

***Rhipicephalus appendiculatus* burdens on Cattle in Relation to Age and Sex of the Host.**

H. Chungu*, N. Speybroeck**, R.G. Pegram*** & D.L. Berkvens**

Keywords : *Rhipicephalus appendiculatus* – Tick burden – Host age – Host sex.

Summary

Adult *Rhipicephalus appendiculatus* burdens on indigenous cattle in the Southern Province of Zambia were determined. Older animals were infested with significantly higher numbers of ticks than younger animals and male cattle had higher infestations than females of comparable age.

Résumé

Charges de *Rhipicephalus appendiculatus* burdens en fonction d'âge et sexe de l'hôte bovin.

Les charges d'adultes de la tique *Rhipicephalus appendiculatus* burdens se nourrissant sur des bovins indigènes dans la Province du Sud de la Zambie ont été déterminées. Une relation significative entre charge et âge et sexe de l'hôte a été établie. La charge augmentait avec l'âge de l'animal et les hôtes mâles portaient un nombre de tiques plus élevé que les femelles d'âge comparable. Les conséquences de cette découverte sont discutées.

Introduction

Newson *et al.* (4) demonstrated a correlation between grazing position of Zebu cattle within the herd and the three-host ixodid tick *Rhipicephalus appendiculatus* burdens: animals at the rear of the herd carried significantly fewer ticks. Neither D.L.B. nor R.G.P. (unpublished data) were able to confirm this in traditionally kept herds in Zambia. Newson *et al.* (4) furthermore reported that the sex of the hosts played no obvious part in tick burdens on cattle, although there might have been too few observations for male animals.

An increase in tick burdens with increasing age up to one year was observed in traditional herds in the Eastern Province of Zambia and this could be related, at least partly, to the grazing position of the calves within the herd, as tick burdens on calves are reduced also through grooming by the mother. No relationship between tick burdens and host age was found for animals over one year of age (D.L.B., unpublished data, some 1480 observations made on animals between one week and nine years of age between November 1982 and October 1983).

The present experiment was conducted primarily to obtain information on the duration of feeding periods of male and female *R. appendiculatus* on cattle under field conditions, but at the same time, data on the effect of host age and sex on tick burdens were obtained.

Material and methods

Experimental site

The experiment was carried out at Nkonkola Veterinary Camp (16°15'S, 27°54'E) at Mazabuka District in the Southern Province of Zambia. The site is situated at an altitude of 1200 m and has a single rainy season from November to April. The vegetation is mixed woodland and grassland with large areas farmed mainly for maize.

Cattle

Twenty-eight adult indigenous Ila-Tonga (Sanga) cattle were recruited from a single traditionally managed herd and divided into four groups of seven each (Table 1). The owner kept very detailed records, including the exact date of birth. The animals were eartagged for identification. They were kept with the rest of the herd, grazing during daytime and returning to the kraal at night. No tick control was practised by the farmer.

Sampling

The observation period started on 2 February 1996 and ended on 15 April 1996, during which time 21 observations were made (Mondays and Fridays). Farm visits were conducted between 06:00 hrs - 07:00 hrs. During the visits, the animals left the kraal and entered a crush-pen where the sampling was done. Adult *Rhipicephalus* were collected from or counted *in situ* in both ears of each animal, the predilection site of adult *R. appendic-*

*Department of Animals Production and Health, Veterinary Research Station, Mazabuka, Zambia

** Institute of Tropical Medicine, Department of Animal Health, Nationalestraat 155, B-2000, Antwerpen, Belgium

*** Caribbean *Amblyomma* Programme, Bridgetown, Barbados

Received on 23.03.00 and accepted for publication on 06.07.00.

Table 1

Sex and age of experimental animals, together with their average adult *R. appendiculatus* burdens

Group	Animal eartag	Sex	Age (years)	Average adult <i>R. appendiculatus</i> burdens
1	726	F	7.15	3.05
	727	M	10.41	3.67
	730	M	7.49	4.38
	732	M	7.39	5.10
	734	M	8.06	3.05
	736	M	9.98	6.14
	739	F	7.93	2.57
2	722	M	3.00	2.15
	724	F	5.84	0.40
	725	F	5.65	3.35
	728	M	9.59	7.80
	729	M	3.32	2.90
	731	M	2.97	0.85
	738	M	6.71	2.55
3	723	F	2.92	1.06
	733	F	7.39	1.28
	735	F	8.18	1.67
	737	M	6.71	2.78
	740	F	5.35	1.06
	741	F	3.00	1.39
	743	M	7.96	4.39
4	742	M	7.97	7.56
	744	F	4.26	0.81
	745	F	6.73	2.06
	746	M	6.65	7.31
	747	F	5.55	1.38
	748	M	2.81	1.13
	749	M	7.41	3.88

ulatus (1). The sampling schedule is presented in Table 2. According to MacLeod (3), the most abundant species of *Rhipicephalus* in this area of the experiment was *R. appendiculatus* and no other *Rhipicephalus* species was found in our collections (250 + specimens). Hence, all counted *Rhipicephalus* ticks were classified as *R. appendiculatus*.

Statistical analysis

The ages of the cattle were determined at the start of the experiment. Individual tick burdens were calculated as averages of the 21 observations.

Statistical analysis was carried out in Stata 6.0 for Macintosh (5) using a Generalised Linear Model (GLM) with Poisson error term and logarithm link: the average number of ticks per host was the response variable, age and sex of hosts the factors.

Results

The results are presented in Figure 1. This figure shows that the tick burdens increase with age of the host and also indicates that male hosts have higher infestation rates than females. Figure 1 also shows the GLM fitted model, which yielded significant effects for both age ($p = 0.003$) and sex ($p = 0.007$).

Tick burdens increased significantly with age and female cattle carried about half the tick burdens of

Table 2

Sampling schedule. Count = *in situ* count; collect = collection of adult ticks of ears and identification and count in laboratory. Initial collections (collect) not used in calculations.

Date	group 1	group 2	group 3	group 4
02/02/96	(collect)			
09/02/96	count	(collect)		
12/02/96	count	count		
16/02/96	count	count	(collect)	
19/02/96	count	count	count	
23/02/96	count	count	count	(collect)
26/02/96	count	count	count	count
01/03/96	collect	count	count	count
04/03/96	count	count	count	count
08/03/96	count	collect	count	count
11/03/96	count	count	count	count
15/03/96	count	count	collect	count
18/03/96	count	count	count	count
22/03/96	count	count	count	collect
25/03/96	count	count	count	count
29/03/96	collect	count	count	count
01/03/96	count	count	count	count
05/04/96	count	collect	count	count
08/04/96	count	count	count	count
12/04/96	count	count	collect	count
15/04/96	count	count	count	count

males of similar age ($e^{-0.72}$). It must be noted that removing the three male animals with the highest ages from the data set does not change the nature of the relationship between age and sex of host and tick burden and that the coefficient for female hosts still remains -0.73 .

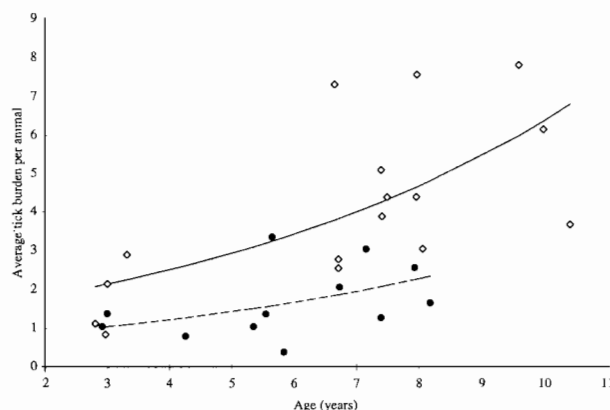


Figure 1: Average *Rhipicephalus appendiculatus* numbers per host in function of host age and sex (○ = male, ● = female) and fitted model I (— = male, - - - - = female)

Discussion

The results show that age within the adult group of cattle affects the tick burdens of individual animals in the field. Older animals were infested with significantly more ticks than young ones. Further, the results show that sex of the host influences the degree of tick infestation: male animals carry more ticks than female ones.

This model can partly be explained by the findings of Newson *et al.* (4) that animals at the front of a herd carry relatively more ticks than animals at the rear. Newson *et*

al. (4) report that cattle grazing in a herd steadily moving forward exhibit behaviour that determines the number of ticks that each animal picks up. Some cattle become leaders and move in front of a herd while other cattle differentiate into followers which move behind the herd. The authors indicate that animals in front of a herd activate the ticks along the way (movement, odour) and pick up a large proportion before the animals further down the herd hierarchy have the opportunity to pass through the same area. It is more likely that male and older animals lead and the female animals follow, but this should be confirmed experimentally.

Similar findings have been reported for *Ixodes dammini* on deer. The ticks' distribution was highly aggregated, associated with deer gender and age (2). The heavier *I. dammini* infestations on bucks were attributed to their

higher mobility. Higher mobility has also been observed in bulls which may predispose them to higher infestations.

The importance of the current finding lies in the fact that age and sex of adult hosts needs to be taken into consideration both when assigning animals to experimental groups in future experiments based on observations of tick burdens and when interpreting data from unplanned surveys and observations.

Acknowledgements

We would like to acknowledge the assistance of the Director of the Veterinary Department of Zambia, Dr. P. Sinyangwe, in supporting the trial.

Literature

- 1 Baker, Maureen K. & Ducasse F.B.W., 1967. Tick Infestation of Livestock in Natal. I. The Predilection sites and Seasonal variations of Cattle Ticks. *Jl. S. Afr. Vet. Med. Ass.*, **38**, 447-453.
- 2 Kitron U., Jones C.J., Bouseman J.K., Nelson J.A. & Baumgartner D.L., 1992. Spatial Analysis of the Distribution of *Ixodes dammini* (Acari: Ixodidae) on White-Tailed Deer in Ogle Country, Illinois. *J. Med. Entomol.*, **29**, 259-266.
- 3 MacLeod J., 1970. Tick infestation patterns in the southern province of Zambia. *Bull. Entomol. Res.*, **60**, 253-274.
- 4 Newson R.M., Mela P.N.P. & Franklin T.E., 1973. Observations on the numbers of the tick *Rhipicephalus appendiculatus* on the ears of Zebu cattle in relation to hierarchical status in the herd. *Trop. Anim. Health Prod.*, **5**, 281-283.
- 5 StataCorp, 1999. Stata Statistical Software: Release 6.0. College Station, TX: Stata Corporation.

H. Chungu, Zambian, DVM, M. Sc., Research Assistant, Department of Animal Production and Health, Veterinary Research Station, Mazabuka, Zambia.
N. Speybroeck, Belgian, Ir. Agric., Research Assistant, Institute of Tropical Medicine, Department of Animal Health, Antwerp, Belgium.
R.G. Pegram, British, Ph.D., Program Co-ordinator, Caribbean *Amblyomma* Programme, Bridgetown, Barbados.
D.L. Berkens, Belgian, Lecturer, Institute of Tropical Medicine, Departement of Animal Health, Antwerp, Belgium