

## Prevalence of Internal Helminthes in Stray Cats (*Felis Catus*) in Mosul City, Mosul-Iraq

Q. T. Al-Obaidi

Department of Internal and Preventive Medicine,  
College of Veterinary Medicine, University of Mosul, Mosul, Iraq

**Abstract:** The objective of this study was to investigate the prevalence, clinical signs, haematological and post-mortem changes resulting from natural infestation with internal helminthes in stray cats. A total of 55 stray cats (4 months to 3 years) old from both sexes were investigated, 50 cats were naturally infected with internal helminthes and 5 clinically normal cats served as control. Humanely, all cats euthanatized, autopsied and examined for internal helminthes. Results indicated that the prevalence of internal helminthes was 90.9% including eight species of nematodes: *Physaloptera praeputialis* (78%), *Toxocara cati* (40%), *T. leonine* (30%), *Ollulanus tricuspis* (40%), *Ancylostoma tubaeforme* (30%), *Ganathostoma* sp. (24%), *Capillaria arophilia* (12%) and *Dioctophyma renale* (10%) and seven species of cestodes: *Dipylidium caninum* (64%), *Taeniae taeniaeformis* (52%), *Joyeuxiella pasqualei* (26%), *Diplopylidium nolleri* (24%), *Spirometra mansonioides* (24%), *Mesocestoides variabilis* (16%) and *Diphlobothrium* sp. (12%), beside one species of trematodes: *Paragonimus killicotti* (4%). Results showed that mixed infection with >2 species were more common. Clinically infected cats showed signs of emaciation, anemia, coughing, vomiting, rough hair coat, abdominal distention and diarrhea. Furthermore, hematological changes showed significant decrease in Total erythrocytes Count (TRBCs), Hemoglobin concentration (Hb) and Packed Cell Volume (PCV), moreover significant increase in Mean Corpuscular Volume (MCV) and significant decrease in Mean Corpuscular Hemoglobin Concentration (MCHC) were also encountered which reflect macrocytic hypochromic type of anemia. Platelets count (Pt) were significantly decreased. Results also detected significant increase in Total leucocytes Count (TWBCs) due to significant increase neutrophils and eosinophils. Grossly, autopsied cats showed excessive mucous in stomach, congestion and hemorrhage in intestine, hepatomegaly, splenomegaly, dark colored feces and large number of adult worms were seen in stomach and intestine.

**Key words:** Stray cats, internal helminthes, prevalence, clinical signs, hematological changes

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### INTRODUCTION

Cats in Iraq enjoy close association as pets or as stray cats (Nihad *et al.*, 1988), therefore those animals provide a potential reservoir of helminthes parasites to domesticates, specially in rural areas, they are reservoir for many zoonotic infestation such as hookworms and ascariasis (Calvete *et al.*, 1998; Fisher, 2003). Cats do not naturally contaminate public places with their feces as dogs do.

However, the sub-soil deposition of helminthes ova and protozoan oocysts may increase their viability and excretion of large quantities of feces by stray cats, present a health hazard to human population specially children (Hayat *et al.*, 1999), cats heavily infested with internal helminthes are most commonly occur under condition of poor hygiene and heavy infestation may occur in young animals (Soulsby, 1986). Surveys of gastrointestinal helminthes of cats in different countries indicated that

cats can harbor a wide range of nematodes and cestodes (Abu-Madi *et al.*, 2008; Palmer *et al.*, 2008) and the predominate species found were *Toxocara cati*, *Ancylostoma tubaeforme*, *Diplopylidium nolleri*, *Taeniae taeniaeformis* (Changizi *et al.*, 2007). In general infected cats with internal helminthes showed signs of loss of appetites, emaciation, pale mucous membrane of eye, vomiting, coughing, distended abdomen, diarrhea and melaena (dark colored feces). In addition, there were hyperplasia and sclerosis of the gastrointestinal epithelium, severe erosions of gastrointestinal mucosa, increased mucus secretion in stomach, hepatomegaly and splenomegaly (Bowman *et al.*, 2003) and significantly changes in hematological parameters lead to anemia (Bowman, 1995).

The aim of this study was to investigate the prevalence, clinical signs and hematological changes due to infected stray cats with internal helminthes in Mosul city, Iraq.

**MATERIALS AND METHODS**

**Animals and study design:** The study were conducted on 55 stray cats (male and female), 4 months to 3 years old. The study was carried out in Mosul city (Mosul-Iraq) during the period from December, 2008- 2009. Fifty animals were naturally infected with internal helminthes and five clinically normal animals served as control group. Stray cats were humanely euthanatized (anesthetized by mixed 3 mL of ketamin 10% and 2 mL of xylazin 2% then killed). The abdominal cavity was opened, the esophagus was detached and stomach and intestinal tract stripped separately from the mesentery then the gastrointestinal tract was opening along its length and examined for the presence of mature and immature helminthes and both contents were collected then examined to identify ova. All obtained helminthes were collecting, relaxing in water then fixed in 70% alcohol and 5% glycerin and examined under the microscope. Nematodes were mounted and cleared in lactophenol (Kassai, 1999). Tape worms were mounted and stained in modified carmine for identification and counting (Cox, 1999). The number of individual of each species was recorded and the number of cestodes was calculated according to number of scoleces. All parasites and eggs were identified according to Soulsby (1986) and Urquhart *et al.* (2003).

**Clinical examination and hematology:** Careful clinical examination had been carried out in all animals. About 2.5 mL of blood mixed with EDTA were drained from each animal by cephalic vein-puncture before autopsies to determined Total erythrocytes Count (TRBCs), Hemoglobin concentration (Hb), Packed Cell Volume (PCV), Platelets count (Pt), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC). Total and differential leucocytes count were also encountered (Coulter counter, Beckman, USA). Post-mortem changes were detected in autopsied animals.

**Statistical analysis:** Statistical analysis were done using t-test (Stell and Torrie, 1985).

**RESULTS AND DISCUSSION**

Out of 55 autopsied stray cats, 50 stray cats were found parasitized by >2 species of internal helminthes with prevalence rate of 90.9% included eight species of nematodes: *Physaloptera praeputialis* (78%), *Toxocara cati* (40%), *T. leonine* (30%), *Ollulamus tricuspis* (40%), *Ancylostoma tubaeforme* (30%), *Ganathostoma* sp. (24%), *Capillaria arophilia* (12%) and *Diocotophyma renale* (10%). Seven species of cestodes: *Dipylidium caninum*

(64%), *Taeniae taeniaeformis* (52%), *Joyeuxiella pasqualei* (26%), *Diplopylidium nolleri* (24%), *Spirometra mansonoides* (20%), *Mesocestoides variabilis* (16%) and *Diphlobothrium* sp. (12%) and one species of trematodes: *Paragonimus killicotti* (4%). The number of infected stray cats and the prevalence and intensity of the infection are shown in Table 1.

Results of clinical signs showed by diseased cats were emaciation (56%), pale mucous membrane (82%), coughing (24%), vomiting (44%), rough hair coat (62%), moreover abdominal distention and diarrhea were detected in 44 and 66% of infected cats, respectively (Table 2).

With respect to hemogram results showed a significant decrease ( $p \leq 0.01$ ) in TRBCs, Hb, PCV, platelets count and a significant increase in MCV and a significant decreased ( $p \leq 0.01$ ) in MCHC reflecting macrocytic hypochromic type of anemia. Results also indicated a significant increase ( $p \geq 0.01$ ) in total leukocytes count which were due to a significant increase ( $p \geq 0.01$ ) neutrophils and eosinophiles (Table 3). Grossly autopsied stray cats showed excessive mucous in stomach, congestion and hemorrhage in intestine, thickness of gastrointestinal wall, hepatomegaly, splenomegaly, dark colored feces (melaena) and large number of worms were

Table 1: Prevalence and intensity of internal helminthes infested (50) stray cats

Parasites	No. of infected cats	Prevalence (%)	Intensity (Mean±SE)	Range
<b>Nematodes</b>				
<i>Physaloptera praeputialis</i>	39	78	60.51±26.84	25-97
<i>Toxocara cati</i>	20	40	10.95±6.540	5-25
<i>T. leonine</i>	15	30	9.86±4.320	4-20
<i>Ollulamus tricuspis</i>	20	40	16.40±8.500	7-37
<i>Ancylostoma tubaeforme</i>	15	30	18.46±8.500	7-35
<i>Ganathostoma</i> sp.	12	24	10.28±2.800	7-15
<i>Capillaria arophilia</i>	6	12	6.16±2.130	4-10
<i>Diocotophyma renale</i>	5	10	3.20±1.920	1-6
<b>Cestodes</b>				
<i>Dipylidium caninum</i>	32	64	5.31±2.910	2-12
<i>Taeniae taeniaeformis</i>	26	52	11.30±3.800	6-19
<i>Joyeuxiella pasqualei</i>	13	26	4.15±2.030	2-8
<i>Diplopylidium nolleri</i>	12	24	10.83±4.900	5-20
<i>Spirometra mansonoides</i>	10	20	10.50±5.880	3-20
<i>Mesocestoides variabilis</i>	8	16	11.75±4.000	2-12
<i>Diphlobothrium</i> sp.	6	12	6.33±3.930	
<b>Trematodes</b>				
<i>Paragonimus killicotti</i>	2	4	4.00±1.410	3-5

Table 2: Clinical signs of infected stray cats with internal helminthes

Clinical signs	No. of infected cats	Percentage
Emaciation	28	56
Pale of mucous membrane	41	82
Coughing	12	24
Vomiting	22	44
Rough hair coat	31	62
Abdominal distention	22	44
Diarrhea	33	66

Table 3: Blood parameters of infected stray cats with internal helminthes and control group

Parameters	Mean±SE	
	Infected stray cats	Control stray cats
TRBs ×10 <sup>6</sup> µL	5.14±1.97**	9.12±1.510
Hb g/100 mL	8.35±1.72**	13.22±1.940
PCV (%)	28.60±3.37**	37.55±2.120
Pt ×10 <sup>3</sup> µL	238.20±5.32**	564.50±10.36
MCV (fL)	47.28±6.60**	40.69±2.610
MCHC g/100 mL	29.18±5.25**	32.47±2.090
TWBCs ×10 <sup>3</sup> µL	18.26±3.47**	14.78±1.290
Neutrophils ×10 <sup>3</sup> µL	11.26±1.03**	7.50±0.500
Lymphocytes ×10 <sup>3</sup> µL	0.20±0.05	0.20±0.050
Monocytes ×10 <sup>3</sup> µL	3.40±0.10	3.60±0.200
Eosinophiles ×10 <sup>3</sup> µL	2.10±0.40**	0.50±0.050
Basophiles ×10 <sup>3</sup> µL	0.10±0.00	0.10±0.000

\*\*p>0.01 values are mean±standard error of mean



Fig. 1: Large number of adult worms seen in stomach



Fig. 2: Large number of adult worms seen in intestine

seen in stomach and intestine (Fig. 1 and 2). The prevalence of internal helminthes in this study was 90.9% with high infection rate of different internal helminthes infected stray cats. Less control programs concerning periodic administration of anthelmintics may play a good role in increase prevalence of infection rate in stray cats, same results were also mentioned by others (Zibaei *et al.*, 2007; Laberthe *et al.*, 2004).

Highest infection rate were detected with *Physaloptera praeputialis* which were also mentioned by

(Nihad *et al.*, 1988). In Iraq but it was higher than found in Newzealand and Qatar (Pomroy, 1999; Abu-Madi *et al.*, 2008). Santen *et al.* (1993) refer to the importance of nematode infested cats as these worms infested stomach and attached to the mucosa on which they feed or they may also sucking blood, this will explain the common clinical sings detected on infected cats in the present study.

Deterioration, leading to substantial significant effects with *Toxocara cati* with high prevalence of infection were also mentioned by Mirzayans (1973) as it migrates through out the liver and lung of infected cats, kitten and can also cause coughing due to pneumonia (Bowman *et al.*, 2003). Other nematods such as *Ollulanus tricuspis* and *Ancylostoma tubaeforme* were also cause chronic gastritis in infected cats (Hanichen and Hasslinger, 1977) anemia and loss of the body weight of cats are the principal consequence of those parasites infection and these are related to the blood loss in the intestine which associated with feeding habits of adult (Onwuliri *et al.*, 1981). Also Soulsby (1986) refer to the *Ganathostoma* sp. and its effect on hepatic tissue by young worms. It have been shown that *Capillaria arophilia* is more common lung worms of cats and with prevalence rate (12%) this results were agreed with Barutzki and Schaper (2003). *Diocotophyma renale* are another nematode detected in the current study and mentioned by Soulsby (1986) which were affect kidney and other organs including liver, omentum and pleural cavity, their eggs passed through urine of the host.

Cestodes are an important internal helminthes infested stray cats, the study were shown that *Dipylidium caninum*, *Taeniae taeniaeformis* and *Joyeuxiella pasqualei* had the higher prevalence, infested gastrointestinal area of stray cats, this results were agreed with Mohsen and Hossein (2009) and Dalimi and Mobedi (1992), heavy infestation of those types of parasites may cause diarrhea and/or constipation, unthrifty and intestinal obstruction may follow (Boreham and Boreham, 1990).

Less humidity and increase dry season period in Mosul area may be the fact for the low prevalence rate seen in infestation with *Diplopylidium nolleri* in current study which may be due to the unsuitable condition for the survival of the insect intermediate host to complete their life cycle, this will agreed with Barutzki and Schaper (2003). The main pathological effect of *Spirometra mansonioides* and *Diphlobothrium* sp. were anemia through blood sucking and prevent absorption of vitamin B12, those types of cestodes have an prevalence of 20 and 12%, respectively which also mentioned by Kirkpatrick and Sharninghausen (1983) and Mueller

(1935). It have been shown that *Paragonimus killicotti* was an important trematods infested cats as the adult were infected pulmonary parenchyma causing substantial pathological effects by Soulsby (1986).

Naturally infested stray cats with internal helminthes showed different clinical sings and post-mortem changes which were in agreement with others (Bowman *et al.*, 2003; Bowman, 1995).

Results of hemogram revealed a significant decrease in TRBCs, Hb and PCV reflecting macrocytic hypochromic type of anemia, similar results were recorded by Bowman (1995). The cause of anemia during helminthes infestation may be multi-factorial, the mechanical action of sucking blood by the parasite, beside the bleeding tendency creating by parasitic migration and irritation may be incriminated (Santen *et al.*, 1993; Onwuliri *et al.*, 1981). Furthermore the increase in WBC in current study were also seen by Bowman (1995) which might occur due to stimulation of immune system and bone marrow as immune response against the parasite or their toxins.

### CONCLUSION

Internal helminthes were adversely affected stray cats and exhibited different clinical signs and post mortem lesions, a significant changes were noticed between the infected and control animals in hematological parameters. *O. tricuspis*, *Ganathostoma* sp., *C. arophia*, *D. renale*, *Mesocestoides variabilis*, *Diphlobothrium* sp. and *Paragonimus killicotti* were register for the 1st time in Iraq.

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