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TOXOCARIASIS, ITS ZOONOTIC IMPORTANCE AND CHEMOTHERAPY IN DOGS

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ABSTRACT

A total of 600 faecal and hair samples (200 of dog faecal, 200 dog's hair and 200 dog owner's stool samples) were collected and examined for the presence of Toxocara canis eggs. Toxocara canis eggs were found in 74(37percent) faecal samples, 25 (12.5percent) in hair samples and in 47 (23.5percent) dog owner's stool samples. Prevalence was higher in pups and children than adults. Twenty five eggs were recovered, of which 2.1percent were embryonated, 12.5percent were embryonating. The maximum densities of the embryonating and embryonated eggs were 180 and 20 EPG per gram of hair respectively. A total of 60 dogs positive for toxocariasis were divided randomly into three groups, A, B and C (control group) each with 20 dogs. Dogs in group A and B were treated with Ivermectin and Levamisole hydrochloride, respectively. The efficacy of the drugs was calculated on the basis of reduction in the number of ova discharged in faeces. Results showed that Ivermectin and Levamisole hydrochloride were 97.3percent and 97.4percent effective respectively. Levamisole hydrochloride is much cheaper than Ivermectin and it was slightly more effective.

Key words: Toxocariasis, Zoonotic, Chemotherapy, Levamisole hydrochloride, Ivermectin, Dog, Human.

INTRODUCTION

Toxocara canis is a nematode of canids, wolves, foxes, coyotes and most importantly, the domestic dogs serve as the final host for the parasite. Its prevalence in dogs depends on many factors such as age (pups and adult), geographical area (rural and urban localities), and worming history (treated or untreated), (Pereiraa *et al.,* 2010). Adult worms live in the small intestine and shed eggs into the environment via faeces of the host. The eggs, when first shed, are not capable of infecting another host. Under optimal environmental conditions, the eggs take 2-7 weeks to mature to the infective, embryonated L2 stage (Lylod, 1998). Although dogs may be infected by ingesting eggs, the most important route by which they are infected is transplacentally. The prevalence of infection in pups born to unwormed dams can reach almost 100percent as a result of transplacental infection (Pereiraa *et al.,* 2010, Glickman and Schantz, 1981). Other ways in which dogs may become infected are by suckling, or by consuming a paratenic host (a host in which the parasite survive without further development) such as small rodent. As the reaching patency, and the prevalence of patent infection among mature, unwormed dogs may fall below 20 percent (Bridger and Whitney 2009; Glickman and Schantz, 1981) when human beings who can be paratenic host, become infected by larvated eggs, they may develop a number of disease symptoms such as ocular larva migrans, visceral larva migrans or covert toxocariasis. (Talaizadeh *et al.,* 2007; Glickman and Schantz, 1981)

Although various route for infection by *T. canis* have been proposed, including; eating meat infected with larvae (Sturchler *et al.,* 1990) or embroynated eggs transmitted by flies (Lawson and Gemmell, 1990), the ingestion of contaminated soil is considered to be the most important. The idea that toxocariasis may be contracted through direct contact with dogs has either been dismissed or ignored. One reason is that many reviews on toxocariasis report that 50percent of cases of ocular larva migrans had no contact with dogs. However, contact with soil and eating soil are still believed to be the most important route, for human infection (Talaizadeh *et al.,* 2007; Glickman, 1993; Lylod, 1998).

The present study was designed to record the prevalence of *T. canis* eggs on the coat and faeces of dogs and to assess the evidence for soil contamination or direct contact with dogs as route of infection.

MATERIALS AND METHODS

a) **Collection of Faecal Samples:** A total of 200 dogs of multiple breed and of various age groups coming to Pet Center, University of Veterinary & Animal Sciences Lahore were included in the present study. Faeces of these dogs were collected separately in a clean sterilized petri-dish and were brought to the laboratory of the Department of Parasitology.

b) **Examination of Faecal Samples:** Faeces were examined by the following methods for the presence of *Toxocara canis* eggs as described by Zajac and Conboy, (2006)

1. Direct Smear Method (Urquhart *et al.,* 2000)
2. McMaster Technique (Coles, 1986)
3. Floatation Method (Urquhart *et al.,* 2000)

4. Sedimentation Method (Urquhart *et al.,* 2000)

Hair Clippings were collected and examined as per recommended schedule (Zajac and Conboy, 2006). Two hundred stool samples of Pet owners were collected and examined under low power microscope for the presence of Ascaris eggs.

Prevalence of Toxocariasis: To record the prevalence of toxocariasis in dogs and humans, samples of dogs and humans of various age groups and sex were examined. The prevalence of the disease was recorded by the method described by Thrusfield (1986).

HEMATOLOGICAL STUDIES

Eosinophil Count: Eosinophil counts were made using technique described by Benjamin (1986).

CHEMOTHERAPEUTIC TRIALS (Grouping of Dogs): A total of 60 dogs positive for toxocariasis of various age groups, breed and both sex were used for anthelmintic trials. These 60 naturally infected dogs were randomly divided into three groups i.e. A, B and C. Each group had 20 dogs. Dogs in group A and B were respectively given Ivermectin and Levamisole hydrochloride at their recommended dose rate whereas no treatment was given to dogs in group C which acted as untreated control.

DRUG USED

Ivermectin (Iovmec Injection) was given subcutaneously at the rate of 0.2 mg/kg body weight to dogs of group A.

Levamisole hydrochloride (Ketrax tablet) was given orally at the rate of 15 mg/kg body weight to dogs of group B.

Control: No treatment was given to dogs of group C, which acted as untreated control.

Epg counting: Egg per gram of faeces was monitored by McMaster egg counting technique (Coles, 1984). Faecal samples were examined on zero, 3rd, 7th and 14th day post treatment.

Efficacy of drugs: Efficacy of the drug was calculated on the basis of reduction in faecal egg count after treatment and by controlled method described by Moskey and Harwood (1941). Side effects of drugs, if any were also recorded.

Statistical Analysis: Statistical analyses were done with the SPSS for Windows (Version 12.0). Through analysis of variance technique.

RESULTS AND DISCUSSION

A total of 200 pet dogs faecal samples were examined for the prevalence of toxocariasis. Of these 74 (37percent) were found positive for *Toxocara canis*. The prevalence rate of infection is comparable to 33.8percent infection in dogs by Maqbool *et at*. (1998) in Pakistan, 29 percent by Overgaauw and Boersema (1998) in Netherlands. It appears that infection rate in the present study is in close agreement to above mentioned workers in various countries of the world. The minor variation may be attributed to environmental conditions, managemental practices and use of anthelmintic drugs.

In the present study the prevalence of toxocariasis was higher in pups (44.8percent) than adults (30.9percent). Overgaauw and Boresema (1998) and Maqbool *et al*. (1998) also recorded similar findings. Pups are considered to act as reservoirs of infection for adults.

It was also noted in the present study that the infection rate was slightly higher (39.6percent) in males than females (32.4percent). Nearly similar results were also reported by Ajayi *et al*. (2000). A total of 200 dog coat samples were examined for the prevalence of *Toxocara canis* eggs (embryonated, embryonating, viable and non-viable). Of these 25 were found positive. Prevalence was thus 12.5percent. A total 25 eggs were recovered, of which 2.1percent were embryonated and 12.5percent were embryonating. The maximum densities of the embryonating and embryonated eggs were 180 and 20 eggs per gram of hair, respectively, much higher than the densities reported for soil samples. It is suggested that dogs infected with *Toxocara canis* may infect people by direct contact. Eosinophilia may be the first clinical clue suggesting possible parasitic infection. In the present study high level of eosinophilia was noted. Similar results were also reported by Lopez *et al.* (2005).

A total of 200 stool samples of dog owners (children and adult) were examined. Of these 47(23.5percent) were found positive. Prevalence was higher in children (28.5percent) than adults (14.6percent). Nearly similar observations were also recorded by Dilniya *et al*. (2004) and Lopez *et al*. (2005), as environmental, managemental and housing condition are different in different localities and areas of the world.

Dogs coat have been examined for *T. canis* eggs and eggs have been recovered at high densities. On the dogs carrying eggs, 2.1 per cent were embryonated and 12.5 percent were embryonating, values of which are within the ranges reported for eggs in soil (Jansen *et al*. 1993), Conde-Garcia *et al*., (1989). However, the densities of eggs on the hair, in terms of total numbers and embryonating and embryonated eggs, were much higher than the densities reported in soil. In most cases, only a few embryonated eggs have been found per kilogram of soil (Holland *et al*., 1991) compared with upto 20 EPG of hair. In addition to the small number of eggs recovered from soil samples, there are other reasons why it may be doubted whether toxocariasis is contracted by the ingestion of soil. However, when the data are plotted the correlation calculated, no significant relationship is apparent. Pica is more widespread than

geophagia and pica does not imply geophagia. Clinical disease as a result of eggs having been ingested as a result of contact with the coat of dog, rather than directly from the soil.

The logic under pinning this belief is that eggs are not infective when first shed in the faeces, but require some weeks to mature to infectivity, a process which is said to occur in soil where the eggs are kept moist and away from harmful ultraviolet light. Nevertheless, no direct link has been demonstrated between soil contamination and seroprevalence. There are many reports of *T. canis* eggs in the soil, but the densities reported show that the contamination level is extremely low, even though studies have concentrated on collected soil from areas in which dogs frequently foul (Xavier *et al.*, 2010). Uptil now, workers have not looked for *T. canis* eggs on dogs, coat or investigated the possibility that it is contamination via this route which seems to be important in the epidemiology of toxocariasis. If it were shown that the eggs can embryonate on the coat of a dog, then direct contact with dogs would provide an alternative explanation of the epidemiology of the disease.

People may be infected by ingesting eggs from contaminated soil through contaminated vegetables and fruits. The fact that 12.5 per cent of the dogs sampled had *T. canis* eggs in their coats provides an ample and intimate source of exposure for people, without source to soil contamination. If a dog is infected with *T. canis* and has eggs on its coat, then anybody who pats the dog may pick up eggs and ingest them; there is no need for them to consume the hair. The densities of the eggs on dogs, coats was much higher than their average densities in soil, further increasing the likelihood that it is through direct contact with dogs that eggs may be ingested, rather than through contact with soil. It is consider that direct contact with dogs may play a more important role than soil contamination in the epidemiology of human toxocariasis.

For effective chemotherapy a strategic chemoprophylaxis of toxocariasis, a safe drug is required with high activity against all stage of worms. The anthelmintic activity of Ivermectin and Levamisole hydrochloride at their recommended dose rate was evaluated and their efficacies were compared with each other and with infected control.

Ivermectin (Ivomec) at the rate of 0.2 mg/kg body weight was 97.3 percent effective on 18th day. These findings are in agreement with Clark *et al*. (1992) and Nolan *et al.* (1992).

Levamisole hydrochloride at the rate of 15 mg/kg body weight caused decrease in EPG count 97.4 percent. The high degree of efficacy of Levamisole hydrochloride against toxocariasis demonstrated in these studies should make it possible to overcome these problems. Nearly similar results were also reported by Maqbool *et al*. (1998). It was concluded that Levamisole hydrochloride was much cheaper and effective than Ivermectin against toxocariasis in dogs.

It is interesting to note that an average size dog passes 136 gm of faeces per day and a light *T. canis* infection results in 10000 eggs per gram of faeces. The faeces containing Toxocara eggs are discharged in the street, and lands some of these may find appropriate condition for survival in the ground and remain infected possibly for years and are responsible for causing larva migran syndromes in children. It was noted that pet owners did not take proper care to their dogs and uncared dogs live miserable lives and are a constant danger and nuisance to humans. It is also noted that the eggs of Toxocara are wide spread in Parks, playgrounds, yards and in homes and apartments where the occupants have dogs. Elimination of eggs from the environment is not possible; therefore, prevention depends on proper hygiene, including hand washing after contact with pets.

Keeping in view these findings, it is recommended that the followings preventive measures should be adopted to reduce the exposure rates.

- Dogs should be dewormed at 2, 4, 6 and 8 weeks.
- Dog faeces should be disposed of properly.
- After playing in public parks, children should be washed their hands before eating.
- Do not pat the dogs, if so then wash hands properly.
- Do not bring stray dog at home if such animals are brought home they should be examined for toxocariasis.

Educating and counseling pet owners about the intestinal parasites and their effects on health of pets and peoples is very important.

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