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PARASITOLOGICAL STUDIES OF SOME GASTEROINTESTINAL PARASITES OF CAMELS IN ASSIUT GOVERNORATE WITH SPECIAL REFERENCE TO ZOONOTIC NEMATODES

(With 4 Tables and 3 Plates)

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دراسات طفيلية على بعض طفيليات الجهاز الهضمي في الجمال بمحافظة أسيوط وخاصة ديدان النيماتودا التي قد تصيب الإنسان

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أجريت هذه الدراسة للتعرف على طفيليات الجهاز الهضمي في الجمال بمحافظة أسيوط . من خلال فحص وزرع عينات البراز . وقد شمل البحث فحص عينات براز من ١١٣ جملا . وقد وجدت نسبة الإصابة بالطفيليات (٧ر٧٩%) موزعة كالأتي : ٢ر٥٢% بها بويضات ديدان و ٣ر١٣% بها أكياس الكوكسيديا و ٢ر١٤% بها عدوى مشتركة ، وكانت نسبة العدوى بالديدان الاسطوانية كالآتي : ديدان التريكوسترونجليس (٣ر٤٥%) ، ديدان التريكوريس (٧ر٣٠%) ، ديدان الأسوفاجوستومام (٣ر٢٥%)، ديدان الشابرتيا (٣ر١٧%)، ديدان الهيمونكس (٣ر١٣%) ، ديدان الاوسترتيجيا (٣ر٩%) ، ديدان النيماتودريس (٧ر٢%)، وبالديدان الشريطية (ديدان المونيزيا ٦ر٦%) ومن الطفيليات الأولية أكياس الايميريا وكانت كالآتي : ايميريا كاميلاى (٧١%) ، ايميريا دروموداراى ٧ر٣٨% . وقد تم عمل مزرعة من عينات البراز وتم الحصول على الطور اليرقي الثالث (الطور المعدي) لديدان التريكوسترونجليس، الاوسترتيجيا، الاسوفاجوستومام، والنيماتودريس. وهذا سهل التعرف على هذه الديدان التي تتشابه في شكل بويضاتها التي توجد في البراز. تم مناقشة عدوى الإنسان ببعض ديدان النيماتودا وخاصة بعض أنواع من ديدان الأسوفاجوستومام التي وجدت بنسبة ٣٠% في الإنسان في توجو وغانا وتم تشخيصها هناك بواسطة عمل مزرعة للبراز وذلك للتشابه الكبير بين بويضاتها وبين بويضات الديدان الخطافية التي تنتشر في نفس المنطقة ، لذلك يوصى الباحثان بضرورة عمل مزرعة للبراز الآدمي في حالة وجود إصابة ببويضات الديدان الخطافية.

SUMMARY

Gasterointestinal parasites of camels in Assiut Governorate are investigated through faeces examination and coproculturing. Out of 113 camels examined, 79.7% were infected. From these, 52.2% were harbouring helminths eggs and 13.3% coccidian oocysts and 14.2% mixed infection. Prevalence of infection was: *Trichostnogylus* sp. (45.3%), *Trichuris* sp. (30.7%), *Oesophagostomum* sp. (25.3%), *Chabertia* sp. (17.3%), *Haemonchus* sp. (13.3%), *Ostertagia* sp. (9.3%), *Nematodirus* sp. (2.7%), *Moniezia* sp. (6.6%), *Eimeria cameli* oocysts (71%) and *E. dromedarii* oocysts (38.7%). Coproculture producing third stage larvae of *Trichostrongylus* sp., *Ostertagia* sp., *Oesphagostomum* sp. and *Nematodirus* sp. facilitated the identification of these parasites; some of which have very similar eggs. Human zoonotic infection with some of these nematodes was discussed, particularly *Oesphagostomum* sp. which was found in 30% of population in northern Togo and Ghana. Diagnosis of this human infection was mainly done through coproculture because of the similarity between eggs of *Oesophagostomum* and hookworm eggs which are prevailing in the same locality. Therefore, the present authors suggest doing stool culture in cases of human hookworm infection.

Keywords: Camels, Nematodes, Cestodes, Coccidia.

INTRODUCTION

Camels in Egypt are considered an important source of cheap animal protein, especially for the lower income group. One of the serious problems which concerned the major cause of their impaired milk, meat production and decline in calving is the parasitic diseases (Richard 1979). These animals have been considered an important reservoir hosts for infections of humans especially in population living in close association with them (Schwabe 1986). Gasterointestinal parasites of camels has been studied in Egypt and several localities of the world by: Selim and Rahman (1972), Lailla et al. (1986), Berkinbaev et al. (1987), Fadl et al. (1992), Nafie et al. (1992), Pathak et al. (1993), Egbe-Nwiyi and Chaudhry (1994), Magzoub et al. (1997), Sayed et al. (1997) and Sharrif et al. (1997). Some of camel nematodes are zoonotic (Faust and Russell 1957, Jeffrey and Leach, 1984 and Roberts and Janovy, 1996). Although sporadic cases of some of these nematodes

were reported in man, yet others e.g. *Trichostrongylus* species are fairly not uncommon human parasites; some of them are of considerable clinical and public health importance. Moreover, laboratory diagnosis of some of these parasites is hampered by the fact that the morphology of their eggs is identical to the eggs of hookworms (Blotkamp et al., 1993), which may be highly endemic in the same area. Therefore, coproculture of eggs was recommended to get the hatched larvae. The characteristic larval features make it possible to reliably differentiate these nematodes (Blotkamp et al., 1993). The aim of the present study was to determine and identify the gasterointestinal helminths and coccidian occysts which infect camels in Assiut Governorate, to assess their prevalence and identification of third stage larvae (infective larvae) of some camels nematodes.

MATERIALS and METHODS

1 - Collection of faecal samples:

The present study was done during the period from May to December 1999. One hundered and thirteen rectal faecal samples were collected from male and female camels from different localities in Assiut Governorate. These samples were collected in clean plastic cups and delivered directly to the laboratory.

2 - Examination of the faecal samples:

The faecal samples were examined for detection of gastrointestinal helminths eggs and *Eimeria* oocysts by concentration techniques (sedimentation and floatation) according to Soulsby (1982). The coccidian oocysts of different species of *Eimeria* were collected and sporulated in 2.5% potassium dichromate solution. The identification of helminths eggs was based on the description given by Soulsby (1982), *Eimeria* oocysts were identified according to Levine (1985). The size of the eggs and oocysts was measured by the use of eye-piece micrometer and illustrated by photomicrographs. Faecal culture was performed according to Eckert (1960). Identification of the third stage larvae (infective larvae) of some species of these helminths was done according to Dunn (1978) and Soulsby (1982).

RESULTS AND DISCUSSION

Out of 113 camels examined, 90(79.7%) were infected with gasterointestinal parasitic stages in their faeces. From these infected animals, 59(52.2%) were harbouring helminth eggs, 15(13.3%) were having coccidian oocysts and 16(14.2%) were suffering mixed helminths and coccidian parasites. Thus, total helminths infection was in 75 animals (66.4%) and total coccidian infection was in 31 animals (27.4%), Table (1).

1- Incidence of different helminth eggs:

The present study showed a high prevalence of gastrointestinal parasites in camels in Assiut Governorate (66.4%). Higher incidence (82.7%) was recorded by Nafie et al.. (1992) at North of Sinai Governorate. However, moderate infection rate (54%) was recorded by Sayed et al. (1997) from diarrhoeic camels in Assiut Governorate. In Saudi Arabia, the prevalence of camels gastrointestinal parasites was reported by El-Bihari and Kawasmeh (1980) to be 60% while Magzoub et al. (1997) reported results ranging between 62-90%. From Sudanese camels, Arzoun et al. (1984) recorded 89%. However, very mild infection rates were reported from USSR (4.1%) by Berkinbaev et al. (1987). The present high prevalence of gastrointestinal nematodes in comparison with previous studies of Selim and Rahman (1972), El-Magawry (1980), Karram et al. (1986) and Nafady et al. (1995) indicates that the prevalence of these parasites vary widely from region to anothor and even from season to season in the same area (Higgins, 1986). It is also proposed that age of examined animals, veterinary care and pastural condition have a predominant effect on the spread of such parasites. Seven nematodes and one cestode eggs were encountered during this study. Table (2) illustrates the parasites found in single and mixed infections, their prevalence, average and mean size of their eggs.

Nematode eggs:

1- ***Trichostrongylus* sp. eggs (Plate I, 1).** This shows the highest incidence of infection (45.3%). It is higher than that reported by Nafady et al. (1995). This could be due to adaptation and higher resistance of *Trichostrongylus* larvae to the hot dry climate and other changes in environmental conditions. Trichostrrongylids are common parasites in the digestive tract of herbivorous animals throughout the world; the majority of species occur as incidental parasites of man, some of them are of considerable clinical and public health importance (Faust and Russell, 1957). Eight

Trichostrongylus sp. have been reported from man with records from nearly every country of the world. Lawless et al. (1956) reported these nematodes in 70% of a village in Egypt. *Trichostrongylus* pathology is identical in humans and other infected animals. Traumatic damage to the intestinal epithelium may be produced by burrowing larvae and feeding adults. Systematic poisoning by metabolic wastes of the parasites and possible thyroid deficiency, haemorrhage, emaciation and mild anaemia may develop in severe infections (Roberts and Janovy, 1996).

2- ***Trichuris* sp. eggs (Plate I, 2)** showed also higher incidence of infection (30.7%). From Cairo, Nafady et al. (1995) recorded only 18.5% infection rate in camels, while Abdel-Aal and Sahlab (1998) reported only 1% of camels in Suez Canal zone. This may be attributed to methods of examination and seasonal variation. *Trichuris* causes severe pathological effects due to damage caused by burrowing of anterior thin end of the parasite in the wall of the intestine. Whether animal whip worms can infect man is a subject of controversy (Roberts and Janovy, 1996).

3– ***Oesphagostomum* sp. eggs (Plate I, 3)** reported in a rate of 25.3%. This is actually a very high incidence of infections as previous study from Cairo reported only 1.4% (Nafady et al., 1995). However, Kayun et al. (1992) suggested that rates of infection can be affected by the different methods used in stool examination. Moreover, Blotkamp et al. (1993) stated that diagnosis of *Oesphagostomum* spp. is hampered by the fact that the morphology of the eggs is identical to the eggs of hookworms. They added that only after coproculture of eggs for one week, during which the larvae will hatch, it is possible to reliably differentiate the larvae of *Oesophagostomum* by the characteristic features present in infective larvae. During the present study, stool culture was done and the infective larvae were obtained and described (Plate II, 3).

Some *Oesphagostomum* spp. has been recorded from man (Lie Kian Joe 1949, Faust and Russel, 1957 and Jeffrey and Leach 1984). Polderman et al. (1991) recorded *O. bifurcum* (a common parasite of monkeys) to be extremely common in man in northern Togo and Ghana (30% of population).

In camels as well as in man *Oesphagostmum* parasites cause significant morbidity. Encapsulated immature worms may cause

tumour-like nodules leading to intestinal occlusion (Polderman and Blotkamp (1995).

4- ***Chabertia* sp. eggs (Plate I, 4),** was recorded in 17.3% of infected camels. The parasite was not detected in Cairo camels in a recent study (Nafady et al., 1995). According to Soulsby (1982) the adult worms attach themselves firmly to the mucosa of colon by their buccal capsule and draw in a plug of mucosa. Worms probably suck blood by accident only, when a blood vessel is ruptured. Infection usually causes a marked diarrhoea with much blood and mucus.

5- ***Haemonchus* sp. eggs (Plate I, 5)** was recorded in 13.3% of infected camels. The parasite was also not recorded in Cairo camels (Nafady et al., 1995) while it was recorded in 5% of camels in Suez Canal Zone (Abdel-Aal and Sahlab, 1998). The parasite lives in the "fourth stomach" or abomasum of ruminants. It is one of the most pathogenic nematodes especially when found in large numbers and in young animals. These produce a fatal form of gastritis accompanied by severe anaemia (Soulsby, 1982). Human infections have been reported from four cases (Faust and Roussell, 1957) and other four cases (Jefferey and Leach, 1984).

6- ***Ostertagia* sp. eggs (Plate I, 6)** were found in 9.3% of infected camels. The parasite was not recorded by Nafady et al. (1997) from Cairo camels or by Abdel-Aal and Sahlab (1998) from Suez Canal Zone. *Ostertagia* spp. suck blood, but not as much as *Haemonchus* (Soulsby, 1982). *Ostertagia ostertagi* and *O. circumcincta* have been reported from man in Russia (Faust et al., 1976).

7- ***Nematodirus* sp. eggs (Plate I, 7)** were found in 2.7% of infected camels. The parasite was not found in Cairo camels (Nafady et al., 1995), but reported from Suez Canal Zone in 3% of camels by Abdel-Aal and Sahlab (1998).

Cestode eggs:

1- ***Moniezia* sp. eggs (Plate I, 8)** were found in 6.6% of infected camels. The present incidence of infection is somewhat higher than those previously detected by Nafady et al., 1995 (4.1%), but lower than those of Nafie et al. (1992) where rate of infection varied from 6.1% to 16.7% in different localities of north Sinai. Difference in incidence of infection indicates the activity of oribatid mites in different localities.

2 - Third stage larvae cultured from faecal samples:

Owing to the great difficulty exhibited in identifying eggs of some gasterointestinal camel nematodes, which are very close in shape and size, stool culture was done. In the present work, four filariform larvae were cultured; *Trichostrongylus* sp. (Plate II, 1), *Ostertagia* sp. (Plate II, 2), *Oesphagostamum* sp. (Plate II, 3) and *Nematodirus* sp. (Plate II, 4). Table (3) illustrates the different morphological features of these larvae. It was found that this technique facilitates the identification of the larvae (according to their length of the tail, sheath and the number of intestinal cells). Hence, it was easier to reach more acurate diagnosis of these nematode infections. The present authors call for using stool culture technique as routine laboratory examination of faeces of camels for nematode infection. Magzoub et al. (1997) assessed their helminths identification in camels by stool culture, although they did not describe the obtained larvae. However, the present work illustrates for the first time the morphological features of four larvae of camel nematodes. Previous descriptions of these larvae were done from studies on nematodes of ruminants other than camels (Dunn, 1978).

3- Incidence of different coccidian oocysts:

Out of 90 infected camels, coccidian oocysts were encountered in 15 animals (13.3%) as single infection and 16 camels as mixed infection with helminths eggs (14.2%). Total incidence of infection was 27.4% (Table 1).

Two species of *Eimeria* oocysts were reported in this study, *Eimeria cameli* (Plate III, 1, 2) and *E. dromedarii* (Plate III, 3, 4). Out of 31 infected camels, *E. cameli* oocysts were found in stool samples of 19 camel (61.29%) as single infection and in 3 camels (9.67%) as mixed infection with *E. dromedarii*. Total infection was in 22 camels (71%). On the other hand, *E. dromedarii* oocysts were recovered from 9 camels (29.03%) as single infection. Total infection was in 12 camels (38.7%) Table (4). Thus, it is clear that *E. cameli* is the most common coccidian parasite of camels in the locality. In relation to the total number of examined animals (113), *E. cameli* infection represented 19.5% and in relation to infected animals (90) the parasite represented 24.4%. The present prevalence of infection was more or less similar to that reported by Sayed et al. (1997) (25%), but higher than that of Kawasmeh and El-Bihari (1983) (14%) and much lower than that of Hussein et al. (1987) (40%). Variations in prevalence of coccidian oocysts infection may be due to the age of

camels, as older camels are oocyst-shedding carrier without clinical signs. Rate of infection is usually higher in camels calves. Overcrowding, stress factors as well as environmental conditions may also affect the incidence of coccidial infection.

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Table (1): Incidence of helminths and coccidian infection of camels.

No. of Ex. animals	Inf. an		Single Helm. inf.		Single Coccidian inf.		Mixed inf.		Total			
									Helminthes		Coccidian	
	No	%	No	%	No	%	No	%	No	%	No	%
113	90	79.7	59	52.2	15	13.3	16	14.2	75	66.4	31	27.4

Table (2): Prevalence and size of the different helminth eggs found in the faeces of camels. (n=75).

Helminthes Eggs	Single inf.		Mixed inf.		Total No. of an. Inf.		Size of egg
	No.	%	No.	%	No.	%	
Nematodes							
1- *Trichostrongylus* sp.	6	8	28	37.3	34	45.3	Av. 79-98 x 36-45 µ M 77 x 38.5 µ
2- *Trichuris* sp.	8	10.7	15	20	23	30.7	Av. 60-71 x 25-34 µ M 66.8 x 29.3 µ
3- *Oesphagostomum* sp.	5	6.7	14	18.7	19	25.3	Av. 63-71 x 38-43 µ M 70.9x47.6 µ
4- *Chabertia* sp.	3	4	10	13.3	13	17.3	Av. 63-98 x 45-58 µ M 90 x 53 µ
5- *Haemonchus* sp.	6	8	4	5.3	10	13.3	Av. 73-81 x 36-18 µ M 69.3 x 38.5 µ
6- *Ostariagia* sp.	3	4	4	5.3	7	9.3	Av. 76-95 x 37-44 µ M 61.6 x 38.5 µ
7- *Nematodirus* sp.	1	1.33	1	1.33	2	2.7	Av. 155-235 x 75-100 µ M 250.4 x 112 µ
Cestodes							
8- *Moniezia* sp.	1	1.33	4	5.3	5	6.6	Av. 73-81 x 54-69 µ M 76.9 x 66.97 µ

Av. = Average M = Mean

Table (3): Measurements and morphological features of infective third stage larvae of some Nematodes of camels.

Nematode larvae	Total length		Length of the Tail sheath		Special morphological features
	Range	mean	range	mean	
1- *Trichostrongylus* sp.	685.3-716.1 µ	710.3 µ	23.1-34.6 µ	30.8 µ	Short tail, large triangular intestinal cells, tail end with finger like projection
2- *Ostertagia* sp.	800.1-885 µ	844.4 µ	30.8-53.9 µ	46.2 µ	Inestinal cells clear, small and triangular shape
3- *Oesphagostomum* sp.	893-954 µ	927.9 µ	138.5-146.3 µ	141.5 µ	Intestinal cells small, rectangular and covered with coarse granules
4- *Nematodirus* sp.	885-1070.8 µ	965.4 µ	100-142.5 µ	120.5 µ	End of the larva has long forked tail.

Table (4): Prevalence and size of *Eimeria* sp. (coccidian oocysts) found in the faeces of camels (n=31).

E. cameli			*E. dromedarii*			Mixed inf.		Total coccidian			
								E. cameli		*E. dromedarii*	
No	%	Size	No	%	Size	No	%	No	%	No	%
19	61.29	Average 81-98x53-91µ Mean 82.7x57.6 µ	9	29.03	Average 24-33x20-26 µ Mean 33.2x26.1 µ	3	9.67	22	71	12	38.7

Plate I

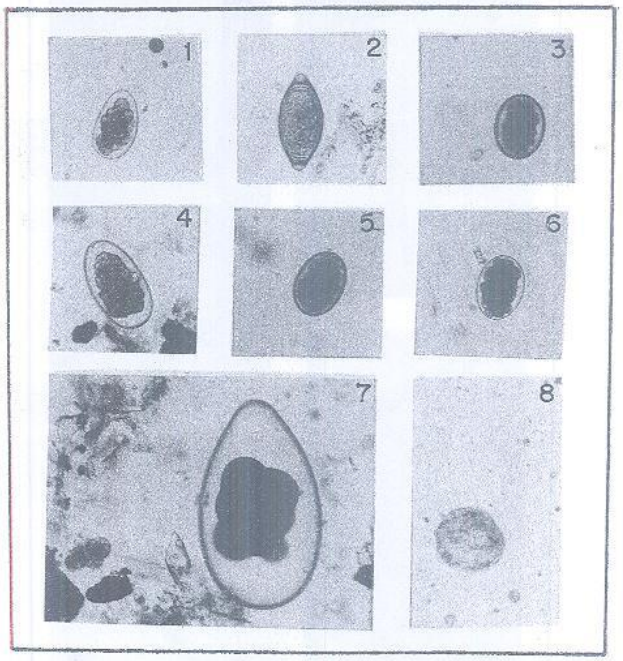

Plate I

Photomicrographs of different species of Nematodes and cestode eggs of camel

Fig. 1: ***Trichostronyglus*** **sp. egg X10**
Fig. 2: ***Trichuris*** **sp. egg X10**
Fig. 3: ***Oesphagostomum*** **sp. egg X10**
Fig. 4: ***Chabertia*** **sp. egg X10**
Fig. 5: ***Haemochus*** **sp. egg X10**
Fig. 6: ***Ostertagia*** **sp. egg X10**
Fig.7: ***Nematodirus*** **sp. egg X10**
Fig. 8: ***Moniczia*** **sp. egg X10**

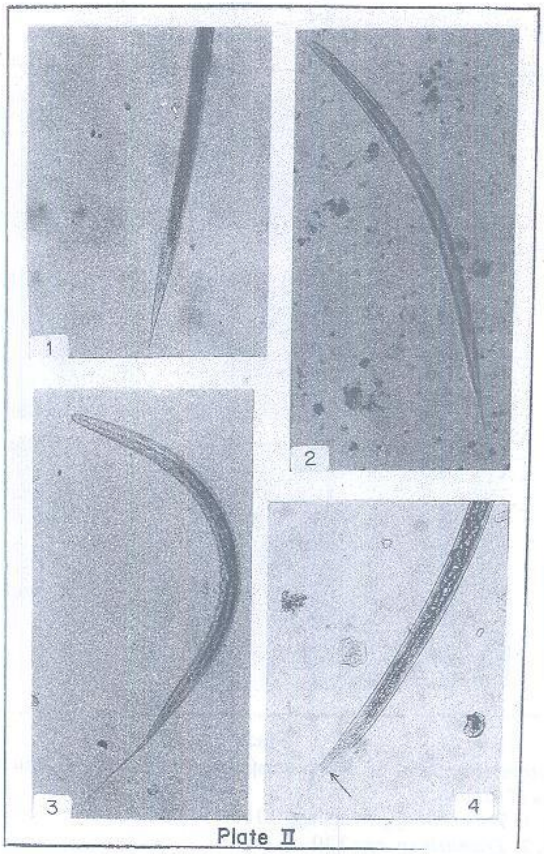

Plate II

Photomicrographs of third stage larvae (infective larvae) of four species of gasterointestinal nematodes of camels
Fig. 1: *Trichostronyglus* sp. larva (Post-end) X10
Fig. 2: *Ostertagia* sp. larva X10
Fig. 3: *Oesphagostomum* sp. larva X10.
Fig. 4: *Nematodirus* sp. larva (post-end) notice forked tail (arrow) X10

Plate III

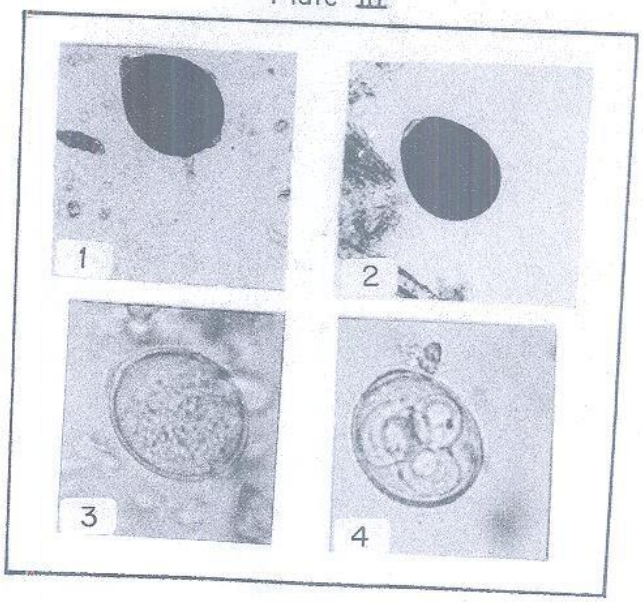

Plate III

Photomicrographs of two species of coccidian oocystos of camels
Fig. 1: Unsporulated oocyst of *E. cameli* X10
Fig. 2: Sporulated oocyst of *E. cameli* X10
Fig. 3: Unsporulated oocyst of *E. dromedarii* X40
Fig. 4: Sporulated occyst of *E. dromedarii* X40