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# Public places contamination in Tirana from dogs intestinal geohelminths

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ABSTRACT

**Objective:** To assess the prevalence of infestation of stray dogs that attend public areas of Tirana by geohelminths zoonotic: *Toxocara canis* (*T. canis*), *Ancylostomatids* and *Trichuris* spp., and indirectly to assess the level of environment contamination by invasive exogenous stages of these parasites.
**Methods:** A total of 240 fecal samples was collected from stray dogs in public three urban areas of Tirana. These samples were analyzed by using the centrifugation-flotation technique.
**Results:** Result showed that 54.58% of the dogs were infested from *T. canis*, *Ancylostomatids* (*Ancylostoma* spp. and *Uncinaria* spp.) and *Trichuris* spp. Those infested dogs from *Ancylostomatids* were 37 (15.41%), from *T. canis* were 47 (19.58%) and from *Trichuris* sp. were 47 (19.58%).
**Conclusions:** Tirana public places are contaminated by exogenous stages of invasive intestinal dog's geohelminths all through the year. But the contamination level is higher during the spring and autumn and the parks with trees and grass are more polluted than the bare areas. So these environments have become a permanent risk factor of infection from parasitic zoonoses for the humans and animals that frequent those places. It is the duty of local authorities who takes care of legislation compilation, to prevent the public areas to become fecalized from dogs and to implement a plan with different actions to minimize the number of stray dogs.

## 1. Introduction

Public areas of the Albanian capital as those are scarce in number, are overcrowded from the many citizens that frequent them with their dogs. But those places are frequented also by the stray dogs whose population has grown in size in the recent years. So, public places in Albanian towns are constantly contaminated from parasitic infectious elements that are carried from the dogs. Helminthiasis that are transmitted through earth affect more than 2 billion people around the world[1].

Intestinal geohelminths affecting dogs have a relevant health-risk impact on both animals and humans, which are typically infected by ingesting infectious stages: larvated eggs or larvae[2]. The importance of these pathogens is often minimized by veterinarians, human doctors and the general public, although *Toxocara canis* (*T. canis*), *Ancylostoma* spp. and *Trichuris* spp. are the most relevant canine helminths in terms of geographic distribution and clinical importance[2-4].

Nowadays, intestinal parasites of dogs represent an important concern for humans due to the increasing presence of stray dogs in urban areas. Only in Tirana about 15 000 nomads dogs were found who move to one place to another in search of food. Geohelminths exogenous stages that together with the faeces of dogs out in the external environment preserve vitality for a long time in these environments.

The large number of stray dogs, the total lack of care for their dehelminthization and long time of surviving in the the external environment of exogenous stages of zoonotic dogs geohelminths, it has turned the green areas of Tirana in dangerous places for the public health. The purpose of this study was to assess the prevalence of stray dog infestation that attends the public facilities

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in Tirana which are infected by *T. canis*, *Trichuris* spp. and *Ancylostomatids* through coproscopike analysis, and indirectly to assess the level of public facilities contamination from their eggs and larvae.

## 2. Materials and methods

### 2.1. Study area and sampling

The study was conducted in three public facilities in Tirana: a) in Lake Park; b) both sides of the Lana River; and c) in Kavaja Street. Each area were determined by monitoring 5 stations with a distance of 200–300 m between them. In each monitoring station 2 samples with fresh faeces of stray dogs were collected in every season during two years without interruption. The samples with faece were gathered without touching the ground and were placed in plastic bags. The bags were labeled with date, month, year and the area gathered. Each sample minimally holds 200 g of faeces. In total were collected 240 samples with faeces and those were stored in the fridge at 5 ˚C.

### 2.2. Fecal examination

To detect eggs of parasites the feces campions were subjected to qualitative coproscopic analysis by centrifugation-flotation technique[5,6] with zinc sulphate (specific weight 1.3)[7,8]. The parasite eggs were differentiated according to their morphologic characteristics. Coproscopic tests were conducted at the Institute of Food Safety and Veterinary of Tirana.

### 2.3. Statistical analysis

To define the infestation prevalence of dogs from each geohelminths separately, from all the three together during all the seasons and in different areas. In order to determine the parasite that is more common found and more dangerous, and to identify the possible impact of season and of the area on the prevalence of dogs infection, the *Chi*-square test, $P$-value < 0.01, $P$-value < 0.05, and confidence interval 95% were used.

## 3. Results

From 240 samples of faeces of stray dogs that were collected during two years in three public urban areas of Tirana, 131 (54.58%) of them have resulted with the presence of 3 zoonotic geohelminths eggs, namely, *Ancylostomatids*, *T. canis* and *Trichuris* spp. (Table 1). Also those that carried *Ancylostomatids* (with which is understood both *Uncinaria* spp. and *Ancylostoma* spp.) have resulted to be infested 37 samples (15.41%), from *T. canis* were 47 samples (19.58%) and 47 samples (19.58%) with *Trichuris* spp. *T. canis* and *Trichuris* spp. have shown an equal infestation prevalence which were higher than the that of *Ancylostomatids* (risk ratio = 1.27). In another similar work held in Milan in Italy in 2014[9], was reported that "the most common nematodes species were *T. canis* and *Trichuris vulpis* (*T. vulpis*). *T. canis* and *Ancylostomatids* are the causes of larval migration syndrome, a serious disease that affects the central nervous system and/or eye, and *T. vulpis* causes a less significant zoonosis[2,10-12]. Sager *et al*.[4] in a coproscopic study of dog intestinal helminths with owners in Switzerland resulted that with *T. canis* were infested 7.1% of tested dogs, by *Ancylostomatids* were 6.9% infected and 5.5% by *T. vulpis*. Besides the life mode influence in the infestation level in the dogs from geohelminths it was observed that the main influence was due to the method used for assessing it. Serological methods have a higher sensitivity than coproscopic methods[2]. Therefore the prevalence of dog's infestation from *T.*

**Table 1**
The coproscopic data for stray dog's infestation prevalence from *T. canis*, *Ancylostomatids* and *Trichuris* spp. *n* (%).

| Season | Parasite | Dogs infestation prevalence | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Year 2013 | | | Year 2014 | | | 2013 and 2014 |
| | | Area a | Area b | Area c | Area a | Area b | Area c | a + b + c |
| Spring | *T. canis* | 2 (20.00) | 2 (20.00) | 3 (30.00) | 3 (30.00) | 3 (30.00) | 3 (30.00) | 16 (26.60) |
| | *Ancylostomatids* | 2 (20.00) | 2 (20.00) | - | 2 (20.00) | 3 (30.00) | 2 (20.00) | 11 (18.30) |
| | *Trichuris* spp. | 2 (20.00) | 1 (10.00) | 3 (30.00) | 3 (30.00) | 3 (30.00) | 3 (30.00) | 15 (25.00) |
| Summer | *T. canis* | 1 (10.00) | 1 (10.00) | 1 (10.00) | 2 (20.00) | 2 (20.00) | 2 (20.00) | 9 (15.00) |
| | *Ancylostomatids* | 2 (20.00) | - | 2 (20.00) | 2 (20.00) | 1 (10.00) | 2 (20.00) | 9 (15.00) |
| | *Trichuris* spp. | 2 (20.00) | - | 1 (10.00) | 1 (10.00) | 1 (10.00) | 2 (20.00) | 7 (11.60) |
| Autumn | *T. canis* | 3 (30.00) | 2 (20.00) | - | 2 (20.00) | 1 (10.00) | 3 (30.00) | 11 (18.30) |
| | *Ancylostomatids* | 2 (20.00) | 1 (10.00) | 1 (10.00) | 1 (10.00) | 2 (20.00) | 2 (20.00) | 9 (15.00) |
| | *Trichuris* spp. | 2 (20.00) | 1 (10.00) | 2 (20.00) | 3 (30.00) | 3 (30.00) | 3 (30.00) | 14 (23.30) |
| Winter | *T. canis* | 2 (20.00) | 1 (10.00) | - | 3 (30.00) | 1 (10.00) | 4 (40.00) | 11 (18.30) |
| | *Ancylostomatids* | 2 (20.00) | 1 (10.00) | 1 (10.00) | 1 (10.00) | 1 (10.00) | 2 (20.00) | 8 (13.30) |
| | *Trichuris* spp. | 3 (30.00) | 1 (10.00) | 2 (20.00) | 2 (20.00) | 2 (20.00) | 1 (10.00) | 11 (18.30) |
| Total | | | | | | | | 131 (54.58) |

In every season and in every area are collected and analyzed 10 samples of faeces. Area a: Kavaja Street; Area b: Lana River; Area c: Lake Park.

*canis* was reported by Christina *et al.*[13], resulted in 82.7%.

Biological cycle of geohelminths can not take place without the participation of the external environment because only through his components they can be transmitted from one animal to another to ensure the spread and continuation of the kind[3,6,11,14,15]. Therefore seasons with their climate parameters (temperature, humidity, solar radiation, *etc.*) affect the growth and life duration of invasive exogenous stages of geohelminths zoonotic that are carried by the dogs[6]. These parameters affect as well the contamination level of the environment and the infestation level of the animals and of people from them.

The prevalence of dogs infestation from parasitic geohelminths in relation with public environment from where their faeces were collected, as shown in Figure 1.

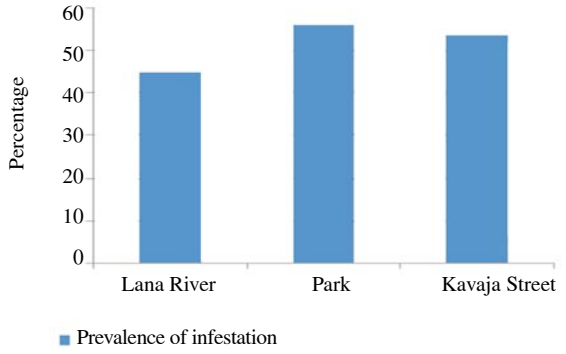


**Figure 1.** Prevalence of stray dogs infestation from *T. canis*, *Ancylostomatids* spp. and *Trichuris* spp.

Table 2 and Figure 2 reflected the sesonal prevalence of dogs infestation from 3 parasitic geohelminths during two years. We concluded that the prevalence of dogs infestation by *T. canis*, *Ancylostomatids* and *Trichuris* spp. was higher during the spring and autumn (73.33% and 55.00%) and the lowest level is during the summer and winter (41.66% and 48.33%).

**Table 2**
The sesonal prevalence of dog's infestation from 3 parasital geohelminths during two years. *n* (%).

| Saeson | The number of tested dogs | Prevalence of dogs infestation | | | Infestation prevalence for three parasites |
|---|---|---|---|---|---|
| | | *T. canis* | *Ancylostoma* spp. and *Uncinaria* spp. | *Trichuris* spp. | |
| Spring | 60 | 16 (26.60) | 11 (18.30) | 17 (28.30) | 44 (73.33) |
| Sumer | 60 | 9 (15.00) | 9 (15.00) | 7 (11.60) | 25 (41.66) |
| Autumn | 60 | 11 (18.30) | 9 (15.00) | 13 (21.60) | 33 (55.00) |
| Winter | 60 | 11 (18.30) | 8 (13.30) | 10 (16.60) | 29 (48.33) |
| Total | 240 | 47 (19.58) | 37 (15.41) | 47 (19.58) | 131 (54.58) |

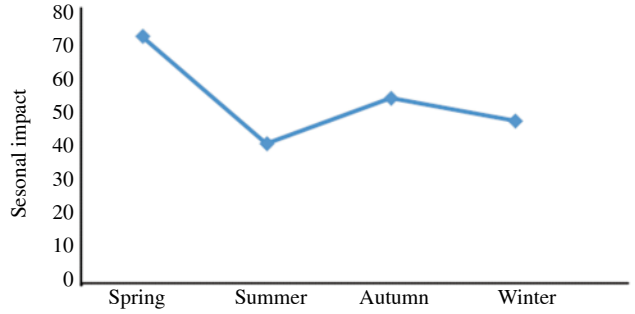


**Figure 2.** The seasonal prevalence of stray dogs from parasitic geohelminths during two years.

The calculation of the risc ratio will have these data: risk ration of spring/summer = 1.76, risk ration of spring/autumn = 1.33, risk ration of spring/winter = 1.5, risk ration of autumn/summer = 1.32, risk ration of autumn/winter = 1.007, risk ration of winter/summer = 1.16. This means that public environments in Tirana are more vulnerable to contamination from exogenous stages of parasitic geohelminths carried by stray dogs during the spring and autumn, and less during summer and winter. So unfortunately, they are the most polluted in the season when they more frequented by the people and their animals escort. In an article of Avcioglu and Burgu[16], they was reported that the prevalence of *Toxocara* spp., *Toxascaris leonina*, and *Taenia* spp. eggs during the summer was (4.21%) lower than those found during the spring (12.64%), in autumn was 13.21% and in winter was 9.77% ($P < 0.05$).

Independently, the fresh faeces of the dogs collected on earth were analyzed, while Avioglu and Burgu[16] analyzed the samples collected on earth in public places. The seasonal character of public places contamination from the zoonotic parasites eggs of the dogs appears clearly in both studies.

## 4. Discussion

In all of the faeces samples of stray dogs that were collected during the period of two years in all monitoring points of the three urban areas of Tirana that were involved in the study, the eggs of *T. canis*, *Acylostomatides* spp. and *Trichuris* spp. were identified. From this result it can be concluded that Tirana public spaces are simultaneously contaminated from eggs and invasive larvae of zoonotic geohelminths carried by stray dogs, being transformed into a permanent source of infestation for people and their pets. Our conclusions are the same as those of other researchers who have monitored the contamination of urban environments from zoonotic parasites carried by stray dogs and infestation ways of the people[15,17-20].

Figure 1 reflects the infestation prevalence of stray dogs that attend the public areas in three urban zones where was held the study.

Infestation prevalence of dogs by *T. canis*, *Ancylostomatids* (*Ancylostoma* spp. and *Uncinaria* spp.) and *Trichuris* spp. that frequent the park and its sorroundings were 56.2%, for the dogs that attend the Kavaja Street environments was 53.7% and for the dogs that attend the Lana River zone was 45.0%. (risk ratio for Park/Lana River = 1.24; risk ration for Park/Kavaja Street = 1.04 and the risk ration for Kavaja Street/Lana River = 1.19). Stray dogs that frequent the park and its sorrounding resulted with the highest level of infestation due to the trees found in the park. The trees protect the eggs and larvae of parasitic geohelminths from sunlight and provide normal levels of moisture in every

season. Also in the park compared to the other two areas are more paratenik hosts to *T. canis*, *Ancylostomatids* and *Trichuris* spp. (rodents, birds, arthropods and worms), which can be eaten with pleasure by stray dogs and this happens especially there is a lack of food for them[19-22].

With all these qualities the park ecosystem has positive impacts on the infestation level of the dogs from parasites. So generally the green place environments in the towns are more contaminated than the bare environments which are less contaminated from exogenous stages of dog's zoonotic geohelminths.

1) From *T. canis* resulting infested 19.58% of stray dogs that attend public facilities, from *Ancylostomatids* (*Ancylostoma* spp. and *Uncinaria* spp.) 15.41% and 19.58% *Trichuris* spp.

2) The contamination level from eggs and invasive larvae of zoonotic geohelminths carried by stray dogs was higher in the green spaces of the city.

3) Tirana public places are continuously contaminated by eggs and invasive larvave of zoonotic geohelminths and as such they have become a permanent factor of risk for parasitic zoonoses infection of community that attend those places. The level of contamination was higher in spring and autumn.

4) The local authorities should bring changes to the legislation in order to prevent the public areas from dogs fecalization and implement a plan of different measures to minimize the number of stray dogs.

## Conflict of interest statement

We declare that we have no conflict of interest.

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