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PREVALENCE OF EXTERNAL AND INTERNAL PARASITES IN LLAMAS (*Lama glama*) AT SURMAN PARK IN LIBYA

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ABSTRACT

This study was conducted on 83 adult llamas and 12 crias (*Lama glama*), to determine the prevalence of parasites in llamas kept at Surman park in Libya. These llamas were free from external parasites and haemoparasites.Faecal examination revealed that 85.5% of the adults had at least one type of egg. In adults, *Nematodirus* spp. was found in 55.4%, *Trichostrongyle* and *Strongyloide* spp. in 31.3% each, *Trichuris* spp. in 20.5%, unidentified large egg in 6.02%, *Fasciola hepatica* and *Eimeria* spp. in 1.2% each. Eight of the crias (66.6%) had at least one type of egg. *Trichuris* spp. was found in 41.6%, *Nematodirus* spp. in 16.6%, *Capillaria* spp., *Trichostrongyle* and *Eimeria* in 8.33%, each. The significance of these findings has been discussed.

Key words: *Gastrointestinal parasites, Lama glama, Libya*

In recent years, llamas have been imported by many countries like the United States, Canada, United Kingdom, Iraq and Libya (Al-Ani *et al*, 1992; Smith, 1993; Tait *et al*, 2002). Information available from around the world, indicates the llama as a host to a wide variety of external, internal and blood parasites (Jansen, 1959; Chavez and Guerrero, 1960; Gorman *et al*, 1986; Bishop and Rickard, 1987; Rickard and Bishop, 1991; Tait *et al*, 2002).

Parasitic infestations are among the factors that limit the productivity of any animal including the camelids. Pathological effects of infestation leads to reduction in the quality and quantity of meat and wool by reducing appetite and causing poor utilisation of nutritional substances, which may lead to low fertility, abortion and death (Windsor *et al*, 1992; Leguia, 1991).

The present study was carried out to determine the prevalence of external parasites, haemoparasites and internal parasites in a herd of llama kept at Surman park in Libya.

Materials and Methods

The present study was conducted on 83 adult (< one year old) and 12 crias (≥ 1 year old) llamas (*Lama glama*) (Bishop and Rickard, 1987). All animals were clinically examined and different body sites were carefully searched for the presence of lice and ticks. Deep marginal skin scrappings were collected from lesions of alopecia and crusting observed on 7 adult llamas. These samples were treated with 10% KOH and examined microscopically for the presence of mites and *Dermacentor*.

Blood samples were collected from the jugular vein. Thin blood smears were prepared, fixed with methyl alcohol, stained with May-Grunwald-Giemsa stain and examined for the presence of haemoparasites.

Faecal samples were collected from the rectum, kept in refrigerator at 4°C until these were examined during one week at the most. Direct, flotation (using saturated zinc sulphate solution) and sedimentation methods were used for the qualitative detection of parasite eggs. The modified McMaster method was applied for counting eggs per gram of faeces (EPG). All methods and techniques were conducted according to Soulsby (1986). Differentiation of parasite eggs was made according to criteria described previously (Georgi, 1974; Soulsby, 1986) with the exception of major *Trichostrongyle* genera which were not separable, and were grouped collectively as *Trichostrongyle* or strongyle eggs.

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Results

All llamas examined were negative for the presence of lice and ticks. Eight adult llamas had lesions of alopecia, crusting and dandruff. Three, two, one and two of these lesions were found on the area of the back, head, ear and nose, respectively. All were negative for mange and ring worm. Later on, lesions healed spontaneously. Blood smears were negative for the presence of haemoparasites.

Of the 83 faecal specimens obtained from adult llamas, 71 (85.5%) had at least one type of parasite egg (Table 1). *Nematodirus* spp. eggs were found in 46 (55.4%) of adults. *Nematodirus* spp. was the most prevalent with mild to moderate intensity of infestation (≥ 100-1200 EPG). *Trichostrongyle* and *Strongyloides* spp. eggs were the second most prevalent found in 26 (31.3%) each of adults. Intensity of infestation with these two parasites ranged from > 100-2400 and > 100- 15000 EPG, respectively. Trichurid eggs with variable pigmentation ranging from beige, yellow to orange - red were observed in 17 (20.5%) of adults. Intensity of infestation was low with this parasite (> 100-300 EPG). *Capillaria* spp. eggs were found in 8 (9.6%) of the examined llamas with low intensity of infestation (> 100-300 EPG). An unidentified egg which appeared large (108 - 126 × 288 μM), heavy, grayish with translucent thin shell containing poorly developed embryo, most likely to be of *Lamanema chavezi*, detected only by sedimentation in 5 (6.02%) of adult llamas with low egg count (> 100 EPG). Eggs of *Fasciola hepatica* and oocyst of *Eimeria* spp., each were found in one (1.2%) animal with low egg count (> 100 EPG).

Of the crias examined, 8 (66.6%) had at least one type of parasite eggs, all with low intensity of infestation (> 100 EPG). *Trichuris* spp. eggs were the most prevalent and found in 5 (41.6%) of the crias. *Nematodirus* spp. eggs were detected in 2 (16.6%) of the crias. The least common parasites were *Capillaria* spp. while *Trichostrongyle* eggs and *Eimeria* spp. oocyst, each was found in 1 (8.33%) animal only.

Discussion

The herd of llama on which this study was conducted is kept in Surman park. Cattle and sheep were not raised in the park. This may explain the absence of infestation with external parasites, since sheep and cattle may act as a source of infestation to llamas. Although this herd was free from lice infestation, llamas can be infestated with lice and it is considered sometimes as a major cause of loss in weight and wool production (Cheney and Allen, 1989; Windsor *et al*, 1992).

Ticks were not recovered from llamas during the whole year of the study. On the contrary, heavy tick infestations were observed in other domestic and pet animals raised in Libya. It seems that tick infestation is rarely a clinical problem in llamas, except when they cause tick paralysis, and one female tick of the genus *Dermacentor* is enough to cause the disease in a llama (Guerrero *et al*, 1986; Cheney and Allen, 1989; Rickard, 1992).

Table 1. Prevalence of gastrointestinal parasites among llamas at Surman park.

Parasite	Adults		Crias	
	Prevalence %	Range intensity (EPG)	Prevalence %	Range intensity (EPG)
Nematodirus spp.	55.4	>100-1200	16.6	>100
Trichostrongyle eggs	31.3	>100-2400	8.33	>100
Strongyloide spp.	31.3	>100-15000	0	0
Trichuris spp.	20.5	>100-300	41.6	>100-100
Capillaria spp.	9.6	>100-300	8.33	>100
Unidentified egg	6.02	>100	0	0
Fasciola hepatica	1.2	>100	0	0
Eimeria spp.	1.2	>100	8.33	>100

All skin lesions observed on some adult llamas were negative for mange. At least 3 genera of mites have been reported in llamas, *Sarcoptes*, *Chorioptes* and *Psoroptes* spp. Infestation with *Sarcoptes* spp. appear to be the most common and clinically important (Cheney and Allen, 1989; Rickard, 1992; Smith, 1993).

All thin blood smears examined were negative for haemoparasites. Many reports are available concerning infection of South American camelids with *Eperythrozoon* (Mclaughlin *et al*, 1990; Reagan *et al*, 1990; Middleton, 1999; Gaunt, 2000). Although the parasite appears to be primarily an opportunistic organism and is usually detected in immunocompromised animals, eperythro-zoonosis has produced substantial concern within the camelids industry (Smith, 1993). Serological tests would have been more informative in detecting haemoparasitic infection, since in the apparently normal llamas used in this study, parasitaemia, if present is very low. Rickettsia is not demonstrable in thin blood films prepared from subclinically infected and carrier animals (Soulsby, 1986; Gaunt, 2000). In addition, the vectors responsible for transmitting haemoparasites to these llamas were not detected.

Information available from around the world indicate the llama as a host to a wide variety of internal parasites (Zawadowsky and Zvaguintzev, 1933; Vasquez *et al*, 1956; Chavez and Guerrero, 1960; Gorman *et al*, 1986; Bishop and Rickard, 1987; Navone and Merino, 1989; Rickard and Bishop, 1991; Gafrune *et al*, 1999 and Tait *et al*, 2002). South American gastrointestinal parasites are reported to cause significant disease in the llamas (Jessup and Lance, 1982). It is apparent from this study that llamas brought from Bolivia and raised in Libya are also a host to a variety of internal parasites. Eggs' morphology and measurements were not enough for species identification, except eggs of *Fasciola hepatica* which are easily identified.

Nematodirus spp. was the most prevalent in adults and second most prevalent in crias. This agreed with others observations which suggests high prevalence of infestation with this parasite in llamas and alpacas (Bishop and Rickard, 1987; Cheney and Allen, 1989; Tait *et al*, 2002; Neyra *et al*, 2002). Prevalence of *Trichostrongyle* eggs were high among adults and crias in this study. Although the major *Trichostrongyle* genera were not determined, many were identified as important parasites in llamas and other South American camelids, like: *Trichostrongylus*, *Camelostrongylus*, *Cooperia*, *Oesophagostomum*, *Chabertia*, *Ostertagia*, *Bunostomum* and *Haemonchus* (Vasquez *et al*, 1956; Chavez and Guerrero, 1965; Led and Boero, 1972; Soulsby, 1986; Cheney and Allen, 1989; Navone and Merino, 1989; Rickard and Bishop, 1991).

Strongyloide spp. eggs were the second most prevalent in adult llamas. Unidentified species of *Strongyloide* eggs have been reported in adult llamas and crias in North America, but none has been recovered at necropsy (Bishop and Rickard, 1987; Rickard, 1994).

Trichuris spp. eggs were the most prevalent in crias, and third most prevalent in adult llamas examined in the present study. A faecal survey on llamas in North America indicated a low prevalence of *Trichuris* eggs in adult llama and crias (Bishop and Rickard, 1987) while high prevalence of this parasite has been reported in alpacas (*Lama pacos*) in Peru (Neyra *et al*, 2002). Variation in the pigmentation of *Trichuris* spp. eggs observed in this study, does not necessarily indicate the presence of more than one species of *Trichuris*, since as in *Ascaris* the same species may yield eggs with varying degree of pigmentation (Zaman, 1984). *Trichuris tenuis* is a typical whipworm of camelids with high prevalence in llamas and vicunas in South and North America (Rickard and Bishop, 1991; Gafrune *et al*, 1999). *Trichuris ovis* is the species most often reported in South America (Chavez and Guerrero, 1965; Alcaino *et al*, 1991).

Capillaria spp. was found with relatively low prevalence and low intensity in adult llamas and crias. Similarly, low prevalence of *Capillaria* spp. was detected by Bishop and Rickard (1987) in North America. *Capillaria* spp. was detected in the small intestine of many South American camelids raised in the United Kingdom (Tait *et al,* 2002). No known species of the genus *Capillaria* is yet identified in llamas (Rickard, 1994). The large, non - operculated unidentified egg, detected mostly by sedimentation, is most likely to be for *Lamanema chavezi*, the most important nematode of llama in South America. This was probably brought with the imported llamas.

Only one egg of *Fasciola hepatica* has been detected in one adult llama. It was within the group originally brought from Bolivia. This may indicate an old chronic infestation. Transmission to other llamas was not possible because the intermediate host, the snail vector (*Lymnea viatrix*) is not present in Libya. Infestation with *F.hepatica* and *F.magna* have been reported in llamas (Conboy *et al*, 1988; Cornick, 1988; Rickard and Bishop, 1991). Fascioliasis has a low prevalence in llama and alpacas (Chavez and Guerrero, 1965; Rickard and Bishop, 1991; Neyra *et al*, 2002). Severe acute fascioliasis with 100% mortality have been observed when llamas were taken to pastures previously occupied by sheep and cattle (Leguia, 1991).

In this study coccidial oocysts were detected in one adult llama and one crias with very low oocyst count (>100 EPG). Species of the genus *Eimeria* are reported in South American camelids. Most coccidial infestations as in other ruminants are asymptomatic (Cheney and Allen, 1989). Although young animals till one year are more susceptible to infestation (Rickard, 1994), severe fatal coccidiosis has been reported in adult llamas (Schrey *et al*, 1991).

The high prevalence of nematode eggs in the faeces of llamas was consistent with data obtained by others (Bishop and Rickard 1987; Navone and Merino, 1989; Rickard and Bishop, 1991; Rickard, 1992; Smith, 1993).

Low intensity of parasitism in this herd was detected by low egg count in most animals. However, six llamas brought recently from another farm, where deworming programme was not attempted gave the high egg count shown in Table 1. Low parasitic burden could be due to routine but irregular deworming programmes followed in this park. The habit of llamas defecating in certain confined places in the yard may also decrease the possibility of contaminating the whole area. Low parasitic burden has been reported in llamas raised in North America and in the United Kingdom (Bishop and Rickard, 1987; Smith, 1993, Tait *et al*, 2002). In South America high prevalence and high infestation rate has been reported. This may be due to the practice of herding animals together in the same place, year after year (Leguia, 1991).

An important feature of parasitic disease is that young are more susceptible than adults. This is mostly due to immunity acquired by age (Soulsby, 1986; Radostits *et al*, 1994). In this study crias harboured very low intensity of parasitic burden, all egg counts were less than 100. This could be due to low parasitic burden in their mothers. A related phenomenon is that the immune response may lead to restriction in shedding of parasite eggs by mature worms. Thus faecal egg count in adult may be inefficient measure of the actual worm burden (Guerrero and Alva, 1986; Radostits *et al*, 1994).

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