Prevalence of intestinal nematodes of dogs in the Warsaw area, Poland

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Summary

The prevalence of infection with intestinal nematodes of dogs in the Warsaw area was determined by coprological examination. Faecal samples of 2659 adult dogs kept under different conditions (dogs from shelters, rural area, pension) and 1115 samples of dog faecal deposits were examined by Füllborn’s method. In dog faeces collected in the Warsaw area the eggs of Toxocara canis, Toxascaris leonina, Trichuris vulpis and Ancylostomatidae were found. Parasite eggs were recovered in 71.2 % dog faeces from shelter 1; 56.5 % in shelter 2; 80.9 % in shelter 3; in 34.2 % of country dog and in 3.3 % of dog faecal deposits collected in Warsaw area. The results of the presented studies suggest that environmental factors influence the health conditions of dogs.

Key words: dog; intestinal parasites; faeces; epidemiology; Poland

Introduction

The first report presenting studies on the prevalence of intestinal parasites infections in dogs in Poland was published in 1935 (Łukasiak, 1935). But the articles were published after the II World War (Koźłowska, 1954; Stankiewicz et al., 1958; Ramisz & Martynowicz, 1963; Kozakiewicz, 1983; Okulewicz et al., 1994).

It is not surprising to find that many of the factors of the natural environment are changing and this influences parasites and their host, which causes the necessity of undertaking still new studies and estimating the prevalence of parasitic infections in dogs.

The most frequent intestinal parasites of dogs are nematodes. Nematodes like: Toxocara canis, Toxascaris leonina, Uncinaria stenocephala and Ancylostoma caninum are common parasites of the alimentary tracts of carnivorous animals. Some of them such as T. canis and A. caninum can infect humans (Beaver et al., 1952; Woodruff, 1970; Prociw & Croese, 1990; Yoshikawa et al., 1989; Sharkey & McKay, 1993). An infection with T. canis evokes toxocariosis in humans. Researchers distinguish three forms of toxocarosis: visceral toxocarosis (visceral larva migrans-VLM) with fever, coughing, allergic reactions, attacks of bronchial asthma, hepatomegaly, anemia, hyper-somnia, vomiting, diarrhoea, loss of body weight, anorexia, persistent eosinophilia, leucocytosis, hypergammaglobulinaemia and elevated anti-A and anti-B isohemaglutinins (Beaver et al., 1952); ocular toxocarosis (ocular larva migrans-OLM), when larvae are localized in the eyes, they evoke eye pain, retinal abnormalities, uveitis, endophthalmitis, retinal granuloma and blindness (Wildir, 1950; Taylor, 2001); and covert toxocariosis, when during routine examination physicians find eosinophilia in blood and a high level of anti-Toxocara spp. antibodies. However, during human infections with A. caninum an idiopathic eosinophilic gastroenteritis was observed (Loukas et al., 1992). Parasites of dogs with their own pathological effect can negatively influence the health of their host. Toxocarosis is very frequent among pups, which do not have a very effective immune system. Glickman et al. (1979) has wrote about „immunity connected with an age“. The aim of the present study was to report the prevalence of intestinal nematodes infections of dogs in the Warsaw area, by coprological examinations.

Material and Methods

In 1998 – 2001 2659 faecal samples were collected from dogs kept in different conditions (dogs from shelters, rural area, pension). There were faecal samples from adult dogs aged between 1 and 10 years. In the same time 1115 samples of dog faecal deposits were collected from urban areas of Warsaw.

Faecal samples were examined usually on the day of collection, but not later than the following day. All the samples were examined microscopically. For detecting parasite infection, flotation with a saline solution was applied using
the Fülleborn's method with Willis' modification (Śtefański & Żarnowski, 1971). Parasite eggs were identified according to their morphological features, as described by Mehlihorn et al. (1986), and percentages of positive samples were calculated.

**Results**

The eggs of intestinal nematodes of dogs was examined by the coprological method. The results of this study were divided into four groups: the prevalence of infections in stray dogs (from three shelters), in domestic pets (from a pension), in rural dogs (from small villages) and the percentage of positive dog faecal deposits collected in Warsaw. Parasite eggs were recovered in 71.2 % dog faeces from shelter 1; 56.5 % in shelter 2 and 80.9 % in shelter 3 (Table 1). The number of parasites species which occurred in the stray dogs was 1 to 3. The eggs of nematodes from the Ancylostomatidae family and T. canis, T. leonina and T. vulpis species were found in many samples. The most frequent parasites were nematodes from the Ancylostomatidae family, and T. vulpis. A different situation occurred in shelter 2. There were 56.5 % infected animals and 55.5 % of them were infected with Ancylostomatidae. From the country dogs (n = 38) 34.2 % was infected with intestinal parasites (Table 1). Eggs of nematodes from the Ancylostomatidae family were the most frequent (34.2 %) in the country animals, and 13.2 % of faecal samples were positive for T. canis and T. vulpis.

310 dog faeces from household dogs kept indoor in the pet hotel were collected. Only 3.2 % of animals from this group were infected with intestinal nematodes (Table 1). After coprological examinations in 2.9 % of domestic pets, nematodes from the Ancylostomatidae family were found. 0.3 % of pet dogs were infected with T. canis and T. vulpis. In the same years 1115 dog faecal deposits were collected from 17 different areas of Warsaw. In 3.3 % of the samples eggs of intestinal nematodes were detected (Table 2). The most frequent eggs were from the Ancylostomatidae family (3.1 %). The eggs of T. canis were found in 0.3 % of the faecal deposits and 0.2 % of the examined samples contained T. leonina eggs.

**Table 1. Prevalence of infection with intestinal parasites in adult dogs**

<table>
<thead>
<tr>
<th>Localisation</th>
<th>Examined animals n</th>
<th>Toxocara Canis</th>
<th>Toxascaris leonina</th>
<th>Trichuris vulpis</th>
<th>Ancylostomatidae</th>
<th>Total number of infected animals</th>
<th>Prevalence of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>shelter 1</td>
<td>1574</td>
<td>1</td>
<td>0.1</td>
<td>224</td>
<td>14.2</td>
<td>182</td>
<td>11.6</td>
</tr>
<tr>
<td>shelter 2</td>
<td>375</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.3</td>
<td>11</td>
<td>2.9</td>
</tr>
<tr>
<td>shelter 3</td>
<td>362</td>
<td>0</td>
<td>0</td>
<td>57</td>
<td>15.8</td>
<td>53</td>
<td>14.6</td>
</tr>
<tr>
<td>country</td>
<td>38</td>
<td>5</td>
<td>13.2</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>13.2</td>
</tr>
<tr>
<td>pension</td>
<td>310</td>
<td>1</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

n – the number of the examined animals; No – the number of the infected animals

**Table 2. Presence of parasite eggs in dog faecal deposits collected from Warsaw area**

| Total examined samples n | Toxocara canis | Toxascaris leonina | Ancylostomatidae | Total number of positive samples | Percent of positive samples |
|--------------------------|----------------|
| 1115                     | 3              | 2                | 34               | 37                             | 3.3                          |

n – the number of the examined animals; No – the number of the positive samples

da family, they were present in 70.6 % (shelter 1), 55.5 % (shelter 2) and 50 % (shelter 3) of dogs faeces, respectively. From the stray dogs 14.2 % (shelter 1); 0.3 % (shelter 2) and 15.8 % (shelter 3) were infected with T. leonina. However, the infection of homeless dogs with T. vulpis was on a level of 11.6 % (shelter 1); 2.9 % (shelter 2) and 14.6 % (shelter 3). Among the all examined dogs only one (from shelter 1) was infected with T. canis.

Comparing the results obtained in stray dogs, it was evident that the differences between shelter 1 and shelter 3 were not significant. There was a similar percentage of dogs infected with nematodes (71.2 % and 80.9 %), especially the percentage of animals infected with T. leonina

**Discussion**

Our results indicated that parasitic nematodes from the Ancylostomatidae family as well as T. canis, T. leonina and T. vulpis species were common parasites of dogs from the Warsaw area, but their prevalence of infection was different among dogs originating from different environments. The prevalence of infection with parasitic nematodes in adult dogs from shelters (71.2 % – shelter 1; 56.5 % – shelter 2; 80.9 % – shelter 3) was considerably higher than in country dogs (34.2 %) and in household dogs (3.2 %). The lower rate of detected eggs of certain nematode species in shelter 2 was induced by a improved hygienic situation,
e.g. concrete bases in animal boxes, washing bases of boxes with running water, presence irrigation in boxes, lower animal concentration, systematic health control by veterinarians and deworming. Shelters 1 and 3 had soil bases in animal boxes, where eggs of parasites, scraps or rain water were accumulated, and in these two places high animal concentrations were attended. Before the presented studies, two Polish teams of researchers found a high prevalence of infection with parasitic nematodes in stray dogs from shelters in Warsaw and Cracow (Górski et al., 1996; Kornaś et al., 2002). Also in other European countries, a high level of infection with parasites was detected in stray dogs (Kuliś et al., 1998).

In this investigation, the most frequent parasite eggs in all groups of dogs were from the Ancylostomatidae. From shelter 1 70.6 % of the dogs, from shelter 2 55.5 %, from shelter 3 50 %, from the country 34.2 % and from private houses 29 % were infected with these parasites. Two species: A. caninum and U. stenocephala belong to the Ancylostomatidae.

The epidemiology of A. caninum infections in dogs in Poland was studied by many Polish researchers. In shelters 4.2 % of dogs in Wroclaw and 3 – 15 % of dogs in Cracow were infected with this nematode (Okulewicz et al., 1994; Kornaś et al., 2002). Similar results were obtained in pet dogs in Poznań (2 %) and Wrocław (10 %) (Luty & Miazga, 1999; Okulewicz et al., 1994). In other countries in Europe the infection with A. caninum was not very often in dogs. 2.8 % of stray dogs in Lithuania and 0.1 % of household dogs in the Czech Republic were infected with this nematode species (Bajoriniene & Baklajewicz, 1988; Vokoun & Sležáková, 1977).

In Poland cases of infection with U. stenocephala were very frequent. This species was found in 5 % and 10.1 – 47.1 % of stray dogs in Wroclaw and Warsaw respectively; 75 % of country dogs around Wroclaw; and 2.9 %, and 10 % of pet dogs in Poznań and Wrocław respectively (Okulewicz et al., 1994; Górski et al., 1996; Miazga & Luty, 1998). In Lithuania Bajoriniene & Baklajewicz (1988) detected this parasite in 11.3 % of stray dogs and in Greece Haralabidis et al. (1988) found it in 3 % of household dogs.

In the presented studies only 0.1 % of dogs from shelter 1, 13.2 % of country dogs and 0.3 % of pet dogs were found to be infected with T. canis. This roundworm lives in the intestines of almost all newborn puppies, because older dogs develop a strong natural immunity to the worms. All examined dogs were older, over one year of age, for this reason prevalence of infection with T. canis is low.

In the last years a few Polish researchers detected this parasite in 12.2 % of stray dogs, 6.4 % of dogs in villages and 2.7 % of household dogs (Kornaś et al., 2002; Miazga & Luty, 1998). Prevalence of infection with T. canis in stray dogs has been documented to be 8.1 – 9.5 % in the Czech Republic (Vokoun & Sležáková, 1977; Borkovcová, 2003); 21 % in Holland (Overgaauw & Boerema, 1998); 18 % in Belgium (Vanparijs & Thienpont, 1973) and 25 % in Ireland (O’Lorcan, 1994). Besides, Hlubetz et al. (2003) found nearly half of the dogs (48.4 %) living in rural areas of Italy to be T. canis positive.

The results of the presented studies showed infection with T. leonina only in homeless dogs kept in shelters. This parasite was diagnosed in 14.2 % of dogs in shelter 1, in 0.3 % of dogs in shelter 2 and in 15.8 % of dogs in shelter 3. Other authors found this nematode in 0.9 % of pet dogs in Poznań (western Poland), in 1 % of household dogs in Olstyn (northern Poland), and in 5 % of pet dogs in Wrocław (southern Poland) (Luty & Miazga, 1999; Gaca et al., 1998; Okulewicz et al., 1994). The prevalence of infection with T. leonina in stray dogs was about 10.1 % in Belgium (Vanparijs et al., 1991); 1.3 % in Greece (Haralabidis et al., 1988); 1.1 % in Spain (Vazquez Valdes et al., 1989) and 9 % in Italy (Tassi & Widenhorn, 1977). Furthermore, 0.5 % of pet dogs in the Czech Republic and 0.4 % of household animals in Holland were infected with this parasite (Vokoun & Sležáková, 1977; Overgaauw, 1997).

In this survey a relatively high level of infection with T. vulpis was detected, especially in dogs from two shelters (shelter 1 11.6 %, shelter 3 14.6 %) and in dogs from villages (13.2 %). But only one pet dog from the 310 dogs kept in the hotel for pets was T. vulpis positive. Polish authors detected this species in stray dogs kept in shelters in Warsaw (5 – 21 %) and in Wroclaw (18.3 %) (Górski et al., 1996; Okulewicz et al., 1994). Dogs of Polish private owners were infected with this nematode in the Warsaw area – central Poland (0.5 – 1 %), in the Olstyn area – northern Poland (1 %), in the Wroclaw area – southern Poland (2 %) and in the Poznań area – western Poland (3.2 %) (Górski et al., 1996; Gaca et al., 1998; Okulewicz et al., 1994; Luty & Miazga, 1999). Okulewicz et al. (1994) diagnosed T. vulpis infections in about 40 % of country dogs from the Wroclaw area. This nematode was detected in homeless dogs in all European countries, e.g. in Yugoslavia (18.1 %), in Belgium (7 %), in Italy (10 %), in Spain (8.2 %) (Kuliś et al., 1998; Vanparijs et al., 1991; Tassi & Widenhorn, 1977; Vazquez Valdes et al., 1989). The prevalence of infection with T. vulpis was lower in the pet dogs in the Czech Republic (0.9 %) and in Holland (0.7 %) (Vokoun & Sležáková, 1977; Overgaauw, 1997).

Finally, the results of the presented studies suggest that factors of the natural environment influence on the health conditions of dogs. Private owners of dogs pay attention to professional veterinary care, proper nourishment, the sanitation of lodging and other factors. Stray dogs kept in kennels have worse living conditions. For this reason it is necessary to improve the keeping conditions in shelters, e.g. change the hygienic condition of boxes – to introduce concrete bases in animal boxes into practice to render impossible direct contacts between healthy and ill dogs, to reduce animal concentration, to carry out systematic health controls.

The second part of the studies was the estimation of the presence of parasite eggs in dog faecal deposits collected in the Warsaw area. In the examined 1115 samples the eggs of T. canis (0.3 %), T. leonina (0.2 %) and Ancylostoma-
matidae (3.1 %) were detected (Table 2). There are not many published reports presenting the results of studies conducted on dog faecal deposits collected in public places. Until now in Poland the presence of these parasite eggs was detected in two places – in the Olsztyn area (northern Poland) and in the Poznań area (western Poland). In the first area, 11.8 % of the faecal deposits contained the eggs of Toxocara spp., 1.8 % – the eggs of T. leonina, 2.7 % – the eggs of Ancylostomatidae family, 1.3 % – the eggs of T. vulpis. Different results were obtained in the second area, where in only 0.9 % of the samples Toxocara spp. and T. leonina eggs were found, and in 1.8 % of the faecal samples the eggs of T. vulpis were present.

In European countries this kind of studies is not very popular. Valkounová (1982) detected the eggs of T. canis (4.2 %), T. leonina (2.6 %), U. stenocephala (1.4 %) and T. vulpis (2.2 %) in collected dog faecal deposits in Prague (Czech Republic). The studies carried out by Fok et al. (2001) in eastern and northern regions of Hungary resulted as follows: T. canis eggs were observed in 24.3 – 30.1 % of the samples, T. leonina eggs – 2.1 %, T. vulpis eggs – 20.4 – 23.3 % and Ancylostomatidae eggs in 8.1 – 13.1 % of the faeces.

Results obtained in the Warsaw area gave evidence that a greater part of the dog population in our city consists of household dogs, because in collected faeces samples parasites eggs were detected rarely. Systematic anthelmintic treatment of pet dogs influences the small number of parasites in the alimentary tract and the small number of their eggs in faeces.

Parasite eggs present in faeces can be transmitted to the soil and are a potential source of humans infection. Toxocarosis and other zoonosis are an accidental human infection acquired by swallowing eggs of parasites. Children are at the highest risk of infection because of pica, geophagia, and playing on grounds contaminated with animal faeces (Glickman et al., 1979).

However, in Poland increasing attention should be paid to proper hygienic habits of dog owners to prevent environmental contamination and community education programmes should promote the concept of responsible pet ownership.

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