

Preliminary observations on ticks and tickborne diseases in the North West province of Cameroon.

II. Bovine heartwater

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Key words

Cattle - *Amblyomma variegatum* - Cowdria - Bacteriosis - Cameroon.

Summary

In this study, the effects of heartwater on cattle at the Bambui (Cameroon) Animal and Veterinary Research Institute were evaluated. The seasonal distribution of *Amblyomma variegatum* ticks was observed and the breed, sex, age and seasonal effects with regard to mortality by heartwater studied. The variations of the monthly distribution of *Amblyomma variegatum* were highly significant ($P < 0.005$). Adult ticks were most abundant in the beginning of the rainy season leading to more deaths due to heartwater. The overall breed effect on mortality was significant ($P < 0.005$). Holstein crosses were the most susceptible to heartwater. Control methods must be set up to prevent adult crossbred animals from being exposed to heavy infestations by *A. variegatum*. There were differences among age groups with regard to mortality but there was no sex effect. Field studies need to be carried out to assess the situation in the extensive cattle farming system practiced by most of the livestock farmers in Cameroon.

■ INTRODUCTION

Heartwater is a fatal disease of cattle, sheep and goats in tropical and subtropical parts of the world, particularly in Africa. This disease caused by the rickettsia *Cowdria ruminantium*, transmitted by several species of *Amblyomma* ticks (2) is limited to the geographical distribution of these ticks. In Cameroon, heartwater remains one of the major disease problems, apart from rinderpest, contagious bovine pleuropneumonia, and trypanosomosis, that delays the cattle industry development. Among the several species of *Amblyomma* ticks already known to transmit heartwater (11, 16), the only species so far found in Cameroon is *Amblyomma variegatum*.

Methods of tick control generally used in Cameroon are acaricides applied in spray races or dips or using knapsack sprayers. These methods though effective are too expensive for the majority of cattle breeders who are smallholders but possess about 80% of the cattle and small ruminant population in Cameroon. This group of farmers employs the manual method (hand picking) which for obvious reasons is only effective for small herds.

At the Animal and Veterinary Research Institute (IRZV) of Cameroon the usual tick control method is application of acaricides in spray races: once a week in the rainy season and once every two weeks in the dry season with chlorfenvinphos (SuponaTM).

Even though the incidence of heartwater has been documented in Cameroon (4, 6, 14) its importance there has only received casual attention. In the light of the above, the present study was carried out from January to December 1987 to evaluate the importance of heartwater at the IRZV Research Station.

The seasonal distribution of *Amblyomma variegatum* at the Bambui IRZV as well as the effects of breed, age, season, and sex on heartwater were assessed. The results could serve as a basis for further epidemiological studies of tickborne diseases.

■ MATERIALS AND METHODS

The Bambui station is located on the high lava plateau of the North West province of Cameroon, about 23 km North West of Bamenda. It is situated at latitude 6° N and longitude 10°15' E. The dry season lasts for four months from mid-November to mid-March. The rainy season starts in mid-March and ends in mid-

1. IRZV Bambui, BP 51, Bamenda, Cameroon

2. IRZV Mankon, BP 125, Bamenda, Cameroon

November bringing 2500 mm of rainfall. The abundant moisture combined with a rich volcanic soil make the Western Highlands of Cameroon highly favorable for agriculture. Temperatures stand at a monthly average of 20°C with a minimum of 15°C and maximum of 25°C. The Bambui station has an elevation of 1600-1980 m above sea level coupled with a rich natural Savannah vegetation.

Tick collection

The first part of this paper was a study on the seasonal distribution of the heartwater vector, while the second part deals with cattle mortality due to heartwater at Bambui. In this study 240 local Ngaoundere Gudali (*Bos indicus*) (Ng), 226 Brangus (*B. taurus/B. indicus*) x Ngaoundere crosses (BrC), 32 Holstein (*B. taurus*) x Red Fulani (*B. indicus*) crosses (HC) and 83 Jersey (*Bos taurus*) x white Fulani (*B. indicus*) crosses (JC) of the Bambui IRZV were used. In crossbreeding, the males were the exotic breed while the females were the local one.

Once a fortnight for a period of one year, ticks were hand picked from 10 animals selected at random from animals which had not been sprayed with an acaricide. Ticks collected in bottles containing 70% ethanol were identified and counted.

Heartwater was diagnosed by microscopical examination of Giemsa stained brain impression smears of grey matter obtained from postmortem examinations (10).

Immediately after the death of an animal a small fragment of grey matter (not larger than a match head) was crushed between two slides drawn over one another lengthwise, so that two brain-crush smears were obtained (15). The smears were fixed in ethanol and stained using the Giemsa stain.

Cowdria were of a reddish purple (small forms) to a blue color (large forms), and were located in broken capillary walls. Mortality due to heartwater was classified according to the breed, sex and age of the affected animals. It is worth noting that the animals used in this study presented a comparable set of age groups.

All the data obtained were analyzed statistically using the Chi square method (12).

■ RESULTS AND DISCUSSION

The larvae of *Amblyomma variegatum* were found to be most abundant on cattle at the end of the rainy season. They had a predilection for necks, while the nymphs were most abundant in the dry season and located mainly on the genitalia. Adult ticks located mainly on the genitalia were abundant in the early part of the rainy season with peak periods in March and April (table I). The seasonal variation of ticks during this study agrees with that of Merlin *et al.* (6, 7). Mohammed made similar observations on the location of ixodid ticks on cattle in Northern Nigeria (8).

The majority of mortality cases occurred during the first half of the year (January-July) when adult ticks were most abundant on cattle (table I), and the age group above 36 months was most affected. There seems to be some immunity in cattle up to about the age of three years with the immunity waning thereafter. A similar phenomenon of immune status of calves had earlier been observed by Purnell (11), but the age limit for such immunity is yet to be determined. Results of the study show that the older the animal, the more susceptible it becomes to heartwater infection.

It is however surprising that more adult animals die of heartwater. The infection of traditional cattle by cowdria is probably close to a critical endemic situation (7). The overall significance of death cases in the adult group may be due to the influence of Holstein crosses used for milking. Death cases in the Jersey crossbreed were not statistically significant from the expected mortality. However, a 20% mortality rate in that breed would put the profitability of a farm in jeopardy. This percentage would still mean a great loss in a milking herd and shows the high susceptibility of *Bos taurus* and their crosses to cowdria.

Statistical analysis of the monthly distribution of adult *A. variegatum* (table I) and mortality with breed (table II) are shown below. The seasonal effects (table III) are organized in four quarters:

1. January to March: less than 100 mm monthly rains;
2. April to June: 200-350 mm monthly rains;
3. July to September: up to 500 mm monthly rains;
4. October to December: less than 250 mm monthly rains.

Table I

Monthly distribution of adult *Amblyomma variegatum* on cattle at Bambui

Month	Rainfall (mm/month)	O	E	$\frac{(O-E)^2}{E}$	P
January	10	94	187	46.25	< .005
February	40	167	187	2.14	> .1
March	133	454	187	381.1	< .005
April	200	453	187	381.1	< .005
May	215	331	187	110.89	< .005
June	280	182	187	0.13	> .1
July	375	96	187	44.28	< .005
August	480	45	187	107.83	< .005
September	500	46	187	106.31	< .005
October	380	55	187	93.18	< .005
November	50	129	187	17.99	< .005
December	20	196	187	0.43	> .1
Total		2248	2244	1291.63	< .005

O = number of *A. variegatum* observed

E = number of *A. variegatum* expected to be found

$\chi^2 = \frac{(O-E)^2}{E}$ was used to find out probabilities in the χ^2 distribution tables

Table II
Cattle mortality due to heartwater - Breed effect on mortality

Breed	Num. animals	O	%	$\frac{(O-E)^2}{E}$	E	P
Ng	240	22	9	2.13	29	> .05
Br C	226	19	8	0.19	28	> .05
JC	83	16	19	0.69	10	> .05
HC	32	14	43	7	4	< .01
Total	581	71		10.01	71	< .05

Ng = Ngaoundere Gudali; BrC = Brangus cross; JC = Jersey cross; HC = Holstein cross

O = number of observed mortality cases; E = number of expected mortality cases

$\chi^2 = \frac{(O-E)^2}{E}$ was used to find out probabilities in the χ^2 distribution tables

% = percentage of mortality within each breed

Table III
Cattle mortality due to heartwater - Seasonal effect on mortality

Month	Rainfall (mm/month)	O	E	$\frac{(O-E)^2}{E}$	P
January-March	< 100	23	18	1.39	> .05
April-June	200-350	23	18	1.39	> .05
July-September	350-500	7	18	6.72	< .01
October-December	< 250	18	18	0.00	> .05
Total		71	72	9.50	< .025

O = number of observed mortality cases by season; E = number of expected mortality cases by season

$\chi^2 = \frac{(O-E)^2}{E}$ was used to find out probabilities in the χ^2 distribution tables

Far more ticks than expected were observed during March-May and far fewer during July-November.

The monthly distribution of ticks shows a highly significant overall variation ($P < 0.005$) and a highly significant month to month variation ($P < 0.005$) except for the months of February, June and December. Tick counts are usually low in the dry season, i.e. November-February. This was confirmed here because tick numbers were less abundant than expected. It would have been helpful to investigate individual differences in tick infestation because there are considerable differences between animals as far as attractiveness for *A. variegatum* is concerned. Some cattle are more attractive to this tick than others and will carry heavy loads of ticks (13).

The overall variation in breed effects on the mortality was significant ($P < 0.05$) though there were no breed differences between Ng, BrC and JC. HC were more susceptible to heartwater ($P < 0.01$), which seems to be the cause for the overall breed differences in the mortality. Imported breeds of cattle, sheep and goats in Africa, South of the Sahara, are more susceptible to heartwater than the local breeds (3). In further studies, it may be more useful to determine breed differences based on the level of exotic blood because the susceptibility observed in HC may be due to this effect.

Mortality among age groups showed differences between animals less than 12 months of age and more than 36 months, as opposed to animals of ages 12-24 and 24-36 months. Calves under three

weeks of age are known to possess a strong immunity to heartwater (1). The age groups between 12 and 30 months might have acquired some immunity following recovery from an earlier infection or maintained a degree of immunity from calf age. If this is true then the immunity tends to wane with age. There were no sex differences with regard to mortality. The mortality caused by heartwater shown in the early rainy season (table III) suggests that a special curative program can be put into place in that period.

CONCLUSION

This study showed that cattle were most likely to contract heartwater when adult *A. variegatum* were most abundant. It would be interesting to determine a threshold of infestation by that tick above which animals would be highly susceptible to cowdria. This would help maintain the infestation at a minimal level by various control methods. Owing to the fact that *Bos taurus* crosses are highly susceptible to heartwater, tick control of all cattle with exotic blood must then be intensified during the rainy season.

Although this study was conducted in one location, it shows the necessity of assessing the extent of the prevalence of heartwater country-wide and surveying the distribution of *A. variegatum* to appreciate the importance of the disease as a preliminary step towards setting up control programs.

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Résumé

Ndi C., Bayemi P.H., Nfi A.N., Ekue F.N. Observations préliminaires sur les tiques et les maladies transmises par les tiques dans la province du Nord-Ouest du Cameroun. II. La cowdriose bovine

Dans cette étude, les effets de la cowdriose ont été évalués sur des bovins à l'Institut de recherches zootechniques et vétérinaires (IRZV) de Bambui, Cameroun. La distribution saisonnière des tiques *Amblyomma variegatum* a été observée et les effets de la race, du sexe, de l'âge et des saisons ont été étudiés en relation avec la mortalité due à la cowdriose. Les variations selon le mois de la distribution d'*A. variegatum* étaient très significatives ($P < 0,005$). Les tiques adultes étaient plus abondantes en début de saison des pluies, entraînant davantage de cas de mortalité dus à la cowdriose. Dans l'ensemble, l'effet race sur la mortalité était significatif ($P < 0,005$). Les croisés Holstein étaient les plus sensibles à la cowdriose. Des méthodes de contrôle doivent être élaborées pour empêcher les animaux croisés adultes d'être exposés à une infestation importante par *A. variegatum*. Il y avait des différences entre les groupes d'âge pour ce qui concerne la mortalité, mais il n'y avait pas d'effet lié au sexe. Des études sur le terrain s'avèrent nécessaires pour évaluer la situation de la cowdriose dans le système d'élevage extensif pratiqué par la plupart des éleveurs du Cameroun.

Mots-clés : Bovin - *Amblyomma variegatum* - Cowdria - Bactériose - Cameroun.

Resumen

Ndi C., Bayemi P.H., Nfi A.N., Ekue F.N. Observaciones preliminares de garrapatas y de enfermedades originadas por garrapatas en la provincia noroeste de Camerún. II. Cowdriosis bovina

El presente estudio evaluó los efectos de la cowdriosis en el ganado, en el Instituto de Investigaciones Veterinarias y Animales de Bambui (Camerún). Se observó la distribución estacional de *Amblyomma variegatum*, y se estudio la raza, sexo, edad y efecto de las estaciones sobre la mortalidad por cowdriosis. Las variaciones en la distribución mensual de *Amblyomma variegatum* fueron altamente significativas ($P < 0,005$). Las garrapatas adultas fueron más abundantes al inicio de la estación lluviosa, llevando a más muertes debidas a la cowdriosis. El efecto total de la raza sobre la mortalidad fue significativo ($P < 0,005$). Los cruces con Holstein fueron más susceptibles a la cowdriosis. Deben establecerse métodos de control para prevenir que los animales adultos de razas cruzadas sean expuestos a fuertes infestaciones de *A. variegatum*. Con respecto a la mortalidad, se encontraron diferencias entre los grupos de edad, pero no hubo efecto del sexo. Deben realizarse estudios de campo, con el fin de evaluar la situación en los sistemas de ganadería extensiva practicada por la mayoría de los ganaderos en Camerún.

Palabras clave: Ganado bovino - *Amblyomma variegatum* - Cowdria - Bacteriosis - Camerún.