

## SURVEY OF INTESTINAL HELMINTH PARASITES OF PUPPIES IN ILE-IFE, NIGERIA\*

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### Abstract

A survey of gastrointestinal helminth parasites was conducted in a sample of fifty puppies aged 0-6 months from Ile-Ife, Nigeria between January 2004 and September 2005 using postmortem technique. Forty-two (84%) of the dogs were infected. No infection was detected in dogs aged 0-2 weeks while all the older puppies were infected. Four helminth species, *Toxocara canis*, *Ancylostoma caninum*, *Dipylidium caninum* and *Spirocerca lupi* were recovered with the prevalences of 80%, 70%, 12% and 2% respectively. Intensity of infection was measured directly by counting worms recovered after post-mortem. The mean  $\pm$  (SEM) worm burden for *T. canis* was  $22.23 \pm 4.33$ , *A. caninum*  $10.85 \pm 2.25$ , *D. caninum*  $15.57 \pm 2.26$  and *S. lupi* 1.0. Monospecific infections were found in 20% of the infected dogs, whereas mixed infections with 2 or more species were found in 70% of the infected dogs. Most frequently encountered mixed infections (52.5%) were those involving the species *T. canis* and *A. caninum*. Female dogs consistently had larger average worm burdens than males.

**Key words:** Gastrointestinal helminth, dog, *Toxocara canis*, *Ancylostoma caninum*, *Dipylidium caninum*, *Spirocerca lupi*.

### 1. Introduction

Dogs have been reported to be victims of several intestinal parasites especially intestinal worms. Previous studies in Nigeria and other parts of the world (Dada and Belino, 1979, Dada *et al.*, 1979, Ugochukwu and Ejimadu, 1985, Fashuyi 1981, Blagburn, 2001, Traub *et al.*, 2002) have shown that the intestinal helminths frequently encountered in dogs include *Toxocara canis*, *Toxascaris leonina*, *Ancylostoma sp.*, *Trichuris vulpis*, *Dipylidium caninum* and *Echinococcus granulosus*. *Toxocara sp.* infections in dogs have, because of their zoonotic significance, important public health consequences. Earlier studies on the gastrointestinal helminths of dogs in Nigeria were based on faecal examination for helminth eggs (Idowu, *et al.*, 1977, Olufemi and Bobade, 1979, Fashuyi, 1981). There are few studies which have employed post-mortem technique (Elamah Unpub. Obs., 1980). There have been no published works to investigate the parasite loads of puppies in Nigeria. Therefore, the present study was undertaken to examine the helminth fauna of puppies in Ile-Ife.

### 2. Materials and Methods

A total of 50 puppies of the local breed "African Shepherd" comprising 25 males and 25 females, all less than 18 weeks were purchased from commercial breeders in Ile-Ife and environs between January 2004

and September 2005. The puppies were transported individually into the laboratory in well aerated cages for examination for infection with intestinal helminths. The puppies were given commercial diet and water, *ad libitum*. They were kept in cages for three days before examination and each dog was given a reference number. The sex and the approximate age were recorded and later the puppies were anaesthetized using chloroform in a chloroform jar. The gastrointestinal tract was dissected, removed and rinsed in normal saline to remove any debris and external blood. It was then cut into various sections comprising oesophagus, stomach, small and large intestines. Each organ was cut open longitudinally and helminths observed were removed with a pair of forceps and washed in saline to free them from detritus. Each segment was further immersed in saline and the contents expressed were examined against a dark background to be able to pick the smaller helminth specimens. The worms recovered were sorted according to their species and preserved separately. The number of the various helminth species recovered were counted and recorded. Adult nematodes were rinsed in saline and stored at room temperature in capped universal bottles containing 5% formalin (Richards and Lewis, 2001). Some of the worms were cleared and mounted in Amman's Lactophenol on clean glass slides, covered with cover

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slips and examined with the microscope. Measurements of the mounted worms were carried out using an ocular micrometer. Cestodes were fixed in 70% ethanol. The nematodes and cestodes were identified to genus and species on the basis of morphological criteria (Kazacos, 1978).

#### Statistical Analysis

Statistical tests were performed using the SPSS 11.0. Chi-square tests were performed to study the prevalence of parasites relative to host age and sex. The relationship between host sex and age with overall worm burdens in dogs was examined using the Student's T-test.

### 3. Results

#### Helminth species recovered from puppies

Four different helminth species were recovered from the fifty puppies examined (Table 1). These include three nematodes and a cestode. The nematodes are *Toxocara canis*, *Ancylostoma caninum*, *Spirocerca lupi* and the cestode is *Dipylidium caninum*.

Forty-two (84%) of the dogs were infected. Among the infected dogs, those harbouring only one worm species were seven (16.7%); mixed infection with two species of worms were twenty-two (52.4%) while thirteen (31.0%) harboured three species.

#### Prevalence and intensity of *Toxocara canis* in the puppies

The prevalence of *T. canis* among the 50 puppies examined was 80.0%. A total of 889 worms were recovered representing a mean of  $22.23 \pm 4.33$  worms per infected dog. The highest number of 138 worms was recovered from a three-week old female dog, while the minimum was one. As shown in Table

2, the prevalence was highest in both sexes in dogs of age 3-12 weeks while no worm was recovered in dogs of 1-2 weeks. There was no significant difference in the prevalence of infection between the male (84%) and the female dogs (76%) ( $P > 0.05$ ).

As shown in Table 3, the highest worm burden was observed in dogs of 3-4 weeks in both sexes. The pattern in the intensity is such that it fell gradually as the age of puppies increase. The overall worm burden was significantly higher ( $P < 0.05$ ) in females with an average of  $31.16 \pm 8.33$  worms than in the males with an average of  $14.10 \pm 2.52$  worms.

The frequency distribution of number of *T. canis* among the dogs as shown in Fig. 1 revealed that about 50% (19) of the infected dogs carry between 1-10 worms while each of the 3 most heavily infected dogs carries over 50 worms. This trend shows that most infected dogs carry few number of *T. canis* while a few number of infected dogs carry heavy worm burden.

#### Prevalence and intensity of *Ancylostoma caninum* in the puppies

The prevalence of *A. caninum* in the puppies was 70.0%. The mean number of worms per infected dog was  $10.37 \pm 2.92$ . As shown in Table 4, the prevalence of *A. caninum* in both sexes was highest in dogs of age 3-4 weeks and 17-24 weeks. The overall prevalence was higher in female dogs (72%) than in male dogs (68%), however, there was no significant difference ( $P > 0.05$ ). The mean worm burden peaked at 17-24 weeks of age in both male and female dogs. The worm burden was also higher in females ( $13.06 \pm 3.62$ ) than in males ( $7.53 \pm 1.75$ ). However, there was no significant differences between the two sexes ( $P > 0.05$ ). Of the

Table 1: Intestinal helminth species recovered from puppies at Ile-Ife

Helminth species	Number of (%) dogs infected	Mean No. of worms	Total No. of worms Recovered
Nematodes			
<i>Toxocara canis</i> (Werner, 1782)	40 (80.0)	22.23	889
<i>Ancylostoma caninum</i> (Ercolani, 1859)	35 (70.0)	10.37	363
<i>Spirocerca lupi</i> (Rudolphi, 1809)	1 (2.0)	1.0	1
Cestode			
<i>Dipylidium caninum</i> (Linnaeus, 1758)	14 (28.0)	15.57	218

Table 2: The prevalence of infestation of *Toxocara canis* in puppies

Age (weeks)	Male Dogs		Female Dogs		Both sexes	
	Number examined	% infected	Number examined	% infected	Number examined	% infected
1-2	4	0.0	4	0.0	8	0.0
3-4	2	100.0	8	100.0	10	100.0
5-8	12	100.0	4	100.0	16	100.0
9-12	4	100.0	6	100.0	10	100.0
13-16	2	100.0	2	50.0	4	75.0
17-24	1	100.0	1	0.0	2	50.0
Total	25	84.0	25	76.0	50	80.0

**Table 3:** Intensity of infestation of *Toxocara canis* in puppies

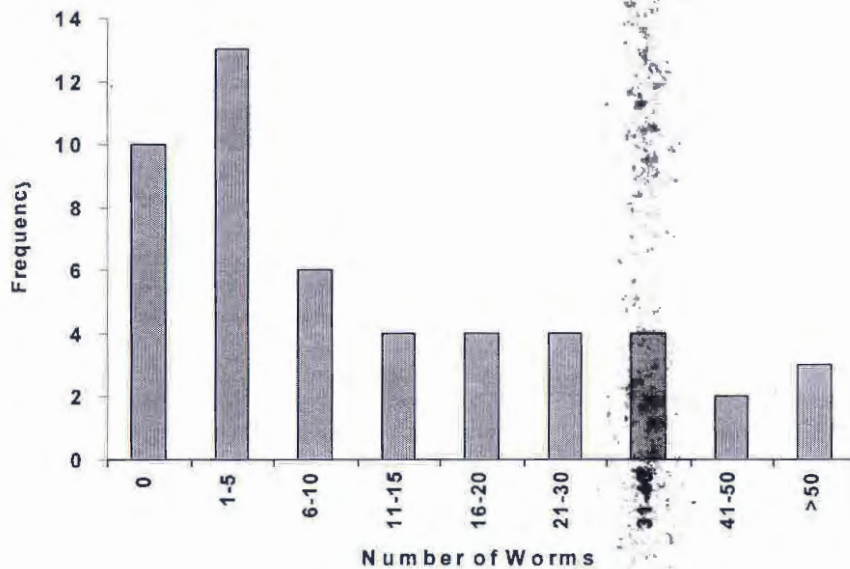
Age (weeks)	Male Dogs		Female Dogs		Both sexes	
	Number examined	Mean worm burden $\pm$ SEM	Number examined	Mean worm burden $\pm$ SEM	Number examined	Mean worm burden $\pm$ SEM
1-2	4	0.0	4	0.0	8	0.0
3-4	2	15.00 $\pm$ 1.00	8	62.63 $\pm$ 17.20	10	53.10 $\pm$ 15.20
5-8	12	16.58 $\pm$ 3.90	4	13.25 $\pm$ 4.63	16	15.75 $\pm$ 3.35
9-12	4	14.00 $\pm$ 5.06	6	6.33 $\pm$ 2.49	10	9.40 $\pm$ 2.76
13-16	2	4.50 $\pm$ 2.50	2	1.00 $\pm$ 0.71	4	3.33 $\pm$ 1.65
17-24	1	2.00 $\pm$ 0.00	1	0.00	2	2.00 $\pm$ 0.00
Total	25	14.10 $\pm$ 2.52	25	31.16 $\pm$ 8.33	50	22.23 $\pm$ 4.33

**Table 4:** Prevalence of infestation of *Ancylostoma caninum* in puppies

Age (weeks)	Male Dogs		Female Dogs		Both sexes	
	Number examined	% infected	Number examined	% infected	Number examined	% infected
1-2	4	0.0	4	0.0	8	0.0
3-4	2	100.0	8	100.0	10	100.0
5-8	12	75.0	4	75.0	16	75.0
9-12	4	100.0	6	83.3	10	90.0
13-16	2	50.0	2	100.0	4	75.0
17-24	1	100.0	1	100.0	2	100.0
Total	25	68.0	25	72.0	50	70.0

**Table 5:** Intensity of infestation of *Ancylostoma caninum* in puppies

Age (weeks)	Male Dogs		Female Dogs		Both sexes	
	Number examined	Mean worm burden $\pm$ SEM	Number examined	Mean worm burden $\pm$ SEM	Number examined	Mean worm burden $\pm$ SEM
1-2	4	0.0	4	0.0	8	0.0
3-4	2	5.50 $\pm$ 3.21	8	4.86 $\pm$ 0.75	10	5.00 $\pm$ 0.91
5-8	12	4.33 $\pm$ 2.00	4	2.33 $\pm$ 3.48	16	10.58 $\pm$ 4.34
9-12	4	14.50 $\pm$ 7.25	6	13.20 $\pm$ 6.91	10	13.78 $\pm$ 5.03
13-16	2	4.00 $\pm$ 0.00	2	3.00 $\pm$ 0.71	4	3.33 $\pm$ 0.94
17-24	1	16.00 $\pm$ 0.00	1	41.00 $\pm$ 0.00	2	28.50 $\pm$ 8.93
Total	25	7.53 $\pm$ 1.75	25	13.06 $\pm$ 3.62	50	10.37 $\pm$ 2.92



**Fig. 1:** Frequency distribution of *T. canis* in 50 dogs

*Ancylostoma* infected dogs, 52.0% had 10 worms or less, 12% harboured 11 to 50 worms and 2% had more than 50 worms each.

#### *Spirocerca lupi*

A single specimen of *S. lupi* which was a female worm was recovered from the oesophagus of a 4-month-old dog.

#### *Dipylidium caninum*

The tapeworm, *D. caninum* occurred in 28% of the sampled dogs. The mean worm burden per infected dog was  $15.57 \pm 2.26$ . There was no significant difference in the prevalence of infection between the males (32%) and females (24%) ( $P > 0.05$ ). Similarly, there was no significant difference in the mean worm burdens between the females ( $19.50 \pm 3.88$ ) and males ( $12.63 \pm 2.40$ ). Heavy infection with 58 worms was observed in one female dog.

#### *Infection of puppies with single and multiple intestinal helminth species*

Six of the fifty puppies had infection with *T. canis* only; one had infection with *A. caninum* only, no puppy had infection with *D. caninum* only. Mixed infections with two or more species of intestinal worms were found in 35 (70%) of the infected dogs. Twenty-one puppies had double infections with *T. canis* and *A. caninum* while one puppy had infection with *A. caninum* and *D. caninum*. Twelve puppies had infections with 3 helminth species; *T. canis*, *A. caninum* and *D. caninum* while another one puppy also had infections with 3 helminth species, *T. canis*, *S. lupi* and *D. caninum*.

## 4. Discussion

The present study has revealed four helminth parasites recovered from 84% of puppies from Ile-Ife and environs. These include three nematodes and one cestode. This result is similar to the findings of Elamah (1980) who conducted a survey based on necropsy technique on 110 stray dogs aged 6-20 months from Calabar, Southeast Nigeria. However, in addition to the four worms observed in this study, Elamah also recovered a fifth species, *Taenia* sp. which is a cestode. The findings in this study is also similar to the result obtained by Cooperrider (1952) who reported a prevalence of 86% with intestinal worms among 50 dogs aged between 3 weeks and 14 years in Athens, Georgia. In another survey by Worley (1964) in Southeastern Michigan, 88.6% of 123 dogs examined were infected with 11 different species of helminths.

The prevalence of *T. canis* (80%) was found to be the highest among the intestinal helminths recovered in this study. This finding is similar to those of previous investigators who examined dogs within the same age range of zero to six months (Sprent and English, 1958; Scothorn *et al.*, 1965). The high prevalence of *T. canis* observed in this study may be as a result of

intra-uterine or transmammary infection which is in agreement with the results of previous workers (Fok *et al.*, 2001, Ramirez-Barrios *et al.*, 2004).

*Ancylostoma caninum* is the second most prevalent helminth observed in this study with a prevalence of 70%. This prevalence was lower than the prevalence of 85.45% reported by Elamah (1980). The recovery of *S. lupi* in this study is the first report of this worm in any part of Southwest, Nigeria. The prevalence observed in this study was considerably low compared with the prevalence of 50.90% reported by Elamah (1980). The tapeworm observed in this study is *D. caninum* with a prevalence of 24%. This result is comparative with the findings of Elamah (1980) who reported a prevalence of 33.63% in his study.

The average worm burden for each helminth parasite recovered in this study with the exception of *S. lupi*, was observed to be generally higher among the female dogs than in the male dogs. This is in agreement with the findings of Worley (1964), who reported that female dogs consistently had larger average worm burden than males in most of the helminth parasites observed.

In conclusion, the high prevalence of intestinal helminth recorded in the puppies was expected and in addition, the high prevalence of *T. canis*, a zoonotic parasite recorded in this study reinforced the need to regularly deworm puppies. This is to prevent contamination of the environment with the nematode eggs especially *T. canis* which causes human toxocariasis, particularly in children.

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