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Contamination of Semi-Intensive Dog Hair with Eggs of *Toxocara canis* in Akungba Akoko, Ondo State.

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ABSTRACT

Dogs, as companion animals and the close contact with human, represent a potential public health risk, since natural transmission of parasitic infections (toxocariasis) to human may occur directly or indirectly via non-favourable environmental and human behavioural factors. The aim of this study was to investigate whether the hair of semi-intensive dogs from Akungba Akoko were contaminated with eggs of *Toxocara canis*, a zoonotic parasite. Hair samples from 200 semi-intensive dogs of different ages were collected from the neck, back and anal region. Eggs were recovered from the hair using a previously standardized detention method. Eggs were found on the hair of 133 (67%) dogs. A total of 315 *T. canis* eggs were recovered from the hair of infected dogs. None of it were embryonated. Those dogs that were positive from hair samples also positive in fecal samples. This study show that semi-intensive dogs harbor considerable numbers of eggs on their hair and this indicate a potential risk factor of transmission of *T. canis* to human when man comes in direct contact with the egg.

Keywords: Toxocariasis, embryonated, detention, potential

INTRODUCTION

Toxocara canis is a parasitic helminth belonging to the phyla nematode which resides in the gut of dogs and other canids. Adults live in the small intestine of the host and a sexually matured female deposit thousands of eggs per day (Habluetzel, *et al.*,2003). The eggs are passed out with the stool of infected dogs. Dogs serve as the definitive host of this zoonotic parasite. Human infection occurs majorly as a result of ingestion of eggs via contaminated food, water and soil. Children in their first decade of life are the most vulnerable due to their geophagic behavior and mouthing of contaminated objects which is further linked to high risk of exposure at playgrounds contaminated with dog faeces (Despommier, 2003). Epidemiologic studies of *Toxocara canis* in humans have indicated that the occurrence of Visceral Larva Migrans cases (Macpherson, 2005), especially in children from one to three years old, is associated with the presence of dogs (Overgaauw, 1997). Infection can also occur following ingestion of partial or whole paratenic host such as raw livers of domestic animals such as chicken, ducks, rabbits, sheep and cattle (Choi *et al.*, 2012) and ingestion of contaminated raw vegetables or fruits (Lee *et al.*, 2010). Direct contact with *Toxocara canis* eggs on the hair of the dogs have also been considered as an alternative route of infection (Wolfe and Wright, 2003). This study was carried out to investigate whether the hair of semi-intensive dogs from Akungba Akoko were contaminated with *Toxocara canis* eggs as well as to determine their developmental stages in relation to their age and sex of dogs.

MATERIALS AND METHODS

Study Area

The study was conducted in Akungba-Akoko, Ondo State, Nigeria. Akungba is one of the town in Akoko

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Southwest Local Government. The town is situated close to Ikare-Akoko. The climate in the study area is tropical with two distinct seasons, the rainy season (April–October) and dry season (November–March) with slight variations from year to year. They generally enjoy luxuriant vegetation. The vegetation consists of coastal forest and mangrove swamp forest and moist lowland forest.

Collection of hair sample

Reconnaissance visits to identify 300 dog-owning households in Akungba Akoko, Ondo state Nigeria were carried out between March and April 2021 for exploratory discussion on the purpose of the study. A total of 200 dogs were sampled from different locations within Akungba Akoko between July 2021 and November 2021. The age and sex of each dog was recorded. The dogs were classified into puppies (age 0-6months), young dogs (age 7-12 months) and adults (>12 months). Each dog was assigned with an ID number and the dogs were classified according to their age and sex. Hair samples were taken from three different locations on the dog's body; the neck, back and anal region. Each hair was taken using a scissors washed thoroughly with hypochlorite solution between each hair sample taken. Each of the three hair samples taken from the dog was placed in individual sample container labelled with ID number. The age, sex, breed and site location of each dog was recorded.

Egg Recovery Technique

Toxocara canis eggs were recovered using Wolfe and Wright (2003) method with some modifications. 300ml of distilled water and two (2) drops of Tween40 were added to each hair sample weighing between 0.1- 0.5g, to separate eggs from the hair. The samples were mixed in a homogenizer for 3 minutes, they were then poured onto a 250µm sieve. The samples were then washed under dripping water while on the sieves, and the sediment collected was transferred to centrifuge tubes. They were then centrifuged at 1500 rev for 10 minutes, the supernatant was decanted and the remaining sediment with a drop of distilled water was collected using Micro Pipette and transferred onto clean microscope slides. The sediments were examined under a light compound microscope at X100 magnification to identify the *Toxocara canis* eggs.

Statistical Analysis

The Chi-square (χ^2) test was used to analyze the existence of associations between the categorical variables (age of the dogs, sex and body location) and the prevalence of *Toxocara canis* on the hair. Data were analyzed using SPSS.

RESULTS

Table 1: Number of *T. canis* eggs on hair from 133 infected dogs.

Age group	Number examined	Number infected	% infected	Number of eggs recovered
0-6months	30	15	50	54
7-12months	45	30	67	86
>12months	125	88	70	175
Total	200	133	67	315

A total of 315 *T. canis* eggs were collected, 54 eggs (17.1%) from puppies, 86 eggs (27.3%) from young dogs and 175 eggs (55.5%) from adult dogs.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume X Issue X October 2023

Table 2: Summary of egg numbers taken from each hair sample of the infected dogs.

Hair Location				
	Neck	**Back**	**Anus**	**Total**
Number of egg positive Hair sample	43	54	98	195
Total eggs recovered	80	90	195	315

The number of eggs found on the hair from different parts of the dogs' body is shown in table 2.

Table 3: *Toxocara* eggs in both faeces and hair of 90 dogs.

Age group	**Number examined**	**Sample with eggs in faeces.**		**Sample with eggs on hair.**		**Samples with eggs in both faeces and hair.**	
		Number	**% i**nfected	Number	% infected	Number	% infected
0-6months	15	10	66.6	8	53.3	6	40.0
7-12months	28	14	50.0	12	42.8	11	39.2
>12months	47	37	78.7	32	68.0	29	61.7
Total	90	61	67.7	52	57.7	46	51.1

Faecal samples were collected from 90 dogs out of the 200 examined stray dogs. 61 (67.7%) were positive for *T. canis* eggs. Nearly all dogs with eggs on the hair were observed to have eggs in their faeces as shown in table 3.

Table 4: Chi-square values and significance levels for *Toxocara* eggs

Effect		**No examined**	**% infected**	**chi square**	**P Value**
Age group	0-6months	30	50		
	7-12months	45	67	2.814	0.676
	> 12months	125	70		
Sex	Male	112	64	0.095	0.972
	Female	88	36		

The statistical analysis showed that there were no significant differences among the age group and between genders (P> 0.05) as shown in table 4.

DISCUSSION

The findings of this study revealed a high prevalence (67%) of Toxocara canis egg on the dog hair samples examined. This result is in agreement to the (67%) and (49%) prevalence's reported by Roddie *et al*., 2008

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume X Issue X October 2023

& Oge *et al*., 2013 respectively. The prevalence obtained in this present study is lower than those reported in previous studies (Overgaauw *et al*.,2009, Wolfe and Wright,2003 & Sowemimo and Ayanniyi 2016). The higher prevalence observed in this study may be as a result of the focus only on semi-intensive dogs which most likely attributed to the lack of anthelminthic treatment frequent contact with soil and grooming given to these animals.

Previous studies revealed that age is not related with the contamination of Toxocara eggs on the hair (Wolfe and Wright, 2003 & Roddie *et al*., 2008) or in other words the eggs on the hair can be seen in all age groups but that it is more prevalent in less than one-year-old (Keegan & Holland 2010; Aydenizoz-Ozkayhan, 2008; Amaral *et al*., 2010 and El-trans 2011). The results of the present study suggested that majority of free range dogs in all three age classes were positive for Toxocara eggs, young and adult dogs are more likely to harbor *Toxocara canis* eggs on their hair than puppies. This suggestion is in line with the findings of Oge *et al*.,2014 and Sowemimo & Ayanniyi 2016. It has been reported that young and adult dogs are susceptible to Toxocara infection, even if they had been previously infected as puppies (Fahrion *et al.,* 2008): and young and adult dogs may still pose a risk to human health. It would therefore be reasonable to conclude that adult dogs may be getting some or many of the eggs found in their hair from the environment.

This study is in agreement with previous studies reported by different authors that there was no significant difference in the prevalence between genders (Roddie et al., 2008; Aydenizoz-Ozkayhan, 2008; Oge *et al*., 2014 & El-trans 2011). It seemed that both sexes have similar resistance to Toxocara infection. Nearly all dogs with eggs on the hair were observed to have eggs in their faeces, this indicates that the presence of T. Canis eggs in hair is probably due to self-contamination.

In the present study, the highest number of eggs was recovered from the anal region, followed by the back, while the lowest number was recorded in the neck region. This can be as a result of the eggs passing out with feces in adult dogs. Other behavior such as scent rolling could also be responsible for increase contact with soil. Although this study recorded no embryonated egg on the hair of dog which also similar to the findings of previous scholar (Overgaauw *et a*l., 2009 & Keegan and Holland, 2010). A study by Devoy Keegan & Holland (2013) found that if unembryonated *T. canis* eggs can develop fully on the hair under controlled condition, then these developed eggs would pose a risk for human exposure. The results obtained in this study indicate that besides reports of Toxocara canis eggs being recovered from feces and in public places, their presence in the hair of dog is potential risk factor for the transmission of this parasite to other animals and humans.

CONCLUSION

Despite the fact that soil contaminated with Toxocara canis eggs is significantly responsible for human disease, eggs ingestion through direct contact with dog has been suggested as an alternative route of transmission for this zoonosis. Public awareness about Toxocara canis and other helminth species should be created, reduction of free range dog, use of anthelminthics and animal hygiene practices can help to prevent the contamination of human toxocariasis.

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ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume X Issue X October 2023

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