Short Communication

# ENDOPARASITISM AND EVALUATION OF ANTHELMINTIC EFFICACY IN CAPTIVE LIONS (*PANTHERA LEO PERSICA*) AT ARIGNAR ANNA ZOOLOGICAL PARK, VANDALUR, CHENNAI, TAMIL NADU

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## ABSTRACT

*A study was conducted to assess the incidence of endoparasitism and evaluate the efficacy of anthelmintic drugs administered to captive lions housed at Arignar Anna Zoological Park, Vandalur, Tamil Nadu. A total of 10 scat samples were collected from captive lions during June-August, 2024. All the samples were examined by standard qualitative methods (direct smear, centrifugal sedimentation and floatation methods) followed by quantitative method (McMaster technique) to determine egg per gram. All the samples (n=10) showed 100% incidence of Toxascaris leonina. Efficacy of two anthelmintic drugs were evaluated by using faecal egg count reduction test (FECRT). The efficacy of ivermectin was recorded only 10.21% and found to be resistant. Fenbendazole demonstrated 100% efficacy, indicating susceptibility of the parasite to this drug.*

**Keywords:** fenbendazole, ivermectin, *Toxascaris leonina, Panthera leo persica*

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## INTRODUCTION

The Asiatic lion (*Panthera leo persica*) is a subspecies of lion that once roamed widely across the Middle East and India but is now found only in the Gir Forest National Park in Gujarat, India. The Asiatic lion is listed as "Endangered" on the IUCN Red List (2022) because of threats such as habitat loss, human-wildlife conflict and disease. Zoological parks are considered as the centres for protecting of different wild animal species for a variety of

purposes, including carrying out research, exhibit and educating the public about wildlife conservation (Varadharajan and Pythal, 1999). In free-ranging wild animals, natural resistance against endoparasites is commonly noticed as well as a balanced living in harmony with helminths in ecosystem is observed (Thawait *et al.,* 2014). Whereas captive wild animals are more vulnerable to parasitic infections, confined areas in zoo enclosure make these animals more prone to different parasitic infections, despite proper attention to feeding and maintenance of hygiene in captivity (Parsani *et al.,* 2001; Raja *et al.,* 2014). Based on the above significance, this study was conducted to evaluate the helminthic incidence and efficacy of anthelmintic therapy administered to captive lions.

## MATERIALS AND METHODS

About 20 g of scat samples were collected from each captive lions (n=10) housed at Arignar Anna Zoological Park (AAZP) from June, 2024 to August, 2024. The samples were brought to the laboratory in separate sterile zip-lock covers under anaerobic conditions and were appropriately labelled. All the samples were processed using standard parasitological techniques, including direct smear examination, centrifugal sedimentation technique, floatation technique and Modified McMaster method (Coles *et al.,*1992). The helminthic eggs were identified microscopically based on the morphological characters as described by Soulsby (1982) and morphometry was done. In AAZP, captive lions (n=10) were treated individually with ivermectin at the dose rate of 0.2 mg/kg body weight subcutaneously. Based on the result of ivermectin, after 21 days another anthelmintic drug fenbendazole was administered orally at the dose rate of 10 mg/kg body weight mixed with meat for three consecutive days (Ravindran *et al.,* 2006) to the same lions (n=9) which showed resistance to ivermectin. Efficacy of both the drugs were evaluated by Faecal egg count reduction test (FECRT). Egg per gram (EPG) were recorded on day 0 (pre-treatment) as compared with the values on 7th and 14th days post treatment. Descriptive statistics for all the parameters were calculated using SPSS software. The percentage Faecal Egg Count Reduction Test (FECRT) was calculated by using ReSO computer programme version 2.0 (Martin and Wursthorn,1990).

## RESULTS AND DISCUSSION

Microscopic examination revealed that the overall incidence of helminth infection in captive lions at AAZP was 100% (n = 10), with *Toxascaris leonina* being the sole species detected (Table 1, Fig. 1). This finding is in confirmation with Fagiolini *et al.* (2010), who reported 100% prevalence of *T. leonina* in lions at the Giardino Zoologico of Pistoia, Tuscany, Italy. Similarly, Singh *et al.* (2006) recorded the prevalence of *T. leonina* as 97.98% in lions at Mahendra Choudhury Zoological Park, Chhatbir, Punjab. Ramadevi and Venu (2020) recorded the prevalence of *T. leonina* as 16.13%, 77.27% and 100% in captive lions at three zoological parks, Sri Venkateswara Zoological Park, Tirupati, Indira Gandhi

Zoological Park, Visakhapatnam and Nehru Zoological Park, Hyderabad, respectively. Shrikhande *et al.* (2008) recorded 85.71% Toxascaris sp. in white tigers at Rajiv Gandhi Zoological Park, Katraj, Maharashtra. In contrast, Manjunatha *et al.* (2019), who collected 41 faecal samples from apparently normal/healthy captive lions and recorded only 39.02% prevalence of *T. leonina* in lions at Bannerghatta Biological Park, Bengaluru, Karnataka.

In the present study, quantitative fecal examination by McMaster method showed a mean EPG of 1318.59 for *T. leonina* eggs (Table 1), which does not agree with the findings of Singh *et al.* (2006), who recorded mean EPG of 2483.33±342.02. Mukarati *et al.* (2013) recorded lower mean EPG of T. leonina eggs in lions as 169.2.

The morphometry of *T. leonina* eggs recovered from lions had a length and width range of 74.75-75.01µm and 63.28-65.42µm, respectively (Table 2 and Fig. 2). These findings differed from Ferdous *et al.* (2023) who observed a length and width of 75×85µm, respectively. Similarly, Peng *et al.* (2016) found *T. leonina* eggs had a smooth surface with a size of 64.54×82.59 µm. However, the present findings were consistent with Tiuria *et al.* (2017) who observed a *Toxascaris sp.,* eggs with length and width range of 73.5 to 84.9 µm and 58.6 to 72.6 µm, respectively.

The EPG values of the captive lions treated with ivermectin at AAZP are 1019±359.61 on 0 day (pre-treatment) and 915±436.95 on 14th day (post-treatment) respectively (Table 3). The FECRT of ivermectin was -52% on 14th day post treatment and efficacy was only 10.21% was observed in this study. The finding of this study showed that the resistance of *T. leonina* to ivermectin- in lions at AAZP (Table 3). The results did not correlate with that of Dehuri *et al.* (2013) who revealed 100% efficacy of ivermectin against *T. leonina* and Ancylostoma spp., by 3rd day post-treatment in lions. Similarly, Panayotova-Pencheva (2023) reviewed the use of ivermectin at the dosage of 0.2–0.3 mg/kg body weight twice at four weeks interval as an effective protocol treatment of *T. leonina*.

After 21 days fenbendazole was administered to the same lions (n=9) which showed resistance to ivermectin which was administered orally at the dose rate of 10mg/kg body weight mixed with meat for three consecutive days. This dosage of fenbendazole was adopted from Meny *et al.* (2012) who treated captive cheetahs (*Acinonyx jubatus*) which had parasitism with similar protocol. On day 0 and day 14 of post-treatment of the captive lions at AAZP had the EPG values of 948±349.31 and 0±0.00, respectively, indicating 100% efficacy of fenbendazole (Table 4). This study showed that the *T. leonina* was highly susceptible to fenbendazole. These results are in accordance with Thawait and Maiti (2016) who found 100% efficacy with faecal egg count reduction from 1800 to 0 pre-treatment and post treatment respectively, in captive lions infected with *Diphyllobothrium spp*. and *Toxocara spp.* However, the results did not correlate with

those of Moudgil *et al.* (2016) who treated captive lions with fenbendazole @ 10mg/kg body weight, once daily for three days proved ineffective with maximum faecal egg count reduction on day 3 post treatments (69.35%), which further reduced to 51.61% at day 21 post treatments against T. leonina. Similarly, Chandrakar *et al.* (2020) observed that fenbendazole (10 mg/kg body weight) and praziquantel (5 mg/kg body weight) administered orally as a single dose (SID) along with meat to be 85.63% effective against Ancylostoma spp. and Spirometra spp. in tigers with a post-treatment EPG reduction from 1086.67 ± 80.69 to 156.67 ± 15.42.

## CONCLUSION

This is the first kind of study conducted in AAZP to evaluate the efficacy of anthelmintic drugs in captive lions. In AAZP, ivermectin is the most commonly used drug for controlling both ectoparasites and endoparasites infection in captive tigers and lions. The present study has shown that ivermectin was found to be less effective against *T. leonina* infection in lions, whereas the fenbendazole proved highly effective. It was suggested that rotational use of anthelmintic drugs in large felids and regular screening of faecal samples before treatment with anthelmintics to avoid the development of resistance.

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**Table.1. Incidence of helminthic infections in lions**

| S. No. | Species | Incidence of *Toxascaris leonina* | EPG for *Toxascaris leonina* | Overall Incidence |
|---|---|---|---|---|
| 1 | Lions (n=10) | 100% (n=10) | 1318.59 | 100% (n=10) |

**Table.2. Morphometry of helminth eggs from lions' scat**

| Sl. No. | Genara/ species | Statistical index | Length (µm) | Width (µm) | Morphological characters |
|---|---|---|---|---|---|
| 1 | *Toxascaris leonina* (n=20) | Mean | 74.88 | 64.35 | Sub-spherical shape with a thick, smooth shell |
| | | Standard error | 1.22 | 0.44 | |
| | | Standard deviation | 5.46 | 2.00 | |
| | | Sample variance | 29.78 | 4.00 | |
| | | Minimum | 66.30 | 62.40 | |
| | | Maximum | 81.90 | 66.30 | |
| | | Confidence level (95.00%) | ±0.13 | ±1.07 | |

n - the number of eggs examined

**Table.3. Therapeutic efficacy of the Ivermectin drug against helminths in lions (n=9, control=1)**

| Sl. No. | Pre-treatment EPG (Mean ± SE) | Post –treatment EPG on 14th day (Mean ± SE) | Control EPG (Mean ± SE) on 14th day | FECRT % | Upper 95% CL | Lower 95% CL | Efficacy % |
|---|---|---|---|---|---|---|---|
| 1 | 1019±359.61 | 915±436.95 | 600 | -52 | - | - | 10.21 |

**Table. 4: Therapeutic efficacy of the Fenbendazole drug against helminths in lions (n=8, control=1)**

| Sl. No. | Pre-treatment EPG (Mean ± SE) | Post –treatment EPG on 14th day (Mean ± SE) | Control EPG (Mean ± SE) on 14th day | FECRT % | Upper 95% CL | Lower 95% CL | Efficacy % |
|---|---|---|---|---|---|---|---|
| 1 | 1019±359.61 | 915±436.95 | 600 | -52 | - | - | 10.21 |

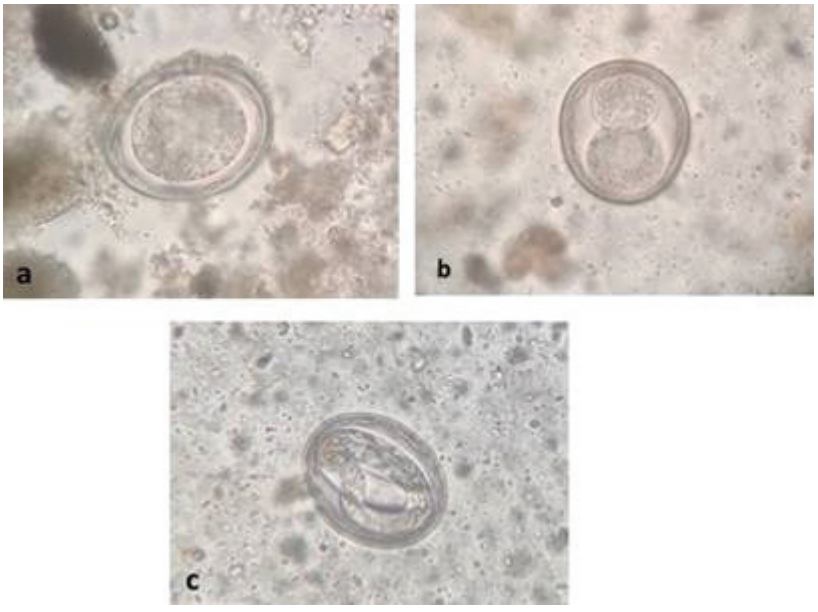


**Fig. 1. Helminths eggs found in lions scat sample (a) *Toxascaris leonina* (40X); (b) *Toxascaris leonina* with two blastomeres (40X); (c) *Toxascaris leonina* with larva (40X).**

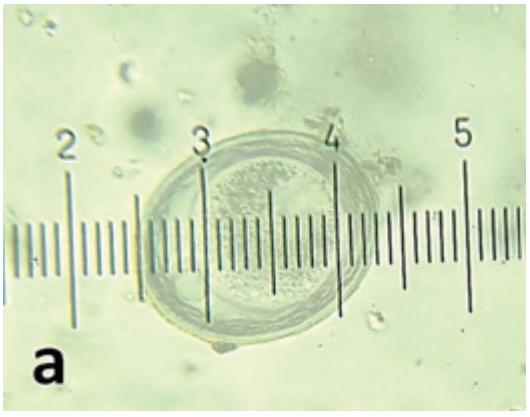


**Fig. 2. Morphometry of helminth egg (a) Toxascaris leonina**

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