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Full Length Research Paper

Prevalence and intensity of gastrointestinal parasites of domestic cats in Ode – Irele and Oyo communities, Southwest Nigeria

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An epidemiological survey was conducted on gastrointestinal parasites among population of cats in two sub-urban communities, Ode-Irele and Oyo in Southwest Nigeria between April and September, 2008. A total of 200 faecal samples collected from domestic cats were processed and examined for eggs and cyst of parasites. The overall prevalence of gastrointestinal parasites obtained was 85.5%. The prevalences and intensities of parasites observed were as follows; Hookworm (57.0%; 194.0 ± 28.1epg), *Toxocara cati* (48.5%; 391.4 ± 101.2 epg), *Isospora* spp. (30.5%), *Physaloptera* spp. (27.0%; 59.4 ± 20.1 epg), *Toxascaris leonina* (23.5%; 34.6 ± 8.5 epg), *Ollulanus tricuspis* (21.5%; 42.1 ± 12.7 epg), *Pseudophyllidia* spp. (12.0%; 34.2 ± 20.7 epg), *Trichuris* spp. (8.5%; 12.0 ± 5.1 epg), *Taenia* spp. (7.5%; 103.0 ± 59.2 epg), *Dipylidium caninum* (5.0%; 9.6 ± 5.4 epg), *Spirocerca lupi* (1.5%; 1.0 ± 0.7 epg), *Schistosoma* spp. (2.0%; 0.9 ± 0.6 epg) and *Capillaria* spp. (2.0%; 9.2 ± 7.3 epg). Hookworm was the predominant species (57.0%). Concurrent infections with two or more parasites were recorded in 81.3% of the infected cats. Prevalence patterns were age-dependent, with *T. cati* and hookworm showing a decreasing prevalence with age of host. Cats aged 0 to 6 months showed higher prevalence of infection than older age groups. The overall prevalence of intestinal parasites may continue to rise due to lack of functional veterinary clinics; hence there is the urgent need for establishment of control based program in order to reduce the prevalence of parasitic infections among the cats.

Key words: Prevalence, intestinal parasites, domestic cat, *Toxocara cati*, feline – zoonosis.

INTRODUCTION

The role of animal parasites, particularly those of the common household pets, in producing human disease has become increasingly apparent. Gastrointestinal parasites are the main causes of morbidity in domestic cats (Hendrix and Blagburn, 1983). Companion animals including cats and dogs contribute significantly to contamination of the environment with their faecal droppings which are deposited in public and private places. Unlike dogs, cats bury their faeces in soil, which leads to the accumulation of numerous enteric parasites in cats due to the fact that places use for defecation are often shared by several cats and this may lead to contamination of cats' paws with infective eggs (Engbaek et al., 1984; Poglayen et al., 1985). Such a habit is favourable for many parasitic infective stages as it protects them from desiccation (Uga and Kataoka, 1995).

The role of cats as definitive hosts for zoonotic parasites (Yamaguchi et al., 1996) has been recognized as a significant health problem worldwide (Schantz, 1994). Previous studies through faecal examination and necropsy surveys have shown that the ascarid nematode, *Toxocara cati* and the hookworm, *Ancylostoma tubaeform* were the commonly reported intestinal helminth parasite of cats worldwide (Power, 1970; Parsons, 1987). The prevalence of *T. cati* and *Toxascaris leonina* in adult cats have been reported to range from 8 to 85% (Overgaauw, 1997) with higher prevalence reported in kittens (Visco et al., 1978).

Several factors could affect the frequency of a species of parasite in a population. The prevalence of intestinal

parasites can vary due to geographical region, presence of veterinary care, habits of the local animal populations, season of the year and the cat population composition (Burt et al., 1980; Calvete et al., 1988; Abu-Madi et al., 2008).

In Nigeria, there is little information available on the prevalence and distribution of gastrointestinal parasites for cats and no data on the intensity of infection among the cat population. So far there are two published articles on the intestinal helminth parasites of cats in Nigeria (Okaeme, 1986; Umeche and Ima, 1988). More studies are needed to determine the parasite fauna among the cats population in Nigeria and epidemiological data are needed to develop effective control measures for zoonotic parasites. The objective of this study was to determine the prevalence and intensity of gastrointestinal parasites among domestic cats in two sub-urban communities Oyo and Ode – Irele, in Southwest Nigeria.

MATERIALS AND METHODS

The study was carried out in two sub-urban communities, Ode-Irele and Oyo communities in Southwest Nigeria. Ode-Irele is a town in Irele local Government Area of Ondo State, Nigeria located between latitudes 06º17´57´N and 06º43´21´N and longitudes 04º49´47´E and 05º10´26´E. Oyo is a town in Oyo west local Government Area of Oyo State Nigeria located between latitudes 03º35´N and 04º10´N and longitudes 007º2´E and 007º40´E. A full description of the study areas can be found in Sowemimo et al. (2010).

Study design and sample collections

A random house-to-house screening of cats was conducted in the two communities between April and September, 2008. With the informed consent of cat owners, interviews were conducted using pre-tested structured questionnaires to obtain information on the cat's approximately, age, sex, mode of life, occupation of cat owners, defecation sites, awareness and knowledge about whether cats harbour worms, frequency of treatment with anthelminthics, feline parasite zoonoses and access to veterinary clinic. Thereafter, stool samples were collected from the cats through a direct rectal swab using long forceps. In households with more than one cat, only one cat (chosen by the owner) was included. Faecal samples were collected into pre – labeled clean specimen bottles and then transported to the parasitological laboratory of the Department of Zoology, Obafemi Awolowo University, Ile-Ife within 24 h of collections.

Laboratory procedure

All faecal samples were initially examined macroscopically for the presence of tapeworm proglottids. Thereafter, each faecal sample was mixed thoroughly with 10% aqueous formaldehyde for preservation. The samples were later processed for egg concentration by modified Kato-katz technique as described by Forrester and Scott (1990) and observed under a binocular microscope at 100× magnification. Parasites eggs and cysts were identified based on structural and morphometric features (Soulsby, 1982). In addition to qualitative diagnosis, an indirect measure of parasite intensity was obtained by counting eggs, expressed as eggs/gram of faeces.

Statistical analysis

Statistical tests were performed using SPSS 16.0 (SPSS Inc., Chicago Ilinois, USA). The prevalence of each parasite was calculated as the number of infected individuals over the total number of cats examined and multiplied by 100 to get a percentage. Chi-squared tests were used to examine the relationship between parasite prevalence and host age and sex. Mann – Whitney U tests were used to explore the relationship between the egg intensity (calculated as the mean egg count of all sampled individuals, both infected and uninfected) and sex, while Kruskal- Wallis tests were used for variables with more than two levels, that is, egg intensity and host age. Multivariate logistic regression was used to analyse the association between parasite prevalence and each household, age, and sex variable after adjusting for other variables. Only variables significant at $P<0.05$ in the univariate analysis were considered eligible for inclusion in logistic multiple regression. Backward elimination was used to determine which factors could be dropped from the multivariable model. Only the results of the Backward Model Analysis were used. These include the odds ratio (Increase in the likelihood of infection association with a unit change in the value of each independent variable after adjusting for the effect of other variables), its confidence limits, and P-value together with the overall P-value for each variable (Hosmer and Lemeshow, 1989).

RESULTS

Out of the 200 cat faecal samples examined for various intestinal parasites, 171 (85.5%) were positive for at least one species of intestinal parasites. A total of 13 species of intestinal parasites were identified microscopically. The prevalence and intensity of the different parasites observed at the two communities are summarized in Table 1. The prevalence and intensities of *T. cati, Ollulanus tricuspis, Trichuris spp., Taenia spp*. and *Dipylidium caninum* were significantly higher ($P < 0.05$) in Oyo community than in Ode – Irele community. While, only the prevalences of hookworm spp. and *Isospora* spp. were significantly higher ($P < 0.05$) in Oyo than in Ode – Irele community. The prevalences and intensities of other intestinal parasites were comparable in the two communities. The prevalence of intestinal parasites was significantly higher in Oyo (97%) than in Ode – Irele community (74%) ($\chi^2 = 21.335$, df = 1 P = 0.000). The most frequently observed parasite in the cat population was hookworm species (57.0%; 194.0 ± 28.1 epg) and the least prevalent parasite was *Spirocerca lupi* (1.5%; 1.0 ± 0.7 epg).

When the overall prevalence of intestinal parasite was analyzed by age, the prevalence of infection was highest (96.7%) in cats less than six months old (<6 months) and decreased until it reached the lowest value of 40.0% in cats older than 36 months (>36 months) (Table 2). The prevalence of intestinal parasites was higher in male (87.5%) than in female cats (82.5%), however, this difference was not significant ($\chi^2 = 0.968$ df = 1, $P > 0.05$).

Table 1. Prevalence of individual parasite in 200 cats in both ode-Irele and Oyo communities.

Parasite	Oyo community N = 100 (%)	Ode-Irele community N = 100 (%)	Both community N = 200 (%)
Hookworm spp.	69.0	45.0	57.0
Toxocara cati	64.0	33.0	48.5
Isospora spp.	48.0	13.0	30.5
Physaloptera spp.	26.0	28.0	27.0
Toxascaris leonina	22.0	25.0	23.5
Ollulanus tricuspis	33.0	10.0	21.5
Pseudophyllidia spp.	16.0	8.0	12.0
Trichuris spp.	15.0	2.0	8.5
Taenia spp.	13.0	2.0	7.5
Dipylidium caninum	10.0	0.0	5.0
Spirocerca lupi	4.0	0.0	2.0
Schistosoma spp.	0.0	4.0	2.0
Capillaria spp.	3.0	1.0	2.0

Table 2. Prevalence (%) of gastrointestinal parasites relative to age and sex of cats.

Age (Months)	Number examined	Number infected	Prevalence (%)
0-6	92	89	96.7
7-12	36	32	88.9
13-18	35	29	82.9
19-24	18	13	72.2
25-36	14	6	42.9
>36	5	2	40.0
		P = 0.000	
Sex			
Male	120	105	87.5
Female	80	66	82.5
		P>0.05	

Prevalence and intensity of individual parasite in relation to age of cats

Analyses of the prevalence of individual parasite relative to age of cats revealed that infection prevalence was generally higher in cats who were less than six months old than in older age groups (no significant difference) except in few cases such as *T. leonina, Physaloptera* sp., *D. caninum* and *S. lupi* which showed the highest prevalence in cats age 7-12 months old (Table 3). The intensities of infections of *T. cati, Physaloptera spp. Pseudophyllidea spp.* and *Taenia spp.* were significantly higher in cats aged 0 – 6 months than other age groups. Although the intensity of hookworm infection was higher in cats aged 7 to 12 months, it was comparable to the intensities of other age groups. The intensity of infections with other parasite species was comparable among the cat's age groups.

It was also observed that there was no infection with *Trichuris vulpis, Taenia spp*. *O. tricuspis* and *Pseudophyllidia* eggs in cats aged 25 months old and above. No infection was recorded with *Capillaria spp*. in cats aged 7-24 months old and in cats older than 36 months. Infection with *S. lupi* was recorded only in cats less than 12 months old (<12 months). *Schistosoma spp.* infection was recorded in cats less than six months old and aged 13-18 months old.

Single and mixed infections

The study also revealed that the prevalence of double (26.3%) and triple (26.3%) infections were higher than with single infection (18.7%) and infection with 4 (15.2%), five (7.0%), 6 (4.1%), 7 (1.8%) or 8 (0.6%) species.

Table 3. The Prevalence (%) and intensity (I) of gastrointestinal parasites in relation to age of cats at Oyo and Ode-Irele Communities.

Parasite	Age (Months)											
	0-6		7-12		13-18		19-24		25-36		>36	
	Prevalence[b] (%)	I (±SEM)	Prevalence[b] (%)	I (±SEM)	Prevalence[b] (%)	I (±SEM)	Prevalence[b] (%)	I (±SEM)	Prevalence[b] (%)	I (±SEM)	Prevalence[b] (%)	I (±SEM)
Hookworm spp.	68.5	199.6±36.7	52.8	233.9±93.3	60.0	226.9±75.3	44.4	203.3±76.3	21.4	30.0±19.8	0.0	0.0±0.0
Toxocara cati	62.0	641.1±203.2	52.8	372.8±187.3	25.7	109.7±57.9	44.4	71.1±29.1	28.6	54.3±30.5	0.0	0.0±0.0
Isospora spp.	43.5	-	19.4	-	28.6	-	5.6	-	14.3	-	20.0	-
Physaloptera spp.	28.3	103.9±42.8	33.3	40.0±15.0	28.6	14.3±6.6	16.7	4.4±2.6	21.4	21.4±11.9	0.0	0.0±0.0
Toxascaris leonina	20.7	34.6±12.7	36.1	66.1±30.7	25.7	14.3±7.2	11.1	15.6±14.4	21.4	35.7±29.9	20.0	16.0±16.0
Ollulanus tricuspis	29.3	42.8±15.8	19.4	88.3±56.1	14.3	16.6±8.6	22.2	40.0±19.1	0.0	0.0±0.0	0.0	0.0±0.0
Pseudophyllidia spp.	9.8	65.2±44.7	8.3	5.0±2.8	2.9	18.3±10.9	11.1	1.1±1.1	0.0	0.0±0.0	0.0	0.0±0.0
Trichuris spp.	15.2	13.7±6.5	11.1	28.9±22.5	14.3	1.1±1.1	5.6	3.3±2.4	0.0	0.0±0.0	0.0	0.0±0.0
Taenia spp.	12.0	184.1±123.8	8.3	95.0±88.3	2.9	0.6±0.6	11.1	12.2±11.1	0.0	0.0±0.0	0.0	0.0±0.0
Dipylidium caninum	6.5	6.9±3.8	8.3	33.9±28.5	0.0	0.0±0.0	0.0	0.0±0.0	7.1	4.3±4.3	0.0	0.0±0.0
Spirocerca lupi	2.2	0.4±0.4	5.6	4.4±3.9	0.0	0.0±0.0	0.0	0.0±0.0	0.0	0.0±0.0	0.0	0.0±0.0
Schistosoma spp.	3.3	0.8±0.5	0.0	0.0±0.0	2.9	2.9±2.9	0.0	0.0±0.0	0.0	0.0±0.0	0.0	0.0±0.0
Capillaria spp.	3.3	19.6±15.8	0.0	0.0±0.0	0.0	0.0±0.0	0.0	0.0±0.0	7.1	2.9±2.9	0.0	0.0±0.0
% Infected Cats	**96.7**		**88.9**		**82.9**		**72.2**		**42.9**		**40.0**	
Total		**92[a]**		**36[a]**		**35[a]**		**18[a]**		**14[a]**		**5[a]**

[b]Prevalence was calculated by dividing the number of cats infected with individual parasite by the total number of cats in each age group; [a]Total number of cats examined in each age group.

Prevalence and intensity of individual parasite in relation to sex of cat

The result of this study also revealed that the prevalence and intensity of *T. vulpis* infection was significantly higher in males than in female cats (χ^2 = 3.868 df = 1, P < 0.05).While, the prevalence and intensity of infection with *Capillaria spp.* and *Schistosoma spp*. were significantly higher in females than in male cats (χ^2 = 6.122 df = 1, P < 0.05). No significant differences were observed between males and females for the prevalence of other intestinal parasites (Table 4).

Logistic regression analysis

The logistic regression analysis combining data from the two communities revealed that, after adjusting the effect of other variables, the age of the cat, the occupation of the individual-owning cat and place of defecation were significantly associated with the prevalence of parasitism (P < 0.05). Cats whose owner were civil servants were 31.4 times more likely to harbour *T. vulpis* eggs (prevalence = 58.3%) than those whose owners were traders (prevalence = 23.1%) (χ^2 = 27.416, df = 4 P = 0.000). Cats aged 0-6 months were 4.9 times more likely to harbour hookworm species eggs (prevalence = 68.5%) than those cats whose aged were 25-36 months (prevalence = 21.4%) (χ^2 = 20.349, df = 5 P=0.001). Cats that defecated

Table 4. Prevalence (%), intensity (I) and range of parasites eggs in the faeces of cats of different sexes.

Parasite	Male (N = 120)			Female (N = 80)			Both Sexes (N = 200)		
	%	I (±SEM)	R	%	I (±SEM)	R	%	I (±SEM)	R
Hookworm spp.	57.5	214.5±36.2	0-2380	56.2	163.3±44.9	0-2240	57.0	194.0±28.1	0-2380
Toxocara cati	45.8	349.7±140.9	0-12300	52.5	454.0±139.7	0-7080	48.5	391.4±101.2	0-12300
Physaloptera spp.	29.2	87.0±33.0	0-2620	23.8	18.0±6.1	0-400	27.0	59.4 ±20.1	0-2620
Toxascaris leonina	21.7	33.0±10.5	0-820	26.2	37.0±14.5	0-1020	23.5	34.6±8.5	0-1020
Ollulanus tricuspis	24.2	52.8±19.6	0-1860	17.5	26.0±11.7	0-840	21.5	42.1±12.7	0-1860
Pseudophyllidia spp.	14.2	48.3±34.2	0-4040	8.8	13.0±6.41	0-340	12.0	34.2±20.7	0-4040
Trichuris spp.	11.7	19.3±8.4	0-800	3.8	1.0±0.6	0-40	8.5	12.0±5.1	0-800
Taenia spp.	7.5	33.7±26.7	0-3180	7.5	207.0±142.2	0-8200	7.5	103.0±59.2	0-8200
Dipylidium caninum	5.0	12.5±8.8	0-1020	5.0	5.3±3.3	0-240	5.0	9.6±5.4	0-1020
Schistosoma spp.	0.0	0.0±0.0	-	5.0	2.3±1.4	0-100	2.0	0.90±0.6	0-100
Capillaria spp.	0.0	0.0±0.0	-	5.0	23.0±18.1	0-1400	2.0	9.2±7.3	0-1400
Spirocerca lupi	2.5	1.7±1.2	0-140	0.0	0.0±0.0	-	1.5	1.0±0.7	0-140
Isospora spp.	-	-	-	-	-	-	-	-	-

outside were 0.3 times less likely to harbour *O. tricuspis* (prevalence = 15.7%) than those cats that defecated inside (prevalence = 27.6%) ($\chi^2 = 4.169$, df = 1, $P < 0.05$).

The responses received to the questionnaires administered to individual-owning cats revealed that 77(38.5%) were aware that cats harbour worms but only 35 (17.5%) were aware of feline parasite zoonoses (that is, the worms harboured by cats are transmissible to humans). 98 (49%) of the respondents reported that their cats defecate inside the house like bedroom, on sacks, in the store, inside a bowl. Only 6 (3.0%) of the households owning cats had access to veterinarian and they de-worm their cats once or twice a year.

DISCUSSION

The present study shows that the cats examined from Oyo and Ode-Irele communities in Southwest Nigeria are host to a wide range of intestinal parasites which include eight nematodes, three cestodes, one trematode and one protozoan giving a total of 13 species of parasites. Similar result was obtained in a recent study conducted in Nile Delta, Egypt where the same number of parasites (13) species comprising 4 nematodes, 2 cestodes, 1 trematode, 4 protozoan species and 2 arthropod species, were observed among 113 stray cats investigated (Khalafalla, 2011). This shows that cats generally harbour quite a number of parasite species which is an indication of inadequate veterinary care.

The overall prevalence of gastrointestinal parasites of cats obtained in this study (85.5%) was similar to the prevalence of 85.2% reported from 27 cats examined recently from India (Borthakur and Mukharjee, 2011) and comparable to 83% reported from another study among 658 cats from Qatar (Abu-Madi et al., 2010). Hookworm species was the most common intestinal parasites from the two communities with an average overall prevalence of 57.0%. Similarly, in a study conducted among 83 cats from Lake Kainji area, Nigeria, *Ancylostoma* sp. (hookworm) was the most prevalent intestinal parasite reported with a prevalence of 44.1% (Okaeme, 1986). In other parts of the world hookworm has equally been reported as the most frequently observed intestinal parasite among cat population (Poglayen et al., 1985; Calvete et al., 1998; Anderson et al., 2003).

The age of the cat was the most significant risk factor for hookworm in the logistic regression analysis. The high prevalence of hookworm observed in cats less than six months old (< 6 months) was expected and may be due to the trans-mammary passage of the parasite to the kittens (Labarthe et al., 2004). This could play a significant role in contributing to the incidence of creeping eruptions or cutaneous larva migrans among the human population.

T. cati is an ascarid nematode which was the next most common intestinal parasite observed in this study with a relatively high prevalence of 48.5% which is higher than 28.85% reported in a study investigated among 52 cats from Calabar, South South Zone, Nigeria (Umeche and Ima, 1988). The prevalence of *T. cati* in this study was however lower than that reported from India (59.3%) (Borthakur and Mukharjee, 2011). The high prevalence of *T. cati* infection recorded poses a high risk to humans in view of the large number of eggs about 200,000 eggs produced per day by a female of this parasite that are deposited in the soil along with cat's faeces. These eggs which can survive for a long time in the environment can be accidentally ingested by humans in which they can cause visceral larva migrans or human toxocariasis (due to larva migration), a commonly reported zoonotic helminthiases (Holland and Smith, 2006).

Physaloptera sp. was another nematode encountered in cats examined from both communities with an average

prevalence of 27.0% which was higher than 6.6% reported from Qatar (Abu-Madi et al., 2008) but lower than the prevalence of (44.4%) reported from India (Borthakur and Mukharjee, 2011). The presence of the eggs of *Physaloptera spp.* in the cat faecal samples from both communities suggest that they had been eating insects (the intermediate hosts of this parasite species) instead of processed cat food. Aside from intermittent vomiting in some infected cats, this parasite is relatively harmless (Labarthe et al., 2004).

O. tricuspis is an unusual trichostrongyloid nematode which was observed in cats examined from both communities with an average prevalence of 21.5%. Studies have shown that transmission of this parasite is through vomitous, as the infective larvae do not appear to survive passage through the intestinal tract (Pomroy, 1999). Hence, environmental conditions should have little direct influence on the prevalence of this nematode. The prevalence of this parasite in this study is higher than 3.8% reported for cats from Saskatoon, Canada (Pomroy, 1999). Pseudophyllid eggs were the dominant tapeworm eggs observed from cats examined from the two communities with an overall prevalence of 12.0%. It is probable that the pseudophyllid eggs observed in this study may be an infection with *Diphyllobothrium spp* due to the similarity in morphology and dimension of pseudophyllid eggs of *Diphyllobothrium latum* reported from previous study (Okaeme, 1986). It is likely that cats acquire infection with pseudophyllid by having access to fish (paratenic hosts) as food sources. Cats are therefore acting as important indirect reservoirs of this parasite for humans. *D. caninum* was another tapeworm encountered in cats examined from Oyo community only, with an average prevalence of 5% which was the same to that reported from Egyptian cats (Khallafalla, 2011). The prevalence of *D. caninum* in this study was lower than those reported from Calabar, Nigeria (23.08%) (Umeche and Ima, 1988), which may be due to reduced prevalence of the intermediate host *Ctenocephalides* sp. Humans, especially children sometimes become infected with *D. caninum* when they accidentally ingest the cysticercoids of *D. caninum* contained in infected fleas that serve as intermediate host. Although this is a cosmopolitan parasite, human infection is rare (Kappus et al., 1991) and is not usually serious (Richardson, 2003).

Isospora sp. was the only protozoan parasite observed in this study with an average prevalence of 30.5% which is higher than 6.0% reported from Germany (Barutzki and Schaper, 2011). Previous studies have shown that puppies, kittens and other young animals are more likely to be infected with protozoans than older cats and dogs (Barutzki and Schaper, 2003; Buehl et al., 2006) which is consistent with the result of this study where the prevalence of *Isospora spp*. was higher among cats less than six months old than in older age groups.

Cats belonging to individuals residing in Oyo and Ode-Irele communities where this study was conducted pose a significant public health threat to the entire inhabitants of these communities with regard to parasitic zoonoses. Some of the parasites (*T. canis*, hookworm, *D. caninum* and *Pseudophyllid spp.*) harboured by cats from these communities have zoonotic potential. This underscores the importance of the domestic cat as a reservoir for zoonotic parasites. Similar observation has been reported in a survey study among stray cat population in Northern Region of Nile Delta, Egypt (Khalafalla, 2011).

Questionnaire results showed that less than half (38.5%) of the respondents surveyed were aware that cats harbour worms and only half of them (17.5%) were aware of feline parasitic zoonoses. This, in addition to the lack of enough veterinary attention exacerbates the risk of transmission of feline parasitic zoonoses to the human community.

In conclusion, the high overall prevalence of gastrointestinal parasites of cats obtained in this study is considered to be critical from the viewpoint of public health importance. Some of these parasite species are responsible for several zoonotic diseases such as visceral larva migrans and ocular larva migrans caused by infection with *T. cati* in humans. Therefore, there is the need to put in place appropriate control strategies by the public health authorities in these communities such as increasing the awareness of feline zoonotic parasites among the inhabitants which could be helpful to prevent or minimize zoonotic transmission. In addition, establishing a control programs to diagnose, treat and control gastrointestinal parasites of companion animals including cats in these communities is hereby recommended.

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