

Acknowledgements

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DANIEL (A.D.), JOSHUA (R.A.), KALEJAIYE (J.O.), DADA (A.J.). Prevalence of trypanosomiasis in sheep and goats in a region of Northern Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3): 295-297

The prevalence of trypanosomiasis was studied during April-June 1991, in sheep and goats kept peridomestically in Alkali and Gombe local Government areas of Bauchi State in Northern Nigeria. A total of 615 animals, consisting of 258 sheep and 357 goats were examined for trypanosome infection. Of this total, 19 (7.4 %) sheep and 18 (5.0 %) goats were positive giving a total infection rate of 37 (6.0 %), 22 being positive with *Trypanosoma vivax*, 9 with *T. congolense* and 6 with *T. brucei*. In order to elucidate the most appropriate tool for surveying trypanosomiasis in small ruminants under Nigerian field conditions, the sensitivity of four techniques currently in use for the parasitological diagnosis of trypanosomiasis was investigated. The concentration methods: haematocrit centrifugation and buffy coat method, were more accurate than the standard trypanosome detection methods: wet film and thin film. Due to the prevalence of the disease, sheep and goats must be treated as well as cattle in the region.

Key words : Goat - Sheep - Trypanosomiasis - *Trypanosoma brucei* - *Trypanosoma congolense* - *Trypanosoma vivax* - Prevalence - Diagnosis - Nigeria.

Isolation of *Theileria parva* (SAO Hill) and *Theileria parva* (West Kilimanjaro) and their cross-immunity with *Theileria parva* (Kasoba)

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MUSISI (F.L.), JACOBSEN (P.), QUIROGA (J.C.), NJUGUNA (L.M.). Isolement de *Theileria parva* (SAO Hill) et *Theileria parva* (West Kilimanjaro) et leur immunité croisée avec *Theileria parva* (Kasoba). *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3) : 297-300

Deux souches de *Theileria parva* ont été isolées sur du bétail-témoin pendant des essais d'immunisation sur le terrain contre la theilériose à SAO Hill et West Kilimanjaro, dans les parties Sud et Nord de la Tanzanie respectivement. Ces deux souches de parasites ont engendré une affection grave au point de vue clinique qui a nécessité un traitement antitheilérien pour 3 des 5 bovins infectés expérimentalement. Les animaux guéris de cette infection avec les deux souches de *T. parva* en cause n'ont pas présenté de signes fébriles, et un seul animal sur quatre a présenté une parasitose avec de rares schizontes pendant un jour, au cours d'un test d'infection avec *Theileria parva* (Kasoba) originaire du sud du Malawi. À l'inverse, les deux témoins ont montré des signes de fièvre avec la présence de schizontes, et l'un d'entre eux a dû subir un traitement antitheilérien pour être sauvé.

Mots clés : Bovin - Theilériose - *Theileria parva* - Immunité - Infection expérimentale - Tique - *Rhipicephalus appendiculatus* - Tanzanie.

Introduction

This paper describes the results of attempts to infect experimental animals with *Theileria* parasites from East Coast fever (ECF) immunization trial sites in Tanzania, the course of their infection and the preliminary observations on cross-protection following challenge with *Theileria parva* (Kasoba) from northern Malawi.

Materials and Methods

Parasite isolation and challenge (table I)

Theileria parva (SAO Hill)

Laboratory-reared *Rhipicephalus appendiculatus* nymphal ticks were fed on control cattle suffering from ECF during an ECF field immunization trial in 1990 at SAO Hill

1. East Coast Fever Vaccine Production, Quality Control and Immunization Project RAF/92/010, C/o FAO Representative, POB 30750, Lilongwe 3, Malawi.

2. Project GCP/URT/098/DEN, P.O. Box 290, Iringa, Tanzania.

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TABLE 1 Responses of cattle to *T. Parva* (Sao Hill), *T. Parva* (W. Kilimanjaro) and with *T. Parva* (Kasoba) infections.

<i>T. parva</i> stock	Cattle	Primary infection				Challenge infection			
		Days to and duration of		Piroplasm parasitaemia	Treatment Day ³	Days to and duration of		Piroplasm parasitaemia	Treatment Day ³
		schizont ¹	fever ²			schizont ¹	fever ²		
SAO Hill	981	14 (16)	7 (1)	3 p. 100	ND	ND	ND	ND	ND
SAO Hill	1 259 ⁴	10 (7)	12 (10)	1 p. 100	15, 20, 22	—	—	—	—
SAO Hill	1 289 ⁴	11 (15)	11 (10)	1 p. 100	—	42 (1)	—	—	—
West Kilimanjaro	1 301 ⁵	7 (7)	9 (3)	0	10, 12	—	—	—	—
West Kilimanjaro	1 302 ⁵	6 (8)	8 (6)	< 1 p. 100	10, 12, 16	—	—	—	—
Kasoba	1 299 ⁶					10 (14)	10 (11)	25 p. 100	20, 22
Kasoba	1 300 ⁶					11 (9)	10 (4)	1 p. 100	—

ND : Not done.

¹ Figures in bracket represent the duration in days of detection of schizonts.

² Figures in bracket represent the duration in days of detection of fever.

³ Days of the experiment on which cattle considered seriously ill were treated with drug buparvaquone.

⁴ Received stabilates No. 110 ; *T. parva* (SAO Hill).

⁵ Received stabilates No. 121 ; *T. parva* (West Kilimanjaro).

⁶ Received stabilates No. 66 ; *T. parva* (Kasoba).

in southern Tanzania. The adult ticks which moulted from the nymphs were sent to the Central Veterinary Laboratory (CVL), Lilongwe, Malawi where they were applied to animal No. 981 to transmit the parasite. Non-infected laboratory-reared *R. appendiculatus* nymphs were applied to animal No. 981 to pick up the parasite for subsequent stabilate preparation using the methods of CUNNINGHAM *et al.* (5).

Theileria parva (West Kilimanjaro)

In a similar field trial in West Kilimanjaro, Tanzania, laboratory-reared *R. appendiculatus* nymphs were fed on to control cattle with ECF. Adult ticks moulting from the engorged nymphs were sent to the same laboratory for isolation of the field *Theileria* at the exposure site for eventual stabilate preparation.

The stabilates prepared from both isolations were inoculated into cattle and the course of infection was monitored clinically, parasitologically and serologically. On day 29 post infection, the cattle were challenged with *Theileria parva* (Kasoba) (6,10). Again the clinical, parasitological and serological responses were monitored.

Cattle and ticks

The cattle used were Friesian-Malawi Zebu crosses obtained from farms where strict tick control is practised in the Southern region of Malawi, where ECF cases have not been reported. All cattle were serologically negative in the indirect immunofluorescent antibody test (IFAT) to *T. parva* schizont antigen (4). *R. appendiculatus* (Muguga) ticks maintained in the laboratory using methods described by BAILEY (1), were used for parasite picked up from the control cattle at the trial sites and for stabilate production.

Estimation of parasite infection in ticks

No estimation of infection rates was made for the adult *R. appendiculatus* ticks collected from SAO Hill because the number was small and this could have prejudiced the success of transmitting the parasite. However, the infection rate for the SAO Hill parasite stock was determined in the subsequent pick-up laboratory ticks and also for the West Kilimanjaro field pick-up ticks by dissecting and staining salivary glands in Feulgen's stain using the method described by BLEWETT and BRANAGAN (2). For each of the parasite stocks, 20 pairs of male and female ticks were dissected after prefeeding on rabbit ears for 4 days.

Results

Thirty-one adult *R. appendiculatus* ticks from the SAO Hill trial were received at CVL, Lilongwe and were applied to animal No. 981 which developed a *Theileria* schizont parasitosis in lymphoid cells. Out of the 11,000 nymphs applied to pick up the parasites from animal No. 981, 10,000 adult ticks were harvested; 32.5 % of these were infected and they had an estimated mean *Theileria* acini infection rate of 26 %. These ticks were used to prepare 500 ml of stabilate No. 110. In the case of the West Kilimanjaro stock, 1,200 adult *R. appendiculatus* ticks were received and prefed on rabbits. One thousand ticks were harvested; 50 % of these were infected and they had a mean *Theileria* acini infection rate of 70 %. The ticks were used for preparing stabilate No. 121.

The responses of cattle to the different parasite stocks are summarized in table I. The West Kilimanjaro parasite stock caused shorter prepatent periods to schizonts and fever than the SAO Hill and Kasoba stocks. For the two Tanzanian parasite stocks, the duration of detection of

schizonts in the untreated cattle was twice that of the treated cattle. The duration of fever was shorter for animals whose treatment started on day 10 than for those whose treatment was started later. The maximum piroplasm parasitaemia in erythrocytes varied between animals from 0 to 25 %. One of three, 2/2 and 1/2 cattle infected with the SAO Hill, West Kilimanjaro and Kasoba parasite stocks required treatment to curtail severe clinical reactions and possible deaths. All animals seroconverted to a significant IFAT titre of 1:640.

Response to challenge with *T. parva* (Kasoba) of cattle previously infected with one of the Tanzania parasite stocks was uneventful except for animal No. 1289 which developed a 1-day low grade schizont parasitosis.

Discussion

The apparent prolonged prepatent period to schizonts in the case of animal No. 981 compared with animals Nos. 1259 and 1289 which received the same parasite stock is probably a reflection of the period ticks took to attach before starting to feed properly. The 1-day low grade fever (39.6°C) which developed in animal No. 981 was not related to *Theileria* parasitosis since it occurred on day 7 post infection, a week before schizonts were first detected. It is, however, surprising that the animal later developed a prolonged and high degree of schizont parasitosis without an associated fever.

In the case of the SAO Hill parasite stock, the duration of schizont parasitosis in the untreated cattle Nos. 981 and 1289 was 16 and 15 days, respectively, in contrast to the 7 days in the treated animal No. 1259. The anti-theilerial treatment shortened the duration of detection of schizonts but did not affect the duration of fever in the treated animal. Similarly, anti-theilerial treatment shortened the duration of detection of schizonts for cattle Nos. 1301 and 1302 which were infected with the West Kilimanjaro parasite stock, but in this case the treatment also shortened the duration of the fever, presumably because it was initiated early in the course of the infection.

The piroplasm parasitaemia in the treated cattle might have been affected by the anti-theilerial treatment. Maximum piroplasm levels could have been inhibited by hampered schizont multiplication due to administration of buparvaquone early in the course of the infection (day 10) to animals Nos. 1301 and 1302. For animals Nos. 1259 and 1299 which received treatment later, piroplasm parasitaemia also could have been reduced due to the effect of this drug on the schizonts and the piroplasms already circulating; the drug affects both stages of the parasite (8). It is thus impossible on the basis of these results to determine conclusively the potential maximum piroplasm parasitaemia characteristic of each of the parasite stocks. Consequently, little significance should be attached to the variations in the piroplasm parasitaemia observed within and between parasite stocks in this study.

The clinical, parasitological and serological responses of cattle to the infection with the *Theileria* parasite stocks isolated from SAO Hill and West Kilimanjaro in Tanzania were indistinguishable from those with a classical *T. parva* stock, *Theileria parva* (Muguga) (3). It is therefore concluded that the two Tanzania *Theileria* isolates are indeed *T. parva* stocks.

The ability of cattle recovering from *T. parva* (SAO Hill) and *T. parva* (West Kilimanjaro) infections to resist a *T. parva* (Kasoba) challenge as evidenced by lack of marked clinical and parasitological responses (table I) indicates a close antigenic relationship between these parasites. The Tanzanian parasite stocks used were isolated during ECF immunization from field sites where significant protection against local ECF challenge was observed (JACOBSEN, unpublished data). It is therefore assumed that a close antigenic relationship also exists between these Tanzanian stocks and the combination of parasite stocks [*Theileria parva* (Muguga), *Theileria parva* (Kiambu 5) (7) and *Theileria parva* (Serengeti transformed) (12)] used in the ECF immunization at SAO Hill and West Kilimanjaro.

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MUSISI (F.L.), JACOBSEN (P.), QUIROGA (J.C.), NJUGUNA (L.M.). Isolation of *Theileria parva* (SAO Hill) and *Theileria parva* (West Kilimanjaro) and their cross-immunity with *Theileria parva* (Kasoba). *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3): 297-300

Two *Theileria parva* stocks were isolated from control cattle during East Coast fever (ECF) field immunization trials at SAO Hill and West Kilimanjaro in the southern and northern parts of Tanzania respectively. Both parasite stocks caused severe clinical ECF which required antitetherial treatment for 3 of the 5 experimentally infected cattle. Cattle recovering from infection with the two *T. parva* stocks did not develop a fever and only 1 of 4 animals developed scanty schizont parasitosis for one day during a challenge with *T. parva* (Kasoba) from northern Malawi. In contrast, both control cattle developed fever and schizonts, and one required antitetherial treatment to survive.

Key words: Cattle - East Coast fever - *Theileria parva* - Immunity - Experimental infection - Tick - *Rhipicephalus appendiculatus* - Tanzania.