Received: 01 October 2023, Accepted: 23 October 2023

Original Research

Journal of Advanced Veterinary Research
(2023) Volume 13, Issue 10, 2156-2158

Survey of Gastrointestinal Parasitic Infection in Captive Lions in Egypt

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Abstract

A coprological survey was conducted to determine the types and prevalence of internal parasites in captive African lions (*Panthera leo*) in Egypt. Individual fecal samples were collected from 30 lions of different ages and gender from Giza Zoo and different circuses over a 1-year period. Young, aged lions were suffered from weight loss, lethargy, and mild decrease in appetite with mild gastrointestinal symptoms and vomiting with presence of adult *Toxascaris leonina* in vomitus of 3 of them while adult ones show normal body condition without any symptoms. Fecal samples were subjected for macroscopic examination then examined using flotation and sedimentation techniques to assess the presence of parasite eggs and oocysts. The overall prevalence of helminth infections was 33.33% (10/30). Eggs of *Toxascaris leonina* were found in the feces of 6 (6/10, 60%) lions and *Taenia* species in 4 (4/10, 40%) lions. In conclusion, due to the increased number of lions in Egypt either for the purpose of acquisition or for work in show as in circus and in the zoo, therefore, diseases that affect lions must be taken into consideration. Parasitic disease is of veterinary importance for lions, but future work including other parasitic, bacterial and viral infections, epidemiology, disease distribution, line of prevention and control for each problem are required.

KEYWORDS
Fecal sample, *Panthera leo*, *Toxascaris leonina*, *Taenia* species.

INTRODUCTION

The lion is a muscular, broad-chested big cat with a rounded head and a short, reduced neck. The fur varies in color from light buff to silvery grey, yellowish red and dark brown (Linnaeus, 1758).

Among felids, the lion is second only to the tiger in size. The size and weight of adult lions varies across its range and habitats. Accounts of a few individuals that were larger than average in Africa and India (Guggisberg, 1975).

There are numerous numbers of parasites that described in lions in many African countries. The majority of currently available information on the endoparasites of African lion stems mainly from free ranging wild animals. Intestinal parasitic infection represents a large and serious medical and public health problem in developing countries. Data on internal parasite infections in large African carnivores are scant. Historically samples have been collected from captive animals (Geraghty *et al*., 1982; Ghoshal *et al*., 1988) or opportunistically from dead wild animals (LeRoux, 1958; Rodgers, 1974; Bwangamoi *et al*., 1990). Little information is available from live, free-ranging populations and what has been reported comes primarily from studies in East Africa (Müller-Graf, 1995; Müller-Graf *et al*., 1999; Bjork *et al*., 2000; Engh *et al*., 2003; Hüttner *et al*., 2009).

Several surveys on internal parasites of free ranging lions have been conducted in different parts of Africa such as: *Taenia regis*, *Taenia gonyami*, *Taenia simbae*, and *Spirometra* were diagnosed in lion from Serengeti, Tanzania.

Parasitism in free ranging lions from other areas of Africa, particularly in southern Africa are more numerous like; *Ancyclostoma paraduodenale* has been found in lions in northern Rhodesia. *Echinococcus felidis* in Northern Transvaal, and *Echinococcus granulosus felidis* in Transvaal (Young, 1975).

Toxocara cati, *Toxascaris leonina*, and *Spirometra* species were described in Australian circus lions and zoo lions in central California that were serologically positive also for *Toxoplasma gondii*. *Giardia* sp. was reported from a captive lion. Two undescribed species of *Isospora* were reported from captive lion cubs in England. A spurious coccidian parasite, *Eimeria felina*, was observed in a lion from the Leningrad Zoo (Bjork *et al*., 2000).

Some types of internal parasites are zoonotic through proximity between wildlife and humans. Commercial use of wildlife, whether legal or illegal, puts humans in direct contact with a range of wild species (Watsa, 2020).

Some types of parasites that affect lions may not expose any symptoms, but many others have such as diarrhea, vomiting, weight loss, loss of appetite and lethargy (Berentsen *et al*., 2012). Commercially, it affects the external appearance of circus animal making it of low turnout, and cannot submits its show perfectly, also affects its ability to breed that cost the owner loss of opportunity of having breeds so having more money.

Our objective was to obtain current data on gastrointestinal parasite infections in populations of captive lions in Egypt. This study is the most comprehensive investigation into gastrointes-

ISSN: 2090-6277/2090-6269/

tinal parasite infections of lions present in Egypt that provided baseline information for future studies beside valuable information on lion's health.

MATERIALS AND METHODS

The study was conducted according to the guidelines of the ethical committee of the faculty of veterinary medicine, Cairo University, Giza. (Institutional Animal Care and Use Committee), Vet CU. IACUC under reference No. (Vet CU 09092023796).

A total of 30 fecal samples have been collected from different localities from December 2022 to June 2023 and divided into four groups according to their location. The first group included 4 samples that were collected from Marsa Matrouh. The second group included 2 samples from Cairo Alexandria desert road farm. The third group included 1 sample collected from Shebein El kom. The fourth group included 23 fecal samples collected from Giza where 20 samples from Giza Zoo, and 3 samples from Africano Tolba, Abou-Rawash. Age of lions ranged between 7 months to 26 years.

Fecal samples were collected according to WHO guidelines in clean, labeled, wide-mouth plastic containers with tight-fitting lids. As soon as samples received, qualitative macroscopic examination was done regarding consistency, color, and presence of mucous, blood and larva spp., then fecal samples were either examined within one to two hours after delivery or refrigerated overnight and preserved with saline solution before being examined by both sedimentation and floatation techniques for microscopical examination of eggs and/or oocysts.

RESULTS

Results of the fecal sample examination are given in the Table 1. Macroscopic examination for all fecal samples revealed negative results. While microscopic examination demonstrated the presence of 2 types of eggs: *Toxascaris* leonine egg and *Taenia* egg.

Out of 30 fecal samples of lion examined, twenty were free from any parasitic infections. Ten samples (10/30, 33.33%) revealed helminthic infections as indicated in Table 1. Samples from females and males showed no discrimination in infections. Toxascarosis (*Toxascaris leonina*) was found to be the most prevalent helminthic infection among the lions (6/10, 60%). *Taenia* spp. eggs was the second most common parasite found in examined fecal samples (4/10, 40%). The eggs of *Taenia* spp. appeared bile stained eggs, radially striated with an internal onchosphere containing sin refractile hooklets and indistinguishable from each other.

Fig. 1. Emaciation and weight loss in cub due to *Toxascaris leonina* infection.

Fig. 2. Adult *Toxascaris leonina* in vomitus of a cub.

Fig. 3. *Taenia* species egg in fecal sample.

Table 1. Results of fecal samples examination according to location with reference to age, sex and clinical signs of each diseased lion.

Location	No. of samples	Result	Sex	Age	Clinical signs
Marsah Matrouh	4	One +ve for *Toxascaris leonina*	male	9 years	Weight loss, lethargy and mild decrease in appetite.
Cairo Alexandria desert road farm	2	One +ve for *Toxascaris leonina*	Lactating female	6 years	Mild decrease in appetite and lethargy
Shebein El kom	1	Negative	-----	-----	-----
Giza (n.=23)					
Giza zoo	20	Five +ve 4 *Taenia* egg. and one *Toxascaris leonina*	3 females	8 months, 4 years, 7 years	Mild gastrointestinal symptoms
			2 males	1.5 year, 12 years	
Africano tolba	3	Three +ve for *Toxascaris leonina*	2 females	4 years, 8 years	
			1 male	11 years	

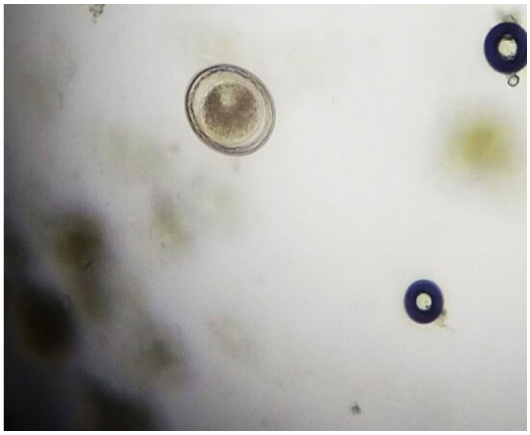

Fig. 4. *Toxascaris leonina* egg in fecal sample.

DISCUSSION

To the best of the authors' knowledge, this is the first documentation of endoparasites in captive and zoo lions in Egypt. Of the total 30 fecal samples, 10 positive samples were found: 6 for *Toxascaris leonina* egg and 4 for *Taenia* spp. eggs.

Toxascaris leonina is a common finding during the fecal examination of captive lions in zoos and in lions of special owners by the concentration floatation technique. *Toxascaris leonina*, the species found in the small intestine of dogs and cats, was previously reported from wild felids and canids in most parts of the world (Bhatia *et al*., 2004). Persistent infections of *T. leonina*, ascertained in both the autumn-winter and spring-summer periods, in lion and leopard and snow panther in both the Warsaw and Plock Zoos has been reported by (Bartosik and Górski, 2010).

Given the conditions in which the captive lions industry currently operates, the considerable scale of trade in lions, and their susceptibility to such a wide range of multi-host pathogenic organisms, it is likely that captive lions could play a central role in the emergence, amplification, and transmission of disease to both people and wild animal populations. *T. leonina* egg was differentiated from other *Toxocara* spp. eggs according to its morphology. As the *Toxascaris* spp. eggshell pitted with different pit dimension but the *Toxascaris leonina* egg has smooth wall with translucent appearance (Okulewicz *et al*., 2012).

Taenia spp. are important tapeworm species in humans and domesticated animals that may lead to a substantial health and economic burden (Jansen *et al*., 2018). The three zoonotic *Taenia* spp., namely *T. saginata*, *T. solium* and *T. asiatica* (Eom, 2006). Other *Taenia* spp., such as *T. hydatigena, T. pisiformis, T. ovis, T. Taeniaeformis* and *T. multiceps,* are mainly of veterinary importance (Craig and Ito, 2007). *Taenia saginata*, is endemic in large parts of Asia, Latin America and sub-Saharan Africa, while T. solium seems to be restricted to Asia, Latin America and sub-Saharan Africa, while *T. asiatica* seems to be restricted to Asia (WHO, 2005). To differentiate true parasitism from spurious findings, careful collection of parasites, complete cultures, and other techniques must be performed. In addition, single random samples from a group of lions may not be representative of the temporal or spatial variation in parasitic infection in a wild population. This study is therefore qualitative in nature. Further taxonomic and epidemiologic studies to determine parasite speciation, intermediate hosts and life cycles, and the importance of parasites and other diseases in predator–prey relationships are needed.

CONCLUSION

Due to the presence and increased numbers of lions in Egypt either for the purpose of acquisition or for work in show as in circus and in the zoo, therefore, diseases that affect lions must be taken into consideration, especially since there are diseases that are transmissible for human. Parasitic diseases are of veterinary importance for lions, but future work including other parasitic infections, epidemiology, disease distribution, line of prevention and control for such problem are needed.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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