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PUBLIC HEALTH IMPORTANCE OF ENTERIC PARASITOSIS IN CAPTIVE CARNIVORA

(With 4 Fig. & 2 Tables)

By

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الأهميه الصحيه للطفيليات المعويه في اكلات اللحوم الاسيره

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أجريت دراسات عن مدى اصابة اكلات اللحوم الاسيره بحديقة الحيوان بالجيزه بالطفيليات المعويه وقد تم جمع عدد ٨١ عينة براز من اكلات اللحوم ، كما تم جمع ١٢ عينه من عمال الحديقه القائمين برعاية الاقفاص التابعه لتلك الحيوانات . وقد تم فحص هذه العينات بطرق مختلفه . وكانت نتيجة فحص البراز فى الحيوانات كالآتى :

(٩٤ ر٤٪) بها جياردیا لامبليا ، (٤١ ر٧٪) بها كريبتوسبوريديا ، (٦٤ ر٨٪) أسكاريس ليونينا ، وكانت نتيجة فحص براز العمال المخالطين للحيوانات كالآتى :

(٦ ر١٦٪) اسكاريس لمبريكويدز ، (٣٣ر ٪) ديدان دبوسيه ، (٢٥٪) جياردیا لامبليا (٣٣ر ٪) أنتاميبا كولى ، (٢٥٪) انتاميبا هيستوليتيكا ، (٧ ر٤١٪) كريبتوسبوريديا . وعند أجراء العدوى التجريبيه لفئران سويسريه بيضاء بالطور المعدى للجياردیا ، الكريبتوسبوريديا و بويضات التوكس اسكارس ليونينا فوجد أنه لا يوجد فرق جوهرى بين الحويصلات التى عزلت من العائل الاصلى (الانسان أو الحيوان) وتلك التى عزلت من الفئران بعد عدواها مما يؤكد ان هذه الطفيليات يمكن نقلها للانسان .

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SUMMARY

Studies on enteric parasites in Carnivora in the zoo were carried out in Giza zoological gardens. Fecal samples from 81 different species of varnivores in the zoo were freshly collected individually in clean plastic bags, also faecal samples from their 12 attendants were collected. The direct wet mount, the flotation technique with sugar and zinc sulfate, the sedimentation technique as well as the staining method using the modified Ziehl-neelsen method were adopted for microscopic examination. The results of faecal examination from carnivora revealed *Giardia lamblia* cysts in 4.94%, Cryptopsoridia oocysts in 7.41% and *Toxascaris leonina* eggs in 8.64%, Likewise, examination of faecal samples from attendants revealed that 16.6% from them were infected with *Ascaris lumbricoides* eggs, 0.33% with *Enterobius vermicularis* eggs, 25% with *Giardia lamblia* cysts, 0.33% with *Entamoeba coli* cysts, 25% with *Entamoeba histolytica* cysts and 41.7% with Cryptosporidia oocysts. Experimental infection with Giardia, Cryptosporidia and toxascaris were conducted in susceptible mice to prove the zoonotic importance of such parasites being transmitted to man.

Keywords: Public health, enteric parasitosis & Captive carnivora

INTRODUCTION

Enteric parasites of different natures known to be transmissible between animals and man are included under protozoa such as Cryptosporidia, *Giardia lamblia* or nematodes such as *Enterobius vermicularis* or cestodes such as Echinococcus spp.

Cryptosporidium is of cosmopolitan distribution in man, birds and reptiles *(CANNING 1990)*. *Giardia lamblia* is a serious protozoan parasite which affects human beings and some other mammals *(LEVINE, 1973)*. Giardia isolates from human lack strict host specificity, while other isolates show extensive biological differences with respect to host specificity, virulence and infectivity *(STRANDEN et al., 1990)*. One of the most important nematodes usually infecting felines in the zoo is *Toxascaris leonina (KIÖS and LANG, 1982)*. *OMAR and FAHMY (1988)* in Egypt, recorded the infection in some felines in Giza

zoological gardens. *Enterobius vermicularis* is also another nematode transmissible between man animals.

Therefore, the present work has been carried out to throw light on certain enteric parasites of carnivora in the zoo from the zoonotic point of veiw.

MATERIALS AND METHODS

Faecal samples from 81 carnivore, which were one wold like jackal *(Canis lupaster)*, 4 Egyptian foxes *(Vulpes vulpes aegyptica)*, 1 fennec fox *(Vulpes zerda)*, 3 sand foxes *(Vulpes ruppellii)*, 1 Egptian mongoose *(Herpestes icheneumon)*, 3 black jackelled wolves *(Canis familiaris)*, 4 cheetahs *(Acinonyx TJubatus)*, 11 leopards *(Felis leopardas)*, 14 tigers *(Felis tiqris)*, 9 lions *(Felis leo)*, 9 Siamese cat *(Felis catus)*, 3 wild cats *(Felis selvistris)*, 7 brown bears *(Ursus arctos)*, 2 Malayan bear *(Helorctos malayanus)*, 7 Polar bears *(Thalastos maritimus)*, 2 Striped hyena *(Hyena hyena)*, 1 Ring tailed coati *(Nausua nausua)* and 1 Racoon *(Procyon lotor)*, and their 12 attendants in giza zoological gardens were freshly collected individually in plastic bags. The direct wet mount, the flotation techniques with sugar and zinc sulphate, the sedimentation technique with formalin-trition ether technique *(LEVINE, 1985)* as well as the staining nethod using the Modified Ziehl-Neelsen methood *(HENRIKSEN and POHLENZ, 1981)* were adopted for microscopic examination.

Forty susceptible suckling Swiss mice were obtained from a clean colony, which is maintained in Animal Health Research Institute, After weaning, the mice were divided into 5 equal groups, each of eight kept in separate cages with free access to clean water and enough feed. From the first group 6 mice were infected orally with 0.2 ml of suspension of *Giardia lamblia* cysts obtained from carnivora, and 2 were left without infection as control. From the second group, 6 mice were infected orally with 0.2 ml of suspension of *Giardia lamlia* cysts obtained from human origin, and 2 were left without infection as control. Likewise, from the third and fourth group, from each group, 6 mice were infected orally with 0.2 ml of suspension of Cryptosporidia oocysts obtained from carnivora and man, respectively, and in each case 2 mice were left without infection as control. Concerning the fifth group, 6 mice were orally infected with *Toxascrais leonina* embryonated eggs and 2 mice were left without infection as control.

Daily examination of faecal materials of mice was carried out continously until the first appearance of the infective stage of the concerned parasite. In case of migratory parasite,

as *T. leonina*, sacrification of infected and control mice was carried out 2 months post-infection and post mortem examination was performed. The liver and the brain were inspected carefuly by digestion using the pepsin-hydrochloric acid method, and smears were microscopically examined.

RESULTS

Table 1 shows that examination of faecal samples from zoo carnivora revealed Cryptosporidia oocysts in 2 Brown bears out of 7, one malayan bear out of 2,1 Polar bear out of 7 and 2 Cheetah out of 4. *Giardia lamlia* cysts were found in 2 Black jackeled wold out of 3 and 2 Siamese out of 9, while *T. leonina* eggs were found in 2 leopards out of 11, 3 tigers out of 14 and in 2 lions out of 9 (Fig. 1).

The percentage of infection in carnivora was 4.94% *Giardia lamblia* cysts, 7.41% Cryptosporidia oocysts and 8.64% *T. leonina* eggs. Likewise, examination of faecal samples from 12 attendants revealed *Ascaris lumbricoides* eggs in 2 cases (16.6%), *Enterobius vermicularis* eggs in 1 case (0.33%), *Giardia lamblia* cysts in 3 cases (25%), *Entamoeba coli* cysts (0.33%), *Entamoeba histolytica* cysts in 3 (25%) and Cryptosporidia oocysts in 5 attendants (41.7%).

Table 2 indicates that experimental infection of mice infected with infective materials of enteric parasites from animal origin revealed that *Giardia lamblia* produced active infection in 4 mice out of 6, the first appearance of cysts in the mice faeces was after 10-13 days post-inoculation, and the mice continued to shed Giardia cysts for 18-21 days. On the other hand, Cryptosporidia oocysts in mice faeces appeared in 3 out of 6 experimentally infected mice on the 3^{rd} to 5^{th} day post-infection and the potent period was 10-15 days. In case of *T. leonina* eggs, the six mice were sacrificed 2-months post inoculation, from which 3 only showed round fibrous cysts each containing one coiled larva in the liver tissues (Fig. 2), while examination of the brain revealed no cysts. after digestion of such cysts, the larvae were recovered viable in the saline solution, the larva measured on average 637.5 μm (Fig 3&4). In the same time, experimental oral inoculation of mice with infective stages of enteric parasites of human origin revealed that 4 infected mice out of 6 excreted giardia cysts on the 4^{th} to 14^{th} days post infection and the cysts excretion continued for 21-25 days. In case of cryptosporidia, 4 mice out of 6 showed positive infection and the prepatent period was 3-7 days, and excretion of oocysts continued for 2.9 days.

DISCUSSION

Carnivora in zoo gardens are exposed to parasite infection especially enteric ones. One of the most common and prevalent nematodes encountered during faecal examination from such animals was *T. leonina* eggs (8.64%). The egg of Toxascaris is characterized by its slightly oval appearance with smooth shell different from that *Toxocara canis* which is circular, with thick finely pitted shell. In Egypt, *OMAR and FAHMY, (1988)* reported the infection of *T. leonina* in Giza zoological gardens in carnivora with a percentage of 40%. This nematode is most frequently occurring in canines in zoological gardens *KLÖS and LANG, (1982)*, the source of infection of animals with it is the stray cats or rodents entering accidentally the animal cages *(FUKASE et al., 1987)* and contaminating animal feeds.

Concerning protozoa,, faecal examination revealed *Giardia lamblia* cysts (4.94%) and Cryptosporidia oocysts (7.4%). *Giardia lamblia* was recorded by *SWAN and THOMPSON, (1986)* in dogs (21%) and cats (14%). The rate of infection may vary according to the age of animals *SYKES and FOX, (1989)*, the contact with other animals *(SISK et al., 1984)* or man *(SWAN and THOMPSON, 1986)* and the presence of flies *(NESVADBA, 1979)*. On the other hand, Cryptosporidia infection in carnivora was reported by many authors *(CARLSON and NIELSEN, 1982, in RACOON)*. The infection with this coccidian protozoa depends to a great extent on the age and the immunity status of the host *(NOUR et al., 1988 and SALEM, 1989)*.

Regarding the human subject, coprologic examination of attendants in contact with carnivora revealed *Giardia lamblia* cysts in 3 cases (25%) and cryptosporidia oocyts in 5 attendants (41.7%).

The presence of Giardia and Cryptosporidia infection in both animals and their attendants ascertained the great probaility of the cross transmission of infection between man and animals. This was quite clear after experimental infection was carried out (Table 2), which realized that the crosss transmission of the enteric parasites between man and animals is quite possible. The prepatent period after infection of mice with *Giardia lamblia* cysts from carnivora was nearly similar, also in case of cryptosporidia there were no great difference between the prepatent and patent period obtained after mice inoculation with oocysts from carnivora and oocysts from human origin.

In mice infected with *T. leonina* eggs and sacrificed 2 months post-infection *(BURREN, 1971)*, the larvae were found in the liver encapsulated in a fibrous cyst. recovered *T. leonina*

larvae from sacrificed infected mice proves that rodents may be a source of infection with *T. leonina* to carnivora predating on such rodents. Development of the parasite to the adult stage can take place in the carnivora, and consequently man can contract infection with *T. lonina*. The mouse in this case is considered as a paratenic host. *DONALDSON (1979)* pointed out to the probability of *T. leonina* to be transmitted from cat to man. Also, *DESOCHERS and CURTIS (1987)* stressed upon the potential zoonotic risks from this nematode. Since attendants and veterinarians have a sort of occupational contact with such animals, thus man may contract easily this infection through contamination of food with embryonated eggs.

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Table (1) Results of coprological examination of different carnivores in the zoo

Animal species	Total No. of examined animals	Enteric parasites detected by different methods				Number of positiv cases
		Floatation concentration technique	Sedimentation technique	Direct smear	Modified Ziehl-Neelsen technique	
Family Ursidae						
Brown bear	7				Cryptosporidia spp oocyst	2
Malayan bear	2				Cryptosporidia spp oocyst	1
Polar bear	7				Cryptosporidia spp oocyst	1
Family Canidae						
Black jackeled wolf	3			G.lamblia cysts		2
Wold like jackal	1					
Egyptian fox	4					
Fennec fox	1					
Sand fox	3					
Egyptian mongoose	1					
Ring-tailed coati	1					
Racoon	1					
Family Felidae						
Cheetah	4				Cryptosporidia spp. oocysts	2
Leopard	11	T.leonina eggs				2
Tiger	14	T.leonina eggs				3
Lion	9	T.leonina eggs				2
Siamese	9			G.lamblia cysts		2
Wild cat	3					
	61					

Table (2): Results of experimental oral inoculation of mice with infective stages of enteric parasites obtained from zoo-carnivores and their attendants

Parasite species	Origin of infective material	No. of infected mice / control	No. of positive mice / infected	prepatent period / days	Patent period / days
G.lamblia cysts	Carnivora	6 / 2	4 / 6	10 - 13	18 - 21
	Man	6 / 2	4 / 6	4 - 14	21 - 25
Cryptosporidia spp. oocysts	Carnivora	6 / 2	3 / 6	3 - 5	10 - 15
	Man	6 / 2	4 / 6	3 - 7	2 - 9
T.leonina embryonated eggs	Feline	6 / 2	3 / 6	‡The mice were sacrificed 2-months post infection. ‡Round cysts, each containing one coiled larva, were detected in the liver tissues. ‡Examination of the brain revealed no infection with any cysts.	

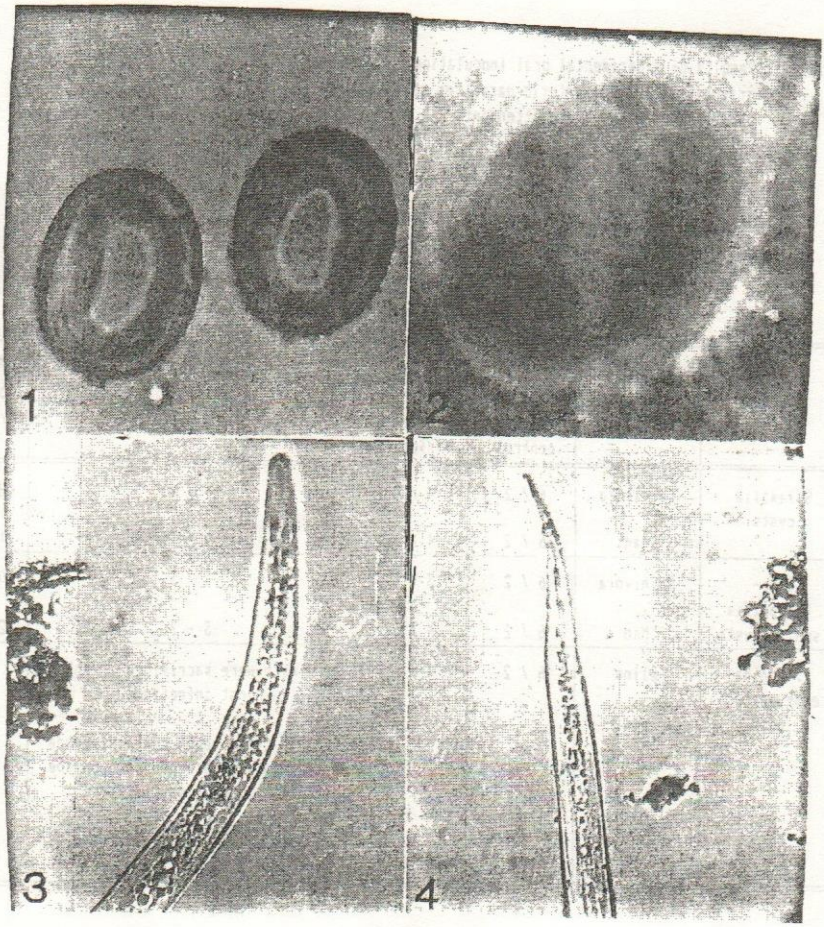

Fig.1. Two fresh Toxascaris leonina embryonated eggs. X 500 .

Fig.2. Cyst in liver of mouse containing Toxascaris leonina larva. X 125 .

Fig.3. Anterior extremity of Toxascaris leonina larva recovered from cyst of infected mouse. X500.

Fig.4. Posterior extremity of Toxascaris leonina larva recovered from cyst of infected mouse. X500.