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Investigation about intestinal parasites in fecal of some captive animals in the Agricultural Center and Alsaeaduh Zoo of Al-Diwaniyah Province, Iraq

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Abstract

This research was performed for the purpose of knowing intestinal parasites in the feces of some captive animals (CA) in Alsaeaduh zoo (ASZ) and the Agricultural Center (AC) in Al- Diwaniyah province, Iraq. Sixty-six fecal samples were collected from *Panthera leo*, *Vulpes vulpes*, *Canis familiaris*, *Macaca* sp., *Sus scrofa*, *Phoenicopterus roseus*, *Ciconia boyciana*, *Axis axis*, *Gazella gazella*, *Struthio camelus*, and *Pavo* sp. The results indicated that the total infection rate in these animals in the ASZ was 50% that recorded 5 species of eggs/oocysts of the intestinal parasites, which included *Eimeria* sp., *Cryptosporidium* spp., *Hymenolepis* sp., *Ascaris* spp., and *Toxocara* spp. While in the animals of the AC, the percentage of the total infection was 44.73%, where recorded four species of eggs/oocysts of the intestinal parasites that included both *Eimeria* sp., *Cryptosporidium* spp., *Hymenolepis* sp., and *Ascaris* spp. The results also indicated that there are no fundamental differences in the percentages of the infected animals with intestinal parasites. This study provides important data about the presence of intestinal infestation by certain species of parasites affecting animals in the zoo and the agriculture center of the sampled city.

Keywords: captive animals, intestinal parasites, Iraq, zoo.

INTRODUCTION

Zoo can be defined as a place where there are rare species of animals brought from their natural habitats (1). Public parks are recreational places frequently visited by many people and contain many species of important wild animals as well as endangered species where they are kept inside cages in order to preserve them as well as increase their numbers (2).

Parasites are major problems that threaten the health and the existence of rare species leading to mortality in these species (3,4). Some modern scientific sources indicate that many animals in public parks are infected with common parasitic species that can infect humans and thus pose a danger to public health (5,6). Rearing of animals in narrow places leads to changes in the living conditions in addition to the environmental pollution generated and thus facilitates the incidence of many parasitic diseases (7–10) as constant stress of captivity makes the immune system of CAs weak and thus more vulnerable to parasitic infection (7,11).

In Iraq, researches on this subject is still very few, which led us to carry out this research to survey the intestinal parasites associated with animals in the zoo and Agricultural Center in Al-Diwaniyah province.

MATERIALS AND METHODS

Samples collection

The study was conducted on the CAs in cages of the ASZ and the AC in Al-Diwaniyah Province, Iraq during the period from March, 2018 until the end of November, 2018. From the ASZ, the study involved *Panthera leo*, *Vulpes vulpes*, *Canis familiaris*, *Macaca* sp., *Sus scrofa*, *Phoenicopterus roseus*, *Ciconia boyciana*. Moreover, in the AC the species involved were *Axis axis*, *Gazella gazella*, *Struthio camelus*, and *Pavo* sp, figure 1. According to that, 66 fecal samples were collected directly from the animals and placed in labelled-clean-plastic boxes. The boxes were then placed separately in plastic bags and kept in an icebox for storing the samples until they were transferred to the laboratory of parasites in the animal house of the Department of Biology, College of Education, University of Al-Qadisiyah, Al-Diwaniyah Province, Iraq

Samples examination

In order to investigate intestinal parasites in the feces of CAs, several methods were used according to Coles (1986)(12), including direct smear method looking for the trophozoites or oocysts of protozoa. Some smears were stained with the Zell Nelson stain, and the other were stained with Lugol's iodine. Sedimentation and floatation with zinc sulphate methods also were used to investigate worm eggs. All the prepared glass slides were examined under a light microscope at 40 and/or 100X. Identification of eggs/oocysts were based on morphology as well as micrometric measurements as provided by Bowman and Lynn (1999) (13).

Statistical analysis

The data obtained were analyzed by (CRD) that was adopted as one-way and two-way laboratory experimental designs as well as comparisons of the averages using the least significant difference (LSD) under probability level of $p \leq 0.05$, in order to study the correlation between the infections with the prevalence of the parasites.

Figure 1: A. *Struthio camelus*. B. *Pavo* sp. C. *Axis axis*. D. *Gazella gazelle*.

Table 1: Oocysts and eggs with their proportions in some captive animals in Al-Diwaniyah Province, Iraq.

Species of animals in the zoo	Species of parasites						
	Number of animal examined	Number of animal infected	*Eimeria* spp.	*Cryptosporidium* spp.	*Hymenolepis* sp.	*Ascaris* spp.	*Toxocara* spp.
			N (%)	N (%)	N (%)	N (%)	N (%)
Panthera leo	1	0	0	0	0	0	0
Vulpes vulpes	1	1	0	0	0	0	1(100)
Canis familiaris	3	2	0	0	0	0	2(66.66)
Macaca sp.	3	1	0	0	0	0	1(33.33)
Sus scrofa	2	0	0	0	0	0	0
Phoenicopterus roseus	15	8	3(37.5)	2(25)	3(37.5)	0	0
Ciconia boyciana	3	1	0	0	0	1(33.33)	0
Total	28	14				50%	
Species of animals in the agriculture center							
Axis axis	25	10	0	0	0	10(40)	0
Gazella gazella							
Struthio camelus	10	5	3(30)	1(10)	1(10)	0	0
Pavo sp.	3	2	0	1(33.33)	0	1(33.33)	0
Total	38	17					

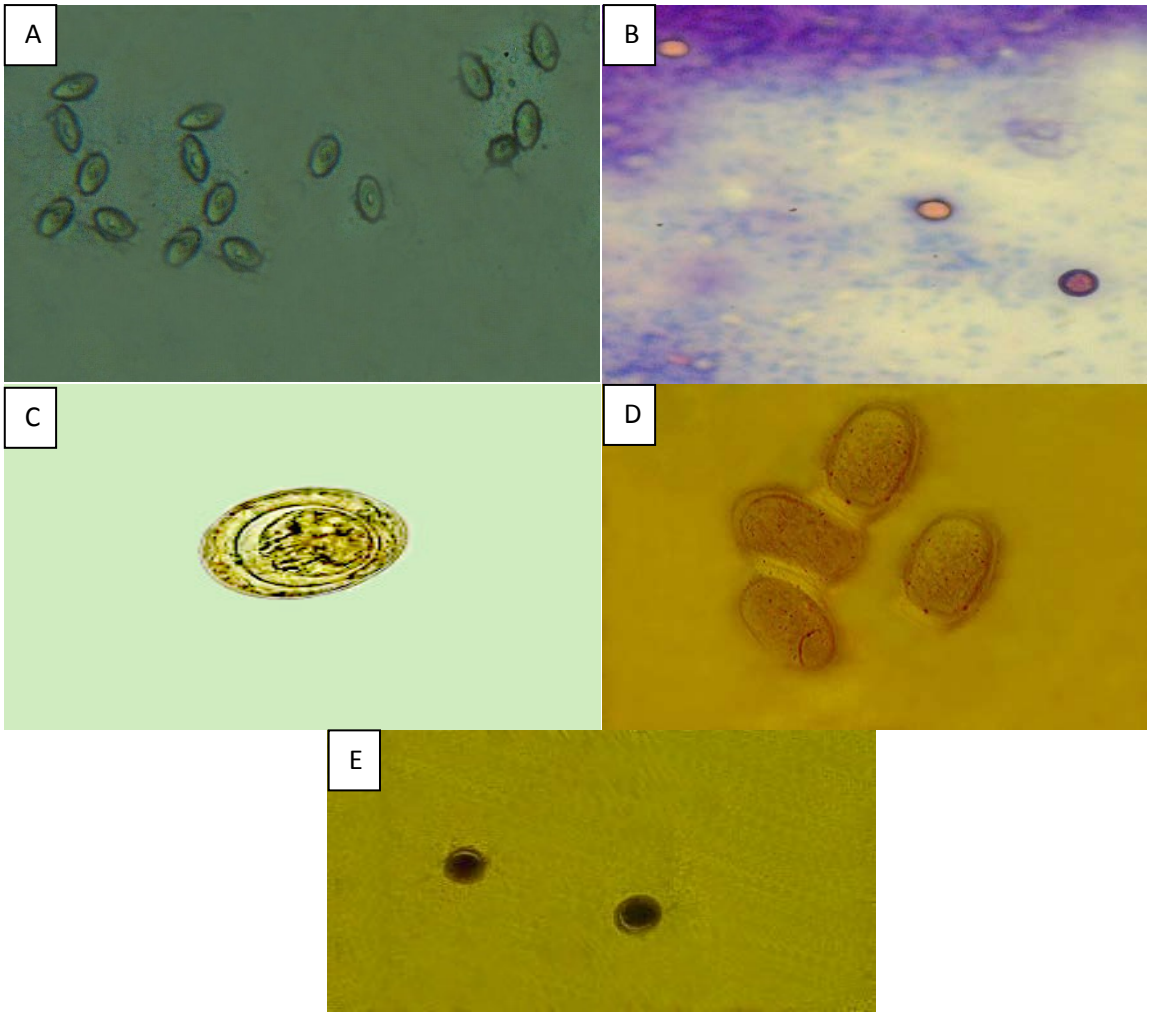

Figure 2: A. Oocysts of *Eimeria sp*. (100x). B. *Cryptosporidium* spp.(100x). C. Egg of *Hymenole* sp. (100x). D. Egg of *Ascaris sp*. (100x). E. Egg of *Toxocara* spp. (100x).

RESULTS AND DISCUSSION

The results of the current study revealed that the CAs in both the ASZ and the AC were infected with 5 intestinal parasites. Five species of oocysts and eggs that belonged to intestinal parasites were observed in the current research, figure 2.

These parasites have included *Eimeria* sp., *Cryptosporidium* spp., *Hymenolepis* sp. *Ascaris* spp., and *Toxocara* spp. The percentage of the total infection in CAs in the zoo was 50%, table 1, while the proportion of animals in the AC has reached 44.73%, table 1.

This ratio seems to be low compared to the rates recorded by Al-Amery (2013) (14) in the park Zora in Baghdad, Mir *et al*, (2016) in Garden animals of Punjab, and Kolapo and Jegede (2017) (15) in CAs of University Ilorin zoological garden which counted as 72.46%, 68%, and 62.9% respectively. The current study results approach to the ratio 46.2% recorded by Thawait *et al* (2014) (16) in animals belonged to Nandan Van Zoo. This may be due to differences in the number of specimens selected, species of animals, area of the study, and the methods used to diagnose parasites. The results indicate that there are no significant differences in the percentage of the infected animals with intestinal parasites. These results differ from the results of the infection surveys recorded in a group of CAs in Iran, Nigeria, Brazil, Costa Rica, and Iraq conducted by Olayide *et al*, (2008) (17), Chunha *et al*, (2008) (18), Ajibade et al, (2010) (5), and Al-Amery (2013) (14) respectively who indicated a higher incidence of nematode infection than other parasites.

The results recorded for the coccidia oocysts that belong to the parasite *Eimeria* sp as *Phoenicopterus roseus* 37.5%, and *Struthio camelus* 30%, and this registration is for the first time for *Phoenicopterus roseus* and *Struthio camelus*, as the Iraqi studies did not indicate its registration previously. Oocysts of *Eimeria* sp were recorded in other species of CAs in zoos such as *Capra hircus*, *Gazella gazelle*, *Panthero leo*, *Ursus arctos*, and *Pantheroa tigeris*. While Radhy and Hassan (2012) (19) recorded in *Gazella gazelle*, *Capra hircus*, *Panthera leo*, *Panthera tigeris*, and *Ursus arctos*. Globally, Coccidia oocysts isolated by Singh et al, (2006) (20) from *Gazella benetti* as well as Kolapo and Jegede (2017) (15) from Badger, Spotted hyena, Mule, Sitatunga, and Ram.

Cryptosporidium spp one of the protozoa that were recorded during the survey as was isolated from only herbivores that included *Phoenicopterus roseus* 25%, Struthio *camelus* 10%, and *Pavo* sp 33.33%. The present

conclusion differed with Radhy and Hassan (2012) (19) who registered *Crypotosoridium* spp contagion in carnivores and herbivores such as *Crocuta Crocuta*, *Panthero tigeris*, *Canis lupus*, *Lama glama*, and *Camelus bactrianus*. It is a common parasite that is not limited to birds has been recorded in reptiles, fish, amphibians, and humans (21,22). Infection of this parasite occurs by ingestion oocysts containing spores with contaminated water and food. The chances of infection with this parasite increase with the presence of animals in large numbers inside rearing cages.

During the current study, eggs of one species of tapeworms were recorded, *Hymenolepis* sp. It is found in *Phoenicopterus roseus* 37.5% and *Struthio camelus* 10%. The parasite lifecycle is indirect and requires beetles and some insects to reach its final stages.

Ascaris spp eggs constituted the highest percentage of the recorded parasites isolated from *Axis axis* 40%, *Pavo sp*. 33.33%, and *Ciconia boyciana* 33.33%. It should be noted that the eggs of the *Ascaris* are widespread and infect different hosts Thawait *et al*, (2014) (16) in the herbivores which included *Axix axis*, *Muntiacus muntjak*, *Tetracerus quadricrnis*, *Boselaphus tragocamelus*, *Antilope cervicapra*, and *Cervus unicolor*. Mir *et al*.(2016) (23) in *Viverra zibetha* and *Hystrix indica* as well as Kolapo and Jegede (2017) (15) in stripped Hyena.

The eggs of *Toxocara* spp were recorded only in carnivores such as *Vulpes vulpes* 100%, *Canis familiaris* 66.66%, and *Macaca* sp. 33.33% while not recorded in any species of the CAs of the AC, and this result is similar to conclusion reached by Al-Amery (2013) (14) in Baghdad. Globally, *Toxocara* spp were recorded in CAs in zoos by Abe and Yasukawa (1996) (24) in sandpits of parks in Japan, Thawait *et al*, (2014) (16) of *Panthera leo*, *Panthera pardus*, *Melursus ursinus*, *Canis aureus*, *Mellivora capensis*, and *Macaca mulatta* as well as Kolapo and jegede (2017) (15) in ILorin.

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