

Effect of experimental *Babesia bigemina* infection on the haematological values of splenectomized white Fulani calves

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RÉSUMÉ

Effets de l'infection expérimentale par *Babesia bigemina* sur certains composants du sang de veaux blancs Fulani splénectomisés.

Quatre veaux blancs Fulani ont été splénectomisés. Trois ont été expérimentalement infectés par *Babesia bigemina* à l'aide de larves infectieuses de *Boophilus decoloratus*; le quatrième a servi de témoin. L'évolution des principaux paramètres de leur sang a été observée pendant 40 jours avec les résultats suivants : chez les veaux infectés, tant les valeurs de l'hématocrite que celles des érythrocytes ont progressivement diminué à partir du 5^e jour après l'infection alors que ces valeurs sont restées constantes chez le veau témoin. Par contre, le taux de leucocytes a augmenté chez les quatre animaux mais de façon plus sensible chez les veaux splénectomisés, ce qui semblerait indiquer que cette augmentation est à mettre pour une faible partie seulement au compte du stress opératoire.

INTRODUCTION

Little or no work has been done in Nigeria on the effect of experimental transmission of *Babesia bigemina* on splenectomized calves. The records available are those of DIPEOLU (2) who showed that *B. bigemina* and *B. bovis* are endemic in the country and are transmitted by ixodid tick of the genus *Boophilus*.

Even elsewhere, only a few references could be cited on the subject. RANATUNGA and WANDURAGALA (3) worked on the reactions and haematology of imported Jersey cattle to *B. bigemina* in Ceylon. WRIGHT (5) in Australia also studied the haematological responses of splenectomized calves to *B. argentina* and *B. bigemina* infections by experimental infection of the parasites maintained in carrier laboratory animals. BROCKLESBY

and SELLWOOD (1) in Britain did a similar work on the *B. major* infections in splenectomized calves, using ixodid tick of *Haemaphysalis punctata*.

In view of the paucity of information on the effect of the experimentally transmitted *B. bigemina* infection on the haematological values of the local cattle breeds, this study is carried out.

MATERIALS AND METHODS

Four White Fulani calves, 9-12 months of age, were each kept in separate pens at the University of Ibadan Animal Hospital to ensure a regular feeding regime. The animals were treated for blood, gastrointestinal, and ecto-parasites and splenectomized a month later.

Fifteen days post-splenectomy, 1 000 freshly hatched infective larvae of *Boophilus decoloratus* were made to feed on each of three splenectomized calves by enclosing them in bags secured over the animals' ears. The earbags were removed after a week when virtually all the larvae had got attached to the animals.

Daily rectal temperatures were taken and blood was collected from a jugular vein of each of the four animals into a tube containing

EDTA on day 0 and then at 5-day intervals for a period of 40 days.

Packed cell volume (PCV) was measured in microhaematocrit centrifuge and total red blood cell (RBC) and white blood cell (WBC) counts were carried out on each sample by the microscopic method in a haemocytometer counting chamber. Thin blood smears were made, fixed with methanol and stained with Giemsa for evidence of *Babesia* infection and differential leucocyte counts.

TABLE I Mean post-splenectomy blood values of 3 infected calves

Index	Days after splenectomy								
	0	5	10	15	20	25	30	35	40
Température °C	38.0	38.6	38.8	39.6	39.8	38.8	38.6	38.0	38.2
PCV	31.5	28.2	18.4	22.1	25.2	20.1	22.3	21.4	20.3
RBC 10 ⁶	7.60	7.40	3.31	4.31	4.30	3.44	4.00	4.25	4.16
WBC 10 ³ :	8.7	10.4	12.1	10.9	30.6	22.5	18.5	17.6	15.0
Neutrophil (%)	48.2	40.4	29.9	26.3	21.0	10.5	11.4	14.9	15.0
Eosinophil (%)	2.4	2.0	3.1	3.0	1.0	4.0	2.0	2.1	2.2
Lymphocytes (%)	46.0	55.0	64.0	68.0	75.0	80.0	84.0	79.0	79.0
Monocytes (%)	3.4	2.6	3.0	1.70	2.0	3.5	2.6	2.0	2.8
Basophyl (%)	-	-	-	1	1	2	-	2	1

TABLE II Post-splenectomy blood values of uninfected calf.

Index	Days after splenectomy								
	0	5	10	15	20	25	30	35	40
Temperature °C	38.1	38.2	37.6	37.6	38.8	38.7	38.3	38.3	38.3
PCV (%)	28.5	28.0	27.0	27.0	27.5	28.0	27.0	27.5	28.0
RBC 10 ⁶	7.3	7.2	7.1	6.9	7.3	7.1	7.1	6.9	6.8
WBC 10 ³ :	7.9	8.4	10.3	10.3	10.8	10.6	10.7	10.5	10.6
Neutrophil (%)	46.0	43.0	34.0	32.0	26.0	24.0	24.0	20.0	23.0
Eosinophil (%)	3.0	2.0	3.0	3.0	2.0	2.0	3.0	2.0	2.0
Lymphocytes (%)	49.0	52.0	59.0	63.0	69.0	70.0	70.0	73.0	72.0
Monocytes (%)	2.0	3.0	4.0	2.0	3.0	4.0	3.0	5.0	3.0
Basophil (%)	-	-	-	-	-	-	-	-	-

RESULTS

The haematological values for the infected and uninfected calves are shown in tables I and II.

PCV and RBC values progressively decreased in the infected calves (Table I) but appeared fairly constant in the uninfected calf (Table II). The lowest mean PVC and RBC values were recorded on day 10.

Persistent increased WBC counts were observed in both the infected and uninfected calves as from day 5, although more marked in the former. The increased WBC counts were due mainly to lymphocytic reaction. Neutrophils showed an inverse proportion to the lymphocytes in all cases.

DISCUSSION

The observed progressive decrease in the PCV and RBC values in the infected calves compares well with the findings of WRIGHT (5). This is probably due to haemolysis associated with *B. bigemina* infection (4). The peak of haemolysis is likely to have occurred on day 10, which coincides with the least PCV (18.4 p. 100) and RBC (3.31×10^6) values obtained throughout the period of observation.

The increased WBC counts recorded in both the infected and uninfected calves are probably a result of the body response to both the *Babesia* infection and the stress of splenectomy. An objective interpretation of blood data derived from the splenectomised, protozoan infected experimental animals would therefore warrant a study of the effects of splenectomy *per se* on such blood data. Moreover, the differential leucocyte counts indicate that lymphocytosis is a feature of both the acute and chronic phases of bovine babesiosis. Therefore, WBC count appears to be a poor indicator of the stage of the infection.

Our inability to record any mortality from the infection even after splenectomy (4) might be ascribed to the persistent premunity of the calves, the observed marked lymphocytic reaction, the cattle breed involved in the study, or combinations of any of these.

In spite of the remarkable response of PCV, RBC and WBC values to bovine babesiosis, these indices are not specific for *Babesia* infection and thus of less value in the diagnosis of babesiosis than the more rapid, routine thin smears used to detect the parasites in the peripheral blood. However, the importance of these haematological values lies in elucidating the pathogenesis of the *Babesia* parasite and, indeed, any other blood parasite.

SUMMARY

In an experimental transmission of *Babesia bigemina* infection into three splenectomised White Fulani calves using infective larvae of *Boophilus decoloratus*, there was a progressive decrease in the PVC and RBC values from the 5th post infection day while these values were fairly constant in the uninfected calf.

On the contrary, there was a persistent increase in the WBC counts in all the animals, although higher values were recorded for the infected calves. The increased WBC count was due to marked lymphocytic reaction.

RESUMEN

Efectos de la infección experimental por *Babesia bigemina* sobre ciertos componentes de la sangre de terneros blancos Fulani esplenectomizados.

Se esplenectomizaron cuatro terneros blancos Fulani. Tres de ellos fueron experimentalmente infectados por *Babesia bigemina* mediante larvas infecciosas de *Boophilus decoloratus*; El cuarto fué el testigo. La observación durante 40 días de la evolución de los principales parámetros de su sangre dió los resultados siguientes: En los terneros infectados, tanto los valores del hematocrito como los eritrocitos han sido disminuyendo a partir del 5º día después de la infección mientras que dichos valores han quedado constantes en el ternero testigo.

En cambio, la proporción de leucocitos ha aumentado en los cuatro animales pero de modo más notable en los terneros esplenectomizados, lo que parecería indicar que se debe imputar sólo una pequeña parte de este aumento al choque operatorio.

BIBLIOGRAPHIE

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