

# Gastrointestinal Strongyle Egg Output and its Relationship with Tick Burden in Gambian N'dama and Gobra Zebu Cattle

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## Summary

Fortnightly quantitative analysis of rectal faecal samples for the presence of strongyle eggs were carried out from May 1992 to April 1993 on 11 Gambian N'dama *Bos taurus* and 11 Gobra zebu *Bos indicus* cattle. Significantly ( $P < 0.001$ ) lower strongyle egg outputs were found in N'dama in comparison with zebu cattle. No correlation was found between individual cumulative tick burden and strongyle egg output in either breed, although individual variations in parasite burdens were lower in N'dama than in zebu cattle. This study strengthens the evidence for the presence of a natural resistant trait to strongyle infection in N'dama cattle.

## Résumé

Une analyse quantitative d'échantillons de selles, collectés per rectum, portant sur la présence d'oeufs de strongles a été effectuée tous les 15 jours de mai 1992 à avril 1993 sur 11 bovins gambiens N'dama *Bos taurus* et 11 zébus Gobra *Bos indicus*. Les N'damas ont présenté une excrétion d'oeufs de strongles significativement ( $P < 0.001$ ) inférieure à celle des zébus Gobra. Une leucocytémie significativement ( $P < 0.01$ ) plus élevée a été mise en évidence chez les N'damas par rapport aux zébus, uniquement pendant la période d'excrétion d'oeufs de strongles. Aucune corrélation n'a été mise en évidence entre la quantité individuelle de tiques et l'excrétion d'oeufs de strongles chez les bovins des deux races, bien que les N'damas aient montré des variations individuelles inférieures à celles des zébus. Les résultats de cette étude renforcent l'évidence de la présence d'une résistance naturelle aux strongyloses gastro-intestinales chez le bétail N'dama.

## Introduction

Gastrointestinal parasites represent one of the major risks to animal health in tropical Africa (3). In particular, gastrointestinal nematodes affect the general health of animals (9) with important repercussions on livestock production (8).

In developed countries nematode control is based on the frequent use of anthelmintics. In developing countries grazing area management, associated with strategic administration of drugs, has been proposed as successful alternative method (16).

In Africa, control measures set up on the use of anthelmintics are unlikely to be widely adopted because they are not sustainable by the rural communities. In addition, in regions where pasture is scarce and food shortage occurs as the long dry season progresses (as reported in The Gambia (1)), pasture rotation is of little relevance. In this situation breeding of animals more resistant to local pathogens could be advantageous to regional farmers in reducing the costs of management.

In The Gambia, *Haemonchus contortus*, *Cooperia* spp., *Oesophagostomum radiatum* and *Bunostomum phlebotomum* have been reported as the most frequent nema-

todes of the gastrointestinal tract in cattle (10), in particular each of the first three species infects approximately 70 % of cattle. These infections generally debilitate the animals (10,11). Tick infestation is also a factor affecting cattle production in Africa (17). Recent studies carried out in The Gambia have found lower strongyle egg output (2,12) and lower burdens of *Amblyomma variegatum* and *Hyalomma* spp. (13,14) in local Gambian N'dama *Bos taurus* in comparison with Gobra zebu *Bos indicus* cattle.

The aim of the present study was to validate previous observations on strongyle egg output in N'dama and Gobra zebu cattle as repeatability of results in different cattle populations is of critical importance to support the presence of a natural resistance trait in a breed (15). In addition, relationship between strongyle egg output and tick infestation burden was also considered in the present paper as the presence of helminths in the gastrointestinal tract can interfere with host susceptibility to other parasites (11).

## Material and methods

Data were collected from May 1992 (5 May was labelled as Week 0) to April 1993 (20 April labelled as Week 50).

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Eleven Gambian N'dama and 11 Gobra zebu cattle were used. Age of the animals (11 to 16 months at the start of the experiment) and sexes were balanced in the two breeds. All the cattle were born and reared at the International Trypanotolerance Centre (ITC) and kept under the same management conditions on station from birth till the end of the experiment. This experiment was carried out at the same time and on the same cattle as reported earlier (14).

The climate of the study area is sub-sahelian with one annual rainfall. The rainy season for the study period lasted from Week 4 to Week 22, i.e. June-October 1992, with a peak of precipitations in August (ITC meteorologic station, unpublished data). The vegetation is degraded, deciduous savannah woodland. During the early dry season the animals had extended access to crop residues (millet, sorghum, cereal stovers); in the late dry season and in the rainy season they grazed natural pasture composed mainly of *Andropogon gayanus*, *Hyparrhenia* spp., *Digitaria* spp., *Pennisetum* spp. and *Imperata cylindrica*. Grazing time was 6-9 h day<sup>-1</sup> according to the time of year. At night they were tethered individually in a fenced pen. Faecal deposits were removed daily from the ground of the overnight holding pen.

At Week -1 the animals were treated with a acaricide (gamma benzene hexachloride 20 % w/v at a dilution of 1:800). Acaricidal treatment was repeated at Week 11. A description of tick collection methodology is reported elsewhere (14). An anthelmintic treatment with fenbendazole (7.5 mg/kg) was given orally at Week 7.

Rectal faecal samples were collected fortnightly from Week 0. Faecal samples were analyzed quantitatively for the presence of strongyle eggs by the McMaster technique (4). Faecal strongyle egg count was expressed as egg per gram of faeces (epg). Field data collection was carried out between 8.00 and 10.00 h. Investigations carried out in the study area showed that *A. variegatum* represents 70-85 % of the total species of ticks infesting cattle, followed by *Hyalomma* spp.; *Boophilus* spp. and *Rhipicephalus* spp. occur, however, in low numbers (13,14).

### Data editing and statistical analysis

Results on tick species burdens in the two breeds have been presented and discussed in another paper (14). In the present article individual cumulative tick counts, all species together per breed, are reported and considered solely as a possible interactive factor influencing the level of faecal strongyle egg output.

Nonparametric Kruskal-Wallis one-way analysis of variance was used to compare differences between breeds in strongyle egg output as data tested for normal hypothesis showed an asymmetrical distribution. Individual cumulative strongyle epg and tick count data were used in a linear regression model to test relationship between parasite burdens.  $P < 0.05$  was considered as statistically significant.

## Results

At the start of the experiment all the animals were visually free of ticks and found to be free of gastrointestinal strongyles, as assessed by the absence of eggs in examined faecal samples. The anthelmintic treatments were successful in maintaining all the cattle free of strongyles till Week 12.

The peak of strongyle egg excretion in faeces was observed in the late rainy season (September-October) in both breeds. The fortnightly means of faecal strongyle eggs were more stable and always lower in N'dama than in zebu cattle, except on Week 42 (Fig. 1). The overall mean of strongyle egg output was significantly ( $P < 0.001$ ) higher in zebu ( $n=209$ ) in comparison with N'dama ( $n=209$ ) cattle, being 546.1 (range 0-5600) and 105.7 (range 0-1800) respectively.

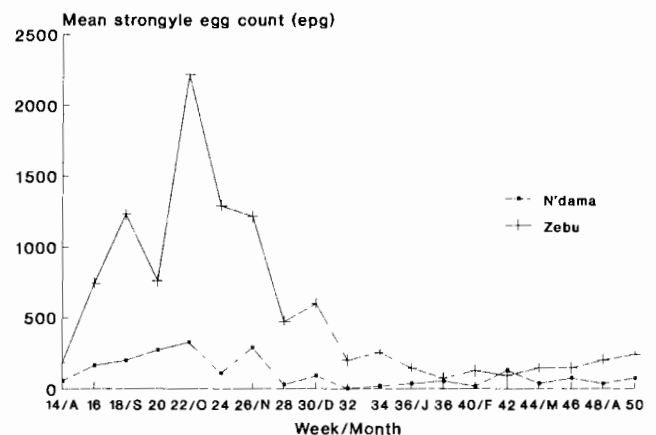


Figure 1: Mean strongyle egg count (epg) in N'dama and zebu cattle throughout the study.

Individual cumulative counts of faecal strongyle eggs and tick burdens, all species together, are shown in Fig. 2. No relationship was found between the two variables, although a positive trend was present in both breeds.

## Discussion

The dynamics and level of gastrointestinal nematode egg outputs observed in our study are in accordance with results obtained by other authors in different ecoclimatic zones in The Gambia (2,10).

The animals used in the present study were herded together resulting in an equal risk of exposure to infective strongyle larvae. Thus, the significantly lower strongyle egg output found in N'dama in comparison with zebu cattle could be due to a more effective response to strongyle infection in the former. Nematode egg production is depressed in resistant sheep (5,6). Higher gastroenteric worm burdens were observed in necropsied zebu cattle having higher faecal strongyle egg counts while epg counts were lower in less infected N'dama (2).

A study carried out in Australia showed that Brahman zebu *Bos indicus* cattle have higher resistance to both ticks and worms than European *Bos taurus* cattle but within breeds the resistance was negatively correlated (7).

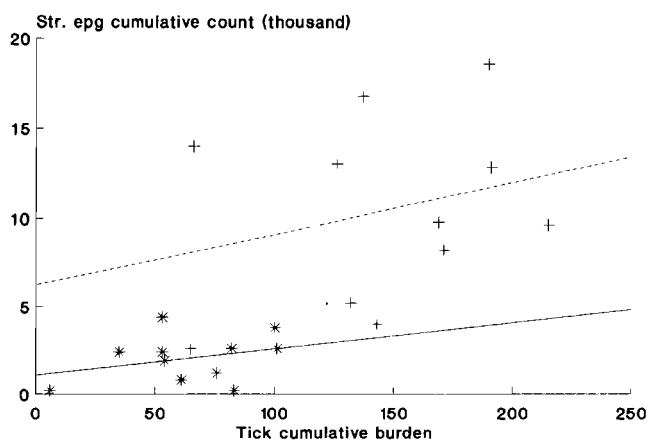


Figure 2: Relationship between cumulative tick burden and strongyle egg counts (egg) in N'dama (\* observed value; — regression line) and zebu cattle (+ observed value; ... regression line).

In contrast, previous studies reported lower tick burden and strongyle egg output in Gambian N'dama in comparison with Gobra zebu cattle (2,12,13). In the same animals, lower number of *A. variegatum* and *Hyalomma* spp. were found on N'dama than on zebu cattle (14), although the present analysis did not show a correlation between indi-

vidual tick burden and strongyle egg output in either breed. It is of interest to note, however, that in this respect the scatter plot (Fig. 2) suggests the presence of a concurrent individual resistance to both ticks and gastrointestinal strongyles in the N'dama population. The absence of a statistically significant relationship could probably be due to the small sample size. Wider individual variations in parasites burdens were present in zebu cattle.

## Conclusion

This study strengthens the evidence for the presence of a resistant trait to strongyle infection in N'dama cattle.

The present study was carried out on station animals. Further investigations involving larger cattle populations at village level are necessary to substantiate the presence of dual parasitic resistance in the N'dama breed. The economic significance of the parasite resistance in N'dama cattle should also be evaluated.

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