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Research Article

# Investigation of Gastrointestinal Parasites in Dogs in Lubumbashi

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## Abstract

A parasitological study was carried out in 2015 on dogs of different sexes, ages and breeds, living in freedom in the city of Lubumbashi. Faeces samples were taken and analyzed by coproscopy using a flotation method. Of the 120 dogs examined, 78 (65%) were infested, of which 74 (61.6%) had gastrointestinal helminths and 4 (3.3%) had coccidia. Coproscopies revealed the presence of 5 species of parasites: *Ankylostoma* spp (41 dogs), *Toxocara canis* (22), *Toxascaris leonina* (8), *Isospora canis* (4) and *Dipylidium caninum* (3). *Isospora canis* has only been found in puppies. Frequent screening for *Ankylostoma* spp and *Toxocara canis* suggests that there is a risk of contamination of humans with these zoonotic parasites in Lubumbashi.

***Keywords:*** *Parasitism; Dog; Coproscopy; Helminths; Protozoa; Democratic Republic of Congo*

## Introduction

In the Democratic Republic of Congo (DRC), as everywhere in Africa, the dog is mainly bred to protect people and their property. This service offers the dog the privilege of living in close contact with humans. However, coexistence is not without risk for humans. In addition to cases of bites, dogs can present a danger to human health [1] because it constitutes a potential source of zoonoses, that is to say diseases, infestations or infections which are transmitted naturally from vertebrate animals to humans. The dog can be parasitized by many species of helminths and protozoa [2]. In the absence of antiparasitic treatments, dogs constitute reservoirs of zoonotic parasites and the prevalence in humans is favoured by contact between humans and animals, while the prevalence in dogs is favoured especially by the lack hygiene [3]. The equatorial climate, hot and humid, which prevails in the DRC is particularly favourable to the development of parasite cycles.

## Aim of the Study

The aim of our study was to determine the prevalence of digestive parasitism in a population of domestic dogs in Lubumbashi. The investigation consisted of collecting faecal samples in 2015, then analyzing them in the Parasitology laboratory of the Faculty of Veterinary Medicine at the University of Lubumbashi. Among the zoonotic parasites present in dogs, the most important are *Ankylostoma* spp and *Toxocara canis* [4], which mainly affect children aged 1 to 3 years [5].

## Materials and Methods

### Study zone

The survey was carried out in the seven municipalities of the city of Lubumbashi (Lubumbashi, Kamalondo, Kenya, Katuba, Kampemba, Ruashi and Annexes). Located in the South East of the Democratic Republic of Congo, in the province of Haut-Katanga, the

city of Lubumbashi is at an altitude of 1250m and is at 27° 28' east longitude and 11° 40' latitude South. It experiences a humid tropical climate with a dry season of six months (April to October) and a rainy season of six months (November to March). The average annual temperature is 20°C, the average annual total rainfall is 1230 mm, January and February are the months of the full rainy season. The average daily relative humidity is 60 percent [6].

In Lubumbashi, dogs have a traditional lifestyle: they are free, left to wander all day, fed on leftover meals, and receive no care. However, some families breed dogs, mostly exotic breeds, in good sanitary conditions, reserving them kennels, appropriate food and providing them with regular care. In these families, the dogs remain in their kennel during the day and are released at night in the plots for guarding purposes.

### Study animals

Our investigations were carried out on a workforce of 120 dogs of different sexes, ages and breeds, randomly selected, the distribution of which is described in table 1.

| Commons | Puppies | Bitches | Dogs | Total |
|---|---|---|---|---|
| Attachments | 3 | 5 | 8 | 16 |
| Kamalondo | 2 | 10 | 5 | 17 |
| Kampemba | 4 | 6 | 9 | 19 |
| Katuba | 5 | 7 | 2 | 14 |
| Kenya | 6 | 1 | 9 | 16 |
| Lubumbashi | 5 | 8 | 7 | 20 |
| Ruashi | 6 | 8 | 4 | 18 |
| Total | 31 | 45 | 44 | 120 |

***Table 1:*** *Distribution of dogs examined.*

## Methods

**Sampling:** The samples, taken between 6:00 a.m. and 10:00 a.m., were spread over a period of 3 weeks, from April 25 to May 16, 2015. The faeces were collected rectally from adult dogs, using one or two gloved fingers depending on the size of the animal, or, in puppies, less than 18 months old, using a cotton swab. The samples were transported from the collection site to the laboratory in a cooler to be analyzed immediately or stored for less than 24 hours in the refrigerator at 4°C before analysis.

**Protocol:** The qualitative coproscopies were carried out by flotation in brine prepared by dissolving 400g of cooking salt in 1 liter of water. This brine (density 1.19 at 20°C) is suitable for quickly detecting nematodes and cestodes. The analyzed mixture consisted of 2g of faeces per 100 ml of solution [7]. The suspension was filtered through a cleaned sieve before any further handling. The filtrate was poured into a 5 ml test tube, filled to the maximum and covered with a coverslip, then centrifuged at 2,500 rpm for 5 minutes. The coverslip was placed on a slide identified by the name of the sample, before being observed under a microscope.

**Microscopic examination:** The samples were observed at low magnification (x40), in order to search for eggs and larvae present in the samples, then at high magnification (x100 and x400), to clarify their identification.

**Statistical analysis:** The results of the coprological examinations were analyzed statistically by the prevalence comparison test or Chi-square ($Chi^2$).

## Results

Of the 120 dogs examined, 78 (65%) were infested, including 74 (61.6%) with gastrointestinal helminths of four different species (Table 2). Four dogs were also infested with the coccidia *Isospora canis*.

| Categories | Examined | Infested | *Ankylostoma* spp. | *Dipylidium caninum* | *Isospora canis* | *Toxascaris leonina* | *Toxocara canis* |
|---|---|---|---|---|---|---|---|
| puppies | 31 | 24 (77,4) | 2 (6,4) | 1 (3,2) | 4 (12,9) | 5 (16,1) | 12 (38,7) |
| bitches | 45 | 26 (57,7) | 20 (44,4) | - | - | 2 (4,4) | 4 (8,9) |
| Dogs | 44 | 28 (63,6) | 19 (43,2) | 2 (4,5) | - | 1 (2,3) | 6 (13,6) |
| Total | 120 | 78 (65%) | 41 (34,2) | 3 (2,5) | 4 (3,3) | 8 (6,7) | 22 (18,3) |

***Table 2:*** *Number (and percentage) of dogs infested with gastrointestinal parasites by age and sex in Lubumbashi.*

The three groups of animals were infested with helminths, but the infestation rates were not significantly different ($Chi^2 = 2.654$; $p = 0.27$). There was also no difference between the sexes. All sexes and ages were found to be infested with *Ankylostoma* spp., *Toxocara canis* and *Toxascaris leonina*, while *Isospora canis* was only found in puppies.

On the other hand, statistically significant differences in infestation were observed between the municipalities of the city ($Chi^2 = 19.3$ and $p = 0.004$), infestations having been more frequently diagnosed in dogs examined in the municipalities of Katuba, Kamalondo, Appendices and Ruashi (Table 3). The commune of Katuba was the most infested and that of Kampemba the least infested.

| Sampling sites | Examined | Infested (%) | *Ankylostoma* spp. | *Dipylidium caninum* | *Isospora canis* | *Toxascaris leonina* | *Toxocara canis* |
|---|---|---|---|---|---|---|---|
| Katuba | 14 | 13 (92,9) | 7 (50,0) | 2 (14,3) | - | 1 (7,1) | 3 (21,4) |
| Kamalondo | 17 | 15 (88,2) | 10 (58,8) | - | - | 3 (17,7) | 2 (11,8) |
| Attachments | 16 | 13 (81,3) | 7 (43,8) | 1 (6,2) | - | - | 5 (31,2) |
| Ruashi | 18 | 12 (66,7) | 4 (22,2) | - | 2 (11,1) | - | 6 (33,3) |
| Kenya | 16 | 8 (50,0) | 3 (18,8) | - | - | 2 (12,5) | 3 (18,8) |
| Lubumbashi | 20 | 9 (45,0) | 6 (30,0) | - | 1 (5,0) | - | 2 (10,0) |
| Kampemba | 19 | 8 (42,1) | 4 (21,0) | - | 1 (5,2) | 2 (10,5) | 1 (5,2) |
| Total | 120 | 78 (65%) | 41 (34,1) | 3 (2,5) | 4 (3,3) | 8 (6,7) | 22 (18,3) |

***Table 3:*** *Number (and percentage) of dogs infested with gastrointestinal parasites in the different municipalities of Lubumbashi.*

## Discussion

The dog is often infested, sometimes massively, with many species of helminths. Several of these species are also observed in wild carnivores [8]. Meat, raw fish and especially organ waste are the most important source of infestation for cestodes (*Taenia, Echinococcus*) and trematodes [9] while nematode infestation occurs mainly by ingestion of the infesting eggs or larvae present in the environment.

This study shows that the most frequent infestation of Lubumbashi dogs is that of *Ankylostoma* spp. followed by that by *Toxocara canis*. Many studies have already revealed the high prevalence of *Ankylostoma* spp. during coprological examination in dogs, in Lubumbashi [10] in Nigeria [11] in Zimbabwe [12] and in India [13]. The lifestyle of Lubumbashi dogs contributes to the permanent spread of hookworm

and roundworm eggs and thus predisposes dogs to reinfestations by these nematodes. *Ankylostoma* spp. is the main cause of canine hookworm in most tropical and subtropical regions of the world [14] but coproscopy does not allow a precise identification of species between *A. caninum*, *A. braziliense* and *Uncinaria stenocephala*, the eggs of these three nematodes being very similar. Their infesting larvae can enter and roam in and under the skin of humans, causing either a cutaneous larva migrans or eosinophilic enteritis [5].

The rate of infestation by *Toxocara canis* was 18.3%, comparable to that already observed in this same city in 1998 [10]. Infestation with *T. canis* is severe in dogs and this species can cause visceral larva migrans syndrome when embryonated eggs are ingested by humans. Larvae can lodge in the retina, causing ocular larva migrans [15] which is a potential danger, especially in children aged 1 to 4 years [5]. *Dipylidium caninum* was found in 2.5% of dogs but it should be noted that coproscopy by flotation has a very low sensitivity for the diagnosis of cestodoses. In fact, eggs are rarely present in the faeces, and the ovigerous segments are often eliminated outside defecation. This may explain the low prevalence of *Taeniidae* in our study. *Isospora canis* is an agent of canine coccidiosis, a pathology the main signs of which are diarrheal enteritis and dysentery (haemorrhagic stools) in young dogs [16,17].

In the city of Lubumbashi, wandering dogs in search of garbage for food represent sources of parasites. The poor medicalization of owner dogs is also a factor favoring parasitosis. In the present study, statistically significant differences in infestation rates were observed between the different municipalities of the city. These variations in infestation rates may be linked to the state of public health, the monitoring of which varies from one neighbourhood to another [18]. Infestation rates were higher in the Communes of Katuba, Kamalondo, Annexes and Ruashi, where filth and pools are more frequent.

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## Conclusion

Screening for *Ankylostoma* spp., *Toxocara canis*, *Toxascaris leonina* and *Dipylidium caninum* in dogs in Lubumbashi indicates a risk of human infection by hookworms and roundworms. For a better control of the gastro-intestinal parasitism of the dogs, it would be necessary: (i) to avoid the straying of the dogs; (ii) control parasitic infestations by deworming dogs of all ages and throughout their lives; (iii) strict control of pet food. Owners of domestic carnivores should be informed about the potential risks of a parasitic infestation, not only for the health of their animals, but also that of their families and all those who have direct or indirect contact with their animals.

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