. We have examined with negative results 208 samples of dog faces obtained from the dog owners and we have found that if the dogs are well cared for, the parasitism can be limited or liquidated and in many cases the dogs can be even kept free from parasites. The care of the dog owners for the health condition of their dogs is documented in the paper by Broková et al. (1988) who recorded 14.4% positive samples among 543 samples of dog faces consisting of dogs of the species of dog from feeding and 31.3% positive samples among 607 samples originating from other dogs examined at the veterinary stations. With regard to the peculiarities in the life-cycle of *T. canis* (Schick et al. 1978) and its higher incidence in pigs than in adult dogs (Vokorn and Slavčková 1977), the faeces of infected pigs are the most important source of soil contamination in public areas and represent the greatest danger even for the dogs. The 1300 eggs of *T. canis* detected in the samples of the concentration method originated most probably also from infected pigs.

Compared to the reports of other authors, our results provide data of epidemiological importance, as the dog faces and soil samples were collected in places where the children play and the children have been lately been reported to be most infected by "visceral larva migrans". Many cases of *Toxocara* infection have been recently reported in children in our country, this problem has been dealt with by Uhliková and Hůbner (1965, 1973). Kouna et al. (1973), Karel et al. (1977) and Virgala and Ceenik (1978).

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(In Czech.)


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2nd Parasitological Colloquium in Berlin

The 2nd Parasitological Colloquium organized by Prof. Dr. Wd. Eichler was held in Museum für Naturkunde in Berlin on 25th March 1981. Czechoslovakia, Hungary and Poland were represented by one participant each. The reports read at the Colloquium were very interesting, as that by J. Zlotoryzka on the geographical distribution and evolution of Mallophaga, by L. Russel, who discussed the possibility of eradication of tsetse fly in the region of African savannah, by Z. Møy dealing with the formation of species groups in the mallephagan genus Deoherobus or by Wd. Eichler, who analyzed the factors influencing the increasing infestations with head louse. The reports were vividly discussed by all participants. The colloquia in Berlin, which will be organized also in future, thus become for the specialists an opportunity of meeting and discussing their opinions on the problems.

Dr. F. Boldt, C.Sc.