USE OF A TRYPANOSOMAL ANTIGEN ELISA TO MONITOR TSETSE AND TRYPANOSOMOSIS CONTROL PROGRAMMES IN KENYA

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Abstract

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The capture Antigen-ELISA was used to monitor serum samples originating from three study areas in Kenya. At the Galana ranch the test was used to assess re-invasion of an area previously cleared of Glossina pallidipes. In Busia district the Ag-ELISA is being used to monitor the progress of a tsetse and trypanosomosis control programme. At Taita and Tara ranches the capture Antigen ELISA and the buffy coat technique (BCT) were used to evaluate the efficacy of a commercial Cypermethrin® dip for the control of Glossina pallidipes.

1. INTRODUCTION

Tsetse-transmitted trypanosomosis is endemic in 60% of Kenya’s rangelands, which constitute 25% of the country [1]. Though large-scale eradication of tsetse and trypanosomosis remains an elusive goal, the availability of low-cost technologies and the prospects of community participation, give optimism for the smaller, and more manageable tsetse and trypanosomosis programmes [2]. This study reports results derived from some of the smaller tsetse and trypanosomosis programmes in Kenya. These programmes included a Deltamethrin® trial in Galana Ranch, a tsetse and trypanosomosis control project on the Kenya-Uganda border in Busia District and a Cypermethrin® trial in Taita/Taru.

The capture Antigen ELISA was used to monitor serum samples originating from Galana ranch. The assay was used to detect trypanosome infections in cattle, which might indicate a possible re-invasion of an area previously cleared of the predominant tsetse species in the area, Glossina pallidipes.

In Busia district located at the border with Uganda, the Antigen ELISA was used to evaluate the success of a tsetse and trypanosomosis control programme. A project supported by the Overseas Development Agency of the United Kingdom was initiated in collaboration with the governments of Kenya and Uganda to control tsetse and trypanosomosis along the common border. During the years 1992 and 1993 impregnated targets and traps as well as Pour-on® and Spot-on® were the tsetse control methods used. All animals detected positive for trypanosomes were treated with the trypanocidal drug diminazene aceturate (Berenil®).

In the third study area, at the Taita and Taru ranch, the capture Antigen ELISA and the buffy coat technique (BCT) were used to evaluate the efficacy of a commercial Cypermethrin® dip for the control of Glossina pallidipes. The two ranches are adjacent to one another, Taita ranch being located in Taita district, Taru ranch in Kwale district. The ranches are situated in the coastal hinterland of Kenya and are infested with a single species of tsetse fly, Glossina pallidipes. Rainfall is low to medium (Fig. 1) and the vegetation is mainly thorn-scrub, a suitable tsetse habitat.

2. MATERIALS AND METHODS

(1) Galana ranch

The tank "E" area was selected for sample collection since it had been cleared of Glossina longipennis using Deltamethrin®-impregnated traps. In order to measure the rate of tsetse re-invasion of this area, a clean herd of 100 steers was introduced and monitored weekly by BCT to assess the degree of trypanosome challenge. Concurrently, tsetse trapping was carried out using bi-conical traps on a weekly basis. In addition, serum samples were collected from all animals for the first three months on a monthly basis, and thereafter, once every three months. Serum samples were stored at -20°C for future analysis by capture Antigen ELISA. A herd of 100 steers kept in an area of medium
FIG. 1. Monthly rainfall (mm) on Taita and Taru ranches in 1994.
tsetse challenge at a distance of about 30 km from the tank "E" area was used for comparative reasons.

(2) Busia district

Three areas, namely Rukada, Apatit and Katelenyan were selected as sites for the assessment of the control programme. As part of the assessment the tsetse population was monitored and cattle were sampled to detect trypanosome infections using parasitological (BCT) and serological (Ag-ELISA) techniques.

(3) Taita and Taru ranch

A herd of 1000 cattle was maintained on Taita ranch and treated weekly with Cypermethrin® using a diptank. Among this herd a sentinel group of 100 steers was monitored weekly by BCT and monthly by Ag-ELISA. On the adjacent Taru ranch at a distance of 10 km, a second sentinel herd of 100 steers was monitored the same way and sprayed with Steladone® weekly. Half of the animals in each sentinel group (50 steers) were treated with diminazene aceturate (Berenil®) on an individual basis when found infected and the other half (50 steers) were treated with homidium chloride (Novidium®) in a block treatment whenever > 10% of the herd was found to be infected within any 4-week period.

3. RESULTS

(1) Galana ranch

A total of 900 serum samples were collected and are awaiting Antigen ELISA analysis. The study forms part of the ODA supported research programme on the epidemiology of animal trypanosomosis. Consequently, the serological results will be combined with data on tsetse challenge as well as BCT scores and haematocrit values for epidemiological analysis.

(2) Busia district

A total of 2400 sera were collected and stored at -20°C for future analysis by Antigen-ELISA. Presently 780 serum samples have been analysed. Complete data analysis is anticipated following the collection of all Ag-ELISA, tsetse, parasitological, and haematological data.

(3) Taita and Taru ranch

To date only 392 of the 4290 serum samples have been analysed by Ag-ELISA. Using parasitological techniques (BCT) 3 samples were detected positive for *T. congolense*, 60 for *T. vivax* and none for *T. brucei*. Using the Ag-ELISA, 7 samples were found positive for *T. congolense*, 26 for *T. vivax* and 73 for *T. brucei* (Table I). A cut-off value of 10 percent positivity (PP) was used for each one of the three trypanosome species. The cut-off value was determined using the ELISA results of a negative cattle population (Table II). BCT results showed a significant difference between the steers at Taita and Taru (Figs 2a and 2b). However, the two sites seem to show a similar trend declining over time in the number of tsetse caught per trap per day (Fig. 3), suggesting a slight positive effect of dipping cattle with Cypermethrin®.

TABLE I. PARASITOLOGICAL AND SEROLOGICAL INVESTIGATIONS OF CATTLE UNDER TSETSE CHALLENGE AT THE TAITA AND TARU RANCHES, KENYA

<table>
<thead>
<tr>
<th>Buffy coat technique</th>
<th>Antigen ELISA</th>
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<td>0</td>
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( ) = number of samples detected positive using the Antigen ELISA.
FIG. 2a. Monthly prevalence of trypanosomosis as determined by BCT in cattle on Taita and Taru ranches (Berenil group).
FIG. 2b. Monthly prevalence of trypanosomosis as determined by BCT in cattle on Taita and Taru ranches (hominidium chloride group).
FIG. 3. Mean tsetse fly catches on Taitu and Taru ranches in 1994.
FIG. 4. Tsetse distribution map of Kenya (1967) showing the study sites: B = Busia; G = Galana ranch; TT = Taita/Taru ranches; hatched area = tsetse free; dotted area = tsetse infested; blank area = unsurveyed.
TABLE II. PARASITOLOGICAL AND SEROLOGICAL INVESTIGATIONS OF A NEGATIVE CATTLE POPULATION FROM THE KAPITI AND KETRI FARMS

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<tbody>
<tr>
<td>Kapiti (ILRI)</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>KETRI (Muguga)</td>
<td>60</td>
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T.b. = Trypanosoma brucei; T.c. = Trypanosoma congolense; T.v. = Trypanosoma vivax.
No. = number of animals sampled.

4. DISCUSSION

Since only a small part of the serum samples (1172 of the 7590 samples) have been analysed, the results should be discussed following the analysis of the complete data set. However, preliminary results of the Ag-ELISA test indicate a high specificity (99.2%) and a low sensitivity (8.3%). The sensitivity may require further readjustment, especially with regard to the cut-off values of percent positivity for T. congolense and T. vivax. As shown in Figures 2a and 2b, parasitological results show evidence of a significant decline in infection rates on Taita Ranch, where Cypermethrin® dip was being used. However, there was no significant difference in tsetse fly catches in the two places. Similar observations were made in an earlier study on Galana Ranch where Deltamethrin® was being used. It was suggested that the lack of difference in fly numbers could be due to re-invasion (Fig. 4) and that the high degree of protection of cattle against trypanosomosis was due to the possible repellant effect of the pyrethroid [3].

ACKNOWLEDGEMENTS

This work was supported by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, to whom we are very greatful. We specifically thank the KETRI field staff at Galana, Taita/Taru and Busia for technical assistance. We would also like to thank Dr. J.B. Githiori for the graphics. This paper is published with the permission of the Director, KETRI.

REFERENCES