"Traditional Husbandry Practices and Major Health Problems of Camels in the Ogaden"

Abebe Wosene

Nomadic Peoples, Number 29, 1991

Nomadic Peoples 29:1991, Wosene, pp.21-30

Traditional Husbandry Practices and Major Health Problems of Camels in the Ogaden (Ethiopia)

Abebe Wosene

An attempt was made to study the husbandry practices and major diseases of Ogaden camels during a period of six months from December 1987 to May 1988. A sample of animals was weighed and their reproduction was studied. To find out the pathological picture, blood examination of 321 camels was made which revealed the presence of Trypanosoma evansi in 21 cases. Faecal examination of 180 camels showed a prevalence rate of 95.6% for the presence of eggs or oocyst of parasites. Post mortem examination of 41 camels in Jijiga abbatoir, in its turn, showed infestation rates of 29.2% hydatid cyst, 85.3% larvae of Cephalopsis titillator, 88% Haemonchus Spp, 39% Stilesia Spp, 44% Avitellina Spp, 31% Monezia Spp. and 4.8% Thysaneizia giardi. Furthermore, diseases like Corynebacteriosis, skin necrosis, camel pox and saddle sores were noted as important diseases of Ogaden camels. Therefore, on the basis of these findings and the increasing realization of the role of the camel in arid and semi-arid lands, special attention on the epidemiological investigation and integrated approach in the control of camel diseases is required to reach the maximum benefit of camel herding.

Introduction

The camel is one of the most important animals in the Ogaden region of Ethiopia and plays a central role in the socio-economic affairs of Somali pastoralists inhabiting the area. The ability of the camel to survive in harsh semiarid and arid areas of the world, its endurance in prolonged drought, and above all its high potential to convert the scanty resources of the desert into milk and meat makes this animal more important to dryland pastoralists, than any other domestic animal.

According to PADP (Peasant Agricultural Development Program), Harrerghe (1983), there are about 0.7 million camels in Harrerghe Administrative Region, of which the largest population is concentrated in the Ogaden part of Harrerghe region. Nevertheless, little is known about the traditional husbandry as well as the pathology of Ogaden camels. Therefore, this paper attempts to offer a general view of the traditional husbandry practices and major health problems of camels in the Ogaden, Ethiopia.

Material and Methods

Data used in this paper was based on observation, questionnaire and measurements. A total of 93 camel breeders with long experience in camel breeding were selected and interviewed using the questionnaire method. In addition, 70 camels from different age and sex groups were measured to estimate the average body weight using barometric weight determination formula given by Boue (1959) B.W. (kg) = $52 \times H \times T \times A \pm 25$, where H = height in cm, T = Thoracic perimetry in cm, and A = Abdominal perimetry in cm. (Gedamu, 1989; Manyazewal, 1987).

In collecting data about health problems, those animals brought to Jijiga Veterinary Clinic and those slaughtered at Jijiga abattoir were the prime subjects. Occasional field trips were also made. Different techniques such as blood, faecal, postmortem and clinical examinations were made. The blood of 320 camels and the faeces of 180 camels were examined in the laboratory for the presence of trypanosomes, and eggs of

parasites, respectively. The nasal cavities, gastrointestinal tract, heart, lungs, liver, and other organs of 41 camels were examined at Jijiga abattoir for the presence of adult parasitic worms and metacestodes. Identification of parasites was made by using the diagnostic key given by Soulsby (1982).

Results and Discussion

Camel and its Breeder

Among the different species of domestic animals that are bred by the pastoralists in the Ogaden, camels constitute the major part in the socio-economic affairs of the society. Like any other animal breed found in Ethiopia, the naming of the dromedary breeds often reflects the locality of the people who breed them. Ogaden camels that are bred by the Ogaden Somali people are large sized animals almost white in colour and yield more milk compared to Issa and Afar types of camels found in Harrerghe.

A number of attempts have been made to classify Ethiopian camels, none of which are complete and satisfactory (Wilson, 1989). The calculated average weight of Ogaden camels in this study, using barometric weight determination formula on 20 adult males, 30 adult females, and 20 one year old calves were 61 kg, 463kg, and 129kg, respectively (See Table 1).

Manyazewal (1987) obtained an average weight of 489kg for adult males, 398kg for adult females, and 83kg for one month old calves of Areho type of Erythrean camel. Therefore, these findings suggest that Ogaden camels are relatively in good physical condition which is expected to correlate positively with their production potential, particularly in terms of meat.

Camel breeders of different ethnic groups are distributed over a vast range of land in Ethiopia, inhabiting particularly the periphery of the country. These different ethnic groups of pastoralists and even different families of the same ethnic group have their own identification mark on the body of their camel made by a branding hot iron (See Table 2). Branding signs collected by the author from Afar areas are included. These different branding marks are also used on sheep, goats, and cattle reared by pastoralists in the area. The branding sign on a camel's body is important in identifying lost or stolen animals. Particular branding marks signify their own meaning, a practice which is not included in this study.

Breeding

Puberty is the age at which an animal first becomes capable of reproduction. During the period of sexual maturity this capacity is increased to the optimum level (in Mukassa-Mugerwa, 1981). Williamson and Payne (1978) and Matharu (1966) estimate that the sexual maturity of dromedaries occurs at 3 years, however, it is a common practice to withhold female camels from breeding until they are 4–6 years (Mukassa-Mugerwa, *ibid.*). According to the findings of this study, female Ogaden camels reach puberty at about four years' age but are not allowed to breed before the age of five. Thus, a female Ogaden camel will be six years before having her first calf. On the other hand, male Ogaden dromedaries reach puberty at about 4 years, but are not allowed to breed until the age of six years.

The longevity of Ogaden camels is known to be in the range of 22–25 years, while some camels live to 35 years, provided good nutrition and management are present. A female Ogaden camel gives 7–8 calves in her lifetime with a calving interval of two years.

A sexually capable camel often shows signs of heat or rut during a particular period of the year. Ogaden camels usually come into heat or rut during the rainy seasons when adequate feed supply is available. Because the level of nutrition is the key factor here, it is also possible for camels to become sexually active throughout the year, provided their access to feed is sufficient.

A rutting male camel is usually difficult to manage. Typical rutting signs include protrusion of the soft palate through the oral cavity, wetting of the neck area by a brownish black colored secretion from two poll glands, and frequent urination.

Table 1. *Estimated average weights of 20 adult males, 30 adult females and 20 one-year-old calves*

		A (cm)	T (cm)	H (cm)	B.W (kg)
Males (adult)	Maximum	305	227	211	774
	Average	275	207	203	612
	Minimum	257	105	190	504
Females (adult)	Maximum	285	210	205	650
	Average	253	190	182	463
	Minimum	235	184	170	389
Calves	Maximum	163	130	133	149
	Average	152	124	129	129
	Minimum	137	121	123	108

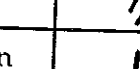
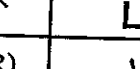
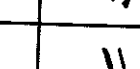
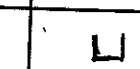
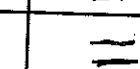
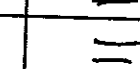
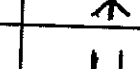
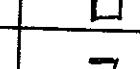
Selection of Camel Stud

Selection of camels for breeding is a common practice among Ogaden pastoralists, particularly in selecting a male stud camel for breeding. Qualities such as beauty, physical condition, and performance of a camel's parents are taken into consideration. The selected camel stud is not used for any purpose other than breeding until the end of its reproductive life. It is interesting to note that only one male camel is selected as a stud for a herd of 40–50 female camels. Male camels which are not fit as studs are either culled or separated from the flock and tamed for draught. This is done to avoid the development of aggressive behaviour during rutting which usually involves fighting. Male camels of about the same physical condition usually fight each other by biting the legs of their opponents. The loser is not allowed to enter the herd (Salih and Musa, 1988).

According to Hussein's study on Somali camel herding (1987), an outstanding male camel can serve 150–200 female camels during the mating season; therefore, one selected male camel is quite sufficient to serve a herd of 40–50 female camels during the mating season.

A rutting male identifies females that come into heat. In a few copulations observed, the male smells the vulva of the female and induces her into a sitting position. Then he tries to copulate in a couched position by inserting his penis into the female genitalia either by his own repeated effort or aided by his owner.

Table 2. *Branding signs made on the Ogaden and Afar camels*

	CLAN	SITE OF BRANDING	BRANDING SIGN
Ogaden (Somali tribe)	Dadimo	Lateral thigh	
	Sherif		
	Lankeyr		
	Abeskul		
	Weyten		
Afar tribe	Horona	Lateral thigh	
		Nose up to ear	
		Lateral abdomen	
	Adali	Lateral side neck	
		Lateral arm (L&R)	
		Abdomen	
	Helelecto	Lateral thigh	
		Hump down to abdomen	
		Lateral side neck	
		Infra orbital area (L&R)	
	Meandita	Nose	
		Lateral side neck	
		Abdomen	
	Banturo	Lateral abdomen	
		Lateral arm (R)	
	Geraysa	Lateral abdomen	
		Lateral side neck	
	Herekemela	Lateral abdomen	
		Lateral arm	

This is a branding sign made on the lateral arm of camel studs belonging to all clans of Afar pastoralists

Note: L=left; R=right

Pregnancy, Gestation and Calf Rearing

Pastoralists in the Ogaden often distinguish a pregnant female camel by her characteristic way of lifting her tail when approached by a male stud or handled by a man. This behaviour is considered as a reliable sign of pregnancy (Mukassa-Mugerwa, *ibid.*).

The gestation period of Ogaden camels varies between 12–13 months. They give birth to only one calf at a time and twinning is rarely encountered. The newborn calf is allowed to suckle the colostrum of its mother to a limited extent because of the danger of diarrhoea and death. The first milk is instead used as an important source of nutrient for the pastoralists themselves. The calf is completely dependent on the milk of its dam for the first few weeks of its life. Two teats are commonly left for the calf while the other two are milked depending on the production potential of the dam. After a few weeks of age the calf starts to feed on grasses, bushes and short tree leaves, and is weaned at the age of 12–14 months.

Feeding and Watering

Ogaden is a semi arid or arid land with a very sparse vegetation growth composed of bushes, trees, shrubs, and grasses. Due to this scanty vegetation growth, camels are subjected to travel 14–20kms away from their village in search of feed to meet their nutritional requirements. Ogaden camels feed mainly by browsing on trees or bushes available but they also graze grasses when shrubs or trees are not available. No supplementary feed is given to any class of camels except salt every 2 to 3 months. During the rainy seasons camels in Degehabur are supplemented with salty soils and grasses to make them fat (Tekle, 1989).

The availability of water is of crucial importance for any livestock production. However, when we see the ecology of camel rearing areas, water is scarce and sometimes even absent. The camel regions of Ethiopia receive low amounts of rainfall with most of them having a mean annual rainfall of 200–700mm, but some places, like Assab, receive as little as 50mm (Tekle, *ibid.*). Therefore, in areas such as Ogaden, only those animals capable of thriving on a minimal water supply are able to survive and reproduce. Fortunately, the camel is an exceptional animal able to survive long periods of drought without drinking, thanks to its special water physiology.

Because of the scarcity of water, camels may not be allowed to have water whenever they want. Watering frequency, therefore, depends upon the availability of water source, season of the year, and the capacity of the owner to pay money to the owners of wells or ponds.

Hence, Ogaden camels are watered every 10–15 days if the watering source is near and once in 30 days if the source is far away. During the rainy season camels will usually not drink water more often than every 1–2 months as the moisture content of the plants browsed is sufficient to supply their need of water. Ogaden camels are able to drink up to 200 liters of water at a time. Gauthier-Pilters (1974) noted that the water content of desert forage is higher than what is generally believed, and estimated that Saharan camels may derive 3–30 liters per day from foraging, depending on the status and locality of the vegetation. (in Mukassa-Mugerwa, *ibid.*).

Wells, ponds, and rivers are the main sources of water for Ogaden camels. Some of the watering sites in the Ogaden, like Bullale and Biyeada, are frequently visited by large numbers of camels from the surrounding areas as well as from far away. Pastoralists believe that water from these sites gives health and even cures to some of the ailments of the camels. Although there is no assessment of the chemical composition of the water, the author believes that the salt concentration is very high and makes up an important mineral source for camels.

Socio-economic Significance

The camel is the pillar of the socio-economic life of Ogaden pastoralists in that it is the main means of their subsistence and is attached to every aspect of their life.

Ogaden camels produce 8–10 liters of milk per day and even more when they are well fed and at the peak of lactation. The average length of lactation period is estimated to be 14 months. Dam is usually milked and suckled by the calf up to two months after copulation. Brémaud (1969) and Knoess (1976) gave the maximum daily production of the Somali and Adal camel to 12 and 10kg, respectively. The average length of lactation for these camels is 12 months but it may vary from 9 to 18 months (Brémaud, 1969; Leese, 1929; Field, 1979; Mares, 1954). (in Mukassa-Mugerwa, *ibid.*). The variation of this trait depends mostly on management and environment (season, temperature, feed supply) (Mukassa-Mugerwa, *ibid.*). Camel milk is usually consumed fresh and is preferred by Ogaden pastoralists to the milk of any other domestic animal. Some camel owners also sell camel milk in local markets to generate income.

Camel meat is also an occasional source of protein for Ogaden pastoralists. Camels are slaughtered on special occasions such as wedding ceremonies and religious festivals. Camels are also sold at local markets. The meat is then sold to consumers from a butcher shop. Usually male camels, which may be fattened or not, and females that have finished their reproductive life or have health problems, are sold on the market as a source of money. A good camel with a reasonable body weight is sold at 700–1000 Eth. Birr while a kilo of camel meat is sold at 7.00 Eth. Birr at Jijiga butcher shops.

The other important use of a camel is its enormous potential as a pack animal. Ogaden camels are used to transport water from watering sites as far away as 15km from the village, contraband materials from neighbouring countries, and firewood and other products from the markets and hamlets to settlement areas during trans-human migration. An adult camel can carry 300kg and cover up to 40km per day. Only male camels are used as pack animals.

In addition to its use as a milk, meat, and pack animal, an Ogaden camel has the potential for ploughing and riding. It is also sometimes used as a source of energy for traction, though this is very rare and insignificant. The major source of traction power for ploughing in the past and even at present are oxen. However, some farmers are presently relying on camels after the loss of oxen during the last drought period.

Major Diseases of Camel

In an attempt to study problems of health in Ogaden camels, diseases of different origins were encountered. The findings of the study are discussed here on the basis of the diagnostic techniques employed to diagnose diseases.

Blood Examination for Trypanosomiasis

Camel trypanosomiasis is one of the most important diseases caused by a protozoa Trypanosoma evansi, which is present in most areas with camels. The disease is locally known as *Duken*. It is worth mentioning that the pastoral knowledge about the epidemiology of such diseases is appreciable.

In an attempt to study the prevalence of the disease in Jijiga and its surroundings, 21 (6.5%) of the 320 camels examined were positive for trypanosomes in their blood. The identified species was entirely Trypanosoma evansi. This finding is found to agree with the results of previous workers such as Richard (1979), Melaku (1985) and others with regard to the prevalence of trypanosomiasis in Ethiopian camels. Richard (*ibid.*) has found 12.5% prevalence rate in camels of Borena (Ethiopia), Melaku (*ibid.*) has found one positive blood sample out of 300 samples collected from Harrerghe, and Trypanosomiasis Control Service found 8% positive in camels of Harrerghe.

All these findings suggest a low prevalence rate of trypanosomiasis in Ethiopian camels which may be attributed to the low level of parasitemia in the blood of infected animals, especially in the chronic form of the disease. However, the chronic form of the disease is very common in Ogaden camels and only rarely is the acute form

encountered. Fazil (1977) confirmed that camel trypanosomiasis is a slow, wasting protozoal disease in camels (in Mukassa-Mugerwa, *ibid.*). The disease is very common in rivery areas such as Fafem and Bombas. It is expected that areas with permanent or temporary waters are conducive for the breeding of biting insects which are vectors of the disease.

Coproscopy Examination

Out of 180 faecal samples examined for the presence of eggs of parasites, 157 (87%) of the samples were positive for helminth eggs such as strongyles, trichuris, cestodes and few protozoans like Balantidium.

This high prevalence of parasite eggs and protozoans among Ogaden camels positively agrees with the findings of previous workers. Birhanu (1986) found 91.5% infestation rate out of 71 camels examined from Jijiga Awraja. Graber (1975) found 93.6% prevalence rate from camels of Ogaden plain. Although the current finding does not show the intensity of the disease in camels it indicates the necessity of anthelmintic treatment to Ogaden camels.

Post Mortem Examination

Examination of camels slaughtered at Jijiga municipality abattoir discloses the presence of different disease causing agents: internal parasites, metacestodes, and nasal bot fly (See Table 3).

Gastro Intestinal Parasites

Forty out of the 41 camels examined were infested with one or more of gastrointestinal parasites listed on Table 3. The most common parasites obtained from Ogaden camels were Haemonchus, Trichuris and Cestodes. It is also important to note that polyparasitism is the most common manifestation of disease in Ogaden camels. The existence of different types of cestodes and nematodes in Ethiopian camels has been reported by numerous authors (Birhanu, *ibid.*; Graber *ibid.*; Richard, *ibid.*).

In all these studies Haemonchus, the most pathogenic Nematode Parasite, seems to be high in its prevalence in Ethiopian camels, urging the treatment of infected camels with proper anthelminthic drug.

Table 3. *Prevalence rate of Helminths, Cephalopsis titillator larvae and Hydatid Cyst in slaughtered camels at Jijiga abattoir*

	No. of camels examined	No. of positive animals	% of positive animals
Haemonchus spp.	41	36	87.8
Trichuris spp.	41	32	78.0
Stilesia spp.	41	16	39.0
Avitellina spp.	41	18	43.9
Moneezia spp.	41	13	31.7
Thysanezia giardi	41	2	4.9
Cephalopsis titillator larvae	41	35	85.3
Hydatid Cyst	41	12	29.3

Nasal Bot Fly

This is a larvae of Cephalopsis titillator that lives in the pharyngeal and nasa mucosa of camels and causing a disease, Cephalopsis. Burgmeister, et al. (1975) reported that the larvae of Cephalopsis titillator were highly pathogenic and that infected camels refuse to eat or drink and finally die with death accelerated by meningitis following secondary infection (in Mukassa-Mugerwa, *ibid.*).

The disease is locally known as *Sangale*. Examination of the head of 41 camels at Jijiga abattoir showed a prevalence rate of 85.3%% for the larvae of Cephalopsis titillator. Previously, Birhanu (*ibid.*) reported 90% infestation rate with a mean of 46 larvae/camel at Dire Dawa abattoir, and Melaku (*ibid.*) observed a high infestation rate (10/12) at Dire Dawa abattoir, the number varying from 7 to 56. Therefore, all the three studies in camels of Harrarghe show a high prevalence and the importance of the disease.

Metacestode

Hydatid cyst is the most important and prevalent metacestode encountered in Ogaden camels at the Jijiga abattoir during meat inspection. Twelve of 41 camels (29.26%), harboured hydatid cysts in their liver and lungs, when examined at the Jijiga abattoir.

Earlier reports by different authors also indicated the presence of hydatid cysts (larvae stage of Echinococcus species) in camels of Ethiopia and other parts of the world. Richard (*ibid.*) reported an infestation rate of 2/8 in Borena camels. Infestation rates of 50% in Morocco, 30% in Tunisia, 7.3–60% in Egypt, and 35.6% in Chad were reported by Graber and Call (in Richard, *ibid.*). These support the present finding in the Ogaden camels which is a relatively high prevalence rate. However, a variation exists between the results of Birhanu (*ibid.*) and Wubet (1987) which were 5.13% and 4.65% infestation rates in camels of Harrerghe, respectively. The area and size of samples may account for such differences.

Richard (*ibid.*) stated that pulmonary form of hydatid cyst is very common. This supports the present finding whereby 63.6% of the cysts were in the lungs and only 26.6% were in the liver of camels.

The present findings, therefore, suggest the importance of the disease; especially, its economic importance due to condemnation of organs, and its public health significance to the meat inspector, and indirectly, to the pastoralists in the Ogaden.

Clinical Observation

Clinical examination of diseased animals at veterinary clinics of Jijiga, Fafem, and Degehabur as well as field surveys in different parts of Ogaden, revealed the presence of diseases like corynebacteriosis, skin necrosis, camel pox, saddle sores, and other minor diseases.

Corynebacteriosis

This is a disease of adult camels usually known as *Malla* and characterized by the formation of subcutaneous abscess on the animals body particularly at the site of rump and cervical area. The disease has also been reported by Richard (*ibid.*) among camels in Borena Awraja. Based on isolation and identification of the agent, Richard (*ibid.*) concluded that Corynebacterium pseudotuberculosis is the causative agent.

Skin Necrosis

This disease, locally known as *Delao*, attacts young Ogaden camels and is characterized by cutaneous abscesses mainly on the neck, head, shoulders, and less commonly in other parts of the body. Richard (*ibid.*) reported the disease in young Borena camels. Curason isolated the etiological agent, Actinomycete (Nocardia) Cameli, from this disease (in Richard, *ibid.*).

Camel Pox

Camel pox is a viral disease of young camels characterized by manifestation of typical pox lesions and fever. Four cases of camel pox were encountered in young camels of about 1–2 years during the study period. Pox le-

sions were observed on the lips, nose, nostrils, under the tail, and inside the mouth. The animals were febrile (39.5–40°C). Richard (*ibid.*) reported the occurrence of camel pox among Borena camels and Melaku (*ibid.*) has observed six cases of camel pox among Issa camels.

Saddle Sore

This is one of the most common and prevalent skin diseases of adult camels caused by ill-fitted, improperly balanced loads. Male camels are highly predisposed to the disease, as only males are used as pack animals by the pastoralists in the Ogaden. Different degrees of the skin damage are encountered at the site of the back or hump of sick animals. Richard (*ibid.*) isolated a wide variety of pyogenic organisms from this disease. The disease is of importance to the pastoralist as it reduces the potential of camels as pack animals. For this reason, Ogaden pastoralists usually bring diseased animals to veterinary clinics for treatment.

Conclusion

The camel plays an important role in the life of the Ogaden pastoralists. As a means of subsistence and as the center of socio-economic affairs it is attached to every aspect of pastoral life. Due to its enormous capacity for milk and meat production the camel is fully utilized by the pastoralists.

Traditional camel pastoralism constitutes the only viable way of exploiting many areas where cultivation is impossible and grazing resources are poor. Therefore, the most successful resource management by camel pastoralism must be identified and preserved so that it may become the basis for any future development in the arid land.

The present study reveals a number of disease-causing agents hampering camel productivity in the Ogaden, besides the direct effect of the ever-threatened arid ecosystem in which most camels are raised.

The nutrient aspect, incidence, prevalence, and seasonality of camel diseases are not yet fully documented. It is, therefore, essential to establish the spectrum of camel diseases occuring in various zones of the country so that appropriate prophylactic measures can be proposed into camel production schemes.

References

Birhanu, A. 1986, *Survey of Camel Helminthiasis in Harrerghe Region*. Thesis, Faculty of Veterinary Medicine (FVM), Addis Ababa University (AAU).

Gedamu, F. 1989, "Camel Pastoralism in the Social and Economic Life of the Somalis in Ethiopia", in T. Teka (ed.), *Camel Pastoralism as a Food System in Ethiopia*. Proceedings of the IDRC/ILCA Workshop in April 1989. IDR, AAU, in cooperation with SIAS, Uppsala.

Graber, M. 1975, *Dromedary Parasitosis, Helminths and Helminthiasis of Domestic and Wild Animals in Ethiopia*. IEMUT, Maison Alfort France.

Hussein, M. Ali 1987, *Traditional Practices of Camel Husbandry and Management in Somalia*. Camel Forum Working Paper No. 19. Mogadisho and Uppsala: SOMAC/SIAS.

Manyazewal, A. 1987, *Management and Diseases of Camels in Keren Awraja*. Thesis, FVM, AAU.

Melaku, T. 1985, *Observation on Productivity and Disease of Issa Camel*. Thesis, FVM, AAU.

Mukassa-Mugerwa, M.E. 1981, *The Camel (Camelus Dromedarius). A Bibliographical Review*. Addis Ababa: ILCA.

Peasant Agricultural Development Program (PADP) Harrerghe 1983, Project Brief.

Richard, D. 1979, *Study of the Pathology of the Dromedary in Borena Awraja, Ethiopia*. IEMUT, Maison Alfort France.

Salih, M.A. Mohamed and B. El Haj Musa (eds.) 1988, *Camel Production as a Food System*. Camel Forum Working Paper No. 26. Mogadisho and Uppsala: SOMAC/SIAS.

Soulsby, E. S. L 1982, *Helminths, Arthropods and Protozoans of Domesticated Animals*. ELBS/Bailliere Tindal. 7th Edition.

Tekle, K. 1989, "Camel Pastoralism in Ethiopia: A Geographical Appraisal", in T. Teka (ed.), *Camel Pastoralism as Food a System in Ethiopia*. Proceedings of the IDRC/ILCA Workshop in April 1989. IDR, AAU, in cooperation with SIAS, Uppsalá.

Trypanosomiasis Control Service: *Camel Trypanosomiasis in Harrerghe*. Unpublished.

Wilson, R.T. 1984, *The Camel*. London and New York: Longman.

1989, "Camels and Camel Research in Ethiopia", in T. Teka (ed.), *Camel Pastoralism as a Food System in Ethiopia*. Proceedings of the IDRC/ILCA Workshop in April 1989. IDR, AAU, in cooperation with SIAS, Uppsala.

Wubet, M. 1987, *A Preliminary Study of Echinococosis-Hydatidosis in Harrerghe Region and the Efficacy of Glinus Lotoidus Seeds Against E. Granulosus in Pups Infected Experimentally with Hydatid Material*. Thesis, FVM, AAU.

Acknowledgements

I am highly indebted to Dr. Jacquest Almargot for his encouragement and advice while doing this research. I would like also to extend my sincere thanks to the staff of Jijiga Third Livestock Development Project for facilitating my research.

Abebe Wosene is a lecturer, Department of Pathology & Parasitology, Faculty of Veterinary Medicine, Addis Ababa University.