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Emerging Parasitic Infections in Goats in Pastoral Systems in Kenya

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ABSTRACT
A cross-sectional survey of ixodid tick infestation and gastrointestinal strongylosis was carried out in 76 herds, in 25 districts in five provinces representing arid and semi-arid lands in Kenya. A total of 832 indigenous goats consisting of 500 Small East African and 332 Galla breeds were sampled. The total number of ticks counted was 17,748, consisting of three major genera, *Rhipicephalus, Boophilus* and *Amblyomma.* The mean tick abundance per animal was 21.4 ticks, with the highest count of 111.8 ticks per animal in Tharaka Nithi district of Eastern province. The highest prevalence rate of 100% was in Tharaka Nithi and Kitui districts of Eastern province, Taita/Taveta of Coast province and Siaya and Homa Bay of Nyanza province.
The mean strongyle egg count in the five provinces was 545 EPG. The ranges indicated very high counts in some herds such as 13700 EPG and 11,100 EPG in Eastern and Rift Valley. The Rift Valley recorded the highest prevalence rate of 81.7% while the Coast recorded the lowest prevalence rate of 39.7%.
The ectoparasites and endoparasites will increasingly become economically important considering the increasing pressure on communal grazing land and watering points in pastoral districts of Kenya.

Key words: Goats arid and semi-arid lands, ixodid ticks, strongylosis, Kenya.

1.0 INTRODUCTION

Eighty percent of Kenya's land area referred to as Arid – Semi-Arid Lands (ASAL) is unsuitable for arable farming but suitable for livestock keeping (ALRM Status Report, 1997; Homewood & Lewis, 1987). Climatic changes in the ASAL are adverse, alternating between droughts and floods and are known to severely affect production by predisposing to disease and causing severe water and animal feed shortages.

Small ruminants form a very significant proportion of the total number of livestock in the ASAL districts of Kenya. Kenya's goat population is estimated to be about eight million (Mwandotto, *et al.*, 1992). Most of them are kept in the districts classified under ASAL. They therefore form an important contribution to the economy of the mostly pastoralist households. Health and disease, however, constitute one of the important production constraints (Gathuma & Mutiga, 1997). Studies on ixodid ticks and tick control programmes in Kenya over the years have placed emphasis on cattle, due to the economic significance of tick borne infections, such as theileriosis, babesiosis and anaplasmosis, amongst exotic breeds of dairy cattle. There has been little or no work done to elucidate the prevalence rates and economic significance of ixodid ticks amongst small ruminants, especially goats (Young *et al.*, 1998; Ongore *et al.*, 1999). Ixodid tick infestations have direct effects on animals such as blood sucking, tick worry and myiasis. They are also well documented as vectors for bacterial, viral and rickettsial diseases (Isa *et al.*, 1995).

Helminthoses especially strongyloses are documented to cause significant economic losses amongst small ruminants in some of the ASAL (Gatongi, 1995; Shivairo & Musalia, 2002). There has, however, been no systematic study to document the prevalence rates in most of the districts classified under ASAL, especially considering the increasing grazing pressure in the diminishing communal grazing land and watering points (Homewood & Lewis, 1987; Kenya Dept. of Vet. Services Report, 1997).

This paper reports results of an extensive cross-sectional survey of ixodid tick infestations and strongyloses in goats in various districts classified as ASAL in Kenya.

2.0 MATERIALS AND METHODS

2.1 Location

The study was carried out in a total of 76 herds in 25 districts in five provinces of Rift Valley, Eastern, Coast, Nyanza representative of the ASAL.

2.2 Animals
The goats sampled belonged to the two main local breeds, the Small East African (SEA) and the Galla. They were all kept under traditional systems. Only adults were sampled.

2.3 Sample collection
Using hand forcep taking care to avoid damage to mouth parts, adult ticks were picked from the ears, perianal region, underbelly and interdigital space. The ticks were put into labeled bottles containing 70% alcohol for preservation and subsequent identification and counting according Hoogstrall (1956). Five grams of a faecal sample was collected from each goat in the same herds. Strongyle egg counts Eggs Per Gram (EPG) was determined according to the modified McMaster technique (Whitlock, 1962).

2.4 Data Analysis
The data was analyzed using general linear model of the Statistical Analysis Systems (SAS).

3.0 RESULTS
A total of 832 goats, consisting of 500 Small East African and 332 Galla were sampled. In total 17,925 ticks were counted consisting of three major genera. *Rhipicephelus, Boophilus and Amblyomma, R. evertsi* was most prevalent in the ASAL districts of Rift Valley, Eastern, Coast and Nyanza provinces while *R. appendiculatus* was the more common species in Western parts of Eastern and Coast province while *B. decolaratus* was identified in Meru district of Eastern province.
Table 1 summarizes the results of tick counts by province. The overall mean tick count per animal was 21, while the mean prevalence rate by province was 84.6%. Some of the highest mean tick counts per animal were observed in two districts of Eastern province. Tharaka Nithi district had 111.8 ticks per animal while Kitui had 83.6 ticks per animal. These two districts also recorded the highest prevalence rates of 100% each. In the Coast province Taita / Taveta district had a mean tick count of 47.1 ticks per animal with a prevalence rate of 100%. In Nyanza province, Siaya district had a mean tick count of 29.5 ticks per animal, while Homa Bay district had mean tick count of 23.8. Both districts had a prevalence rate of 100%.
Table 3 is a summary of strongyle egg counts. The overall mean count for the five provinces was 545 EPG. Western province recorded the highest mean EPG of 937, followed by Nyanza with 714 EPG. Coast province had the lowest EPG of 311. The mean prevalence rate ranged between the highest 81.7% for Rift Valley province and the lowest 39.4% for Coast province.

The high EPG ranges 11,100 in Rift Valley province and 13,700 in Eastern province are an indication of high infection in individual animals in some herds.
Table 4 compares the overall mean tick count per animal and the overall EPG for the two breeds, the Small East African and the Galla. The overall mean tick count does not vary significantly from either one of the breeds. The same applies to the overall mean EPG.

4.0 DISCUSSION AND CONCLUSION
In studies of ixodid ticks in goats (Isa *et al.,* 1995) the prevalence of *R. evertsi* in dry areas was attributed to the same reason. The role of *R. evertsi* in the transmission of various tickborne goat diseases is however not well documented. In studies elsewhere *B. decoloratus* was associated with the transmission of anaplasmosis in goats, while *A. variegatun* was well documented as a vector for heartwater disease causing organism. In a study of ticks in small ruminants in Morocco 6 ticks species of different genera were collected in goats, three belonging to *Hyalomma* and three to *Rhipicephalus* especially *R. bursa* a known vector for anaplasmosis (Sahibi *et al.,* 2012).
This study demonstrated that ixodid tick infestation in indigenous goats in ASAL, in Kenya is widespread with high prevalence rates and high abundance on individual animals. In previous studies in ASAL (Shivairo & Musalia 2002; Gatongi, 1995), it was demonstrated that *Haemonchus contortus* was the most dominant strongyle worm in sheep and goats. A count of 545 EPG considered a medium infection level would therefore be significant in these conditions of low level management in pastoral systems in Kenya.
In a previous study (Shivairo & Musalia, 2002) it was established that there was emerging pressure due to diminishing communal grazing land and many watering points were drying up leading to pressure on the remaining few. This in turn led to increased risk of disease spread especially pasture contamination with worm eggs in ASAL. Ixodid tick infestation and strongylosis in goats fall in the category of infections whose economic importance is likely to increase as a result of grazing and watering pressure.
There is, therefore, justification for further epidemiological studies to determine specific roles of the ticks as vectors of disease and their direct losses due to blood sucking and myiasis so that appropriate control measures

can be recommended. The impact of strongylosis also needs to be studied with a view to recommending cost-effective control measure such as a strategic deworming schedule to the pastoralists.

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Table 1: Sampled Provinces

	Rift Valley	Eastern	Western	Nyanza	Coast	Total
No. of districts	8	7	2	3	5	25
No. of herds	23	22	7	8	16	76
No. of goats	318	233	48	67	166	832

Table 2: Ixodid Tick Counts

	Rift Valley	Eastern	Western	Nyanza	Coast	Total
Total Count	2,782	9,954	568	1,269	3,352	17,925
Mean Count	7.9	44	12	21	21	21
SD	12.08	68.37	10.68	21.03	31.73	41.89
Range	0-7	0-38	0-50	0-85	0-145	0-380
Prevalence rate (%)	78.5	82.6	91.7	95	75.2	84.6

Table 3: Strongyle Egg Counts (EPG)

	Rift Valley	Eastern	Western	Nyanza	Coast	Overall mean
Mean EPG	515	635	937	714	311	545
Range	0-11,100	0-13,700	0-5400	0-6600	0-3100	76
SD	733.13	1224.18	1120.61	993.29	448.81	832
Prevalence rate (%)	81.7	67.3	60.4	62.7	39.7	62.4

Table 4: Comparisons of Tick Counts and Egg Counts between Breeds

	Mean Tick Count	Mean EPG
SEA	22.7	573
Galla	19.5	533
Overall Mean	21.4	545

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