PD-AAU-206
46962

THE INTERNATIONAL CENTRE OF INSECT
PHYSIOLOGY AND ECOLOGY
P. O. BOX 30772, NAIROBI

USAID GRANT DAN - 4083-G-SS-3063-00
HOST RESISTANCE INTEGRATED TICK CONTROL
MARCH - MAY 1986

PBC
5TH JUNE 1986

1. Introduction

During the quarter under review ICIPE had its Annual Research Conference. The Livestock Tick Programme mounted a 12 section poster session.

2.0. Personnel

There has been a satisfactory response to the advertisements for post doctoral fellows in population modelling and immuno chemistry and interviews will take place shortly. A further post for an insect physiologist to work on *in vitro* feeding of *R. appendiculatus* has been advertised.

3.0. Progress against agreed outputs

3.1. Rusinga Island: The monthly tick population survey on five farms on the island has continued. There has been little alteration in tick count since the survey commenced in January, although counts are now expected to rise following the rains.

A small initial trapping for tsetse fly on the southern coast of the island revealed surprisingly high catches of *Glossina fuscipes*: - four traps caught approx. 500 flies in three days. This fly species prefers reptiles for food and it can be infected with trypanosomiasis, but no trypanosomes were detected in the disease survey carried out in January 1986. A more extensive survey of the island is now planned.

Results of the disease survey antibody tests are now coming to hand. All the 162 cattle sera have been assessed for *Theileria parva* antibody levels in collaboration with V.R.D. Muguga, and 65.4% are positive. This confirms other South Nyanza results and probably indicates a good enzootic stability on the island, as animals are not reported as dying from E.C.F. Surprisingly, the same sera tested for brucellosis and leptospirosis, gave only one positive to each disease. These latter results are under discussion with V.R.D. Muguga.

Three collections of ticks for E.C.F stabilate production have been made. Two of these have been placed on susceptible cattle but failed to produce E.C.F. The third collection was made from the ground, and should therefore have a better chance of being infected, and this awaits testing in cattle at Muguga.

3.2. Intona Ranch: Following the termination of the induced immunity paddock experiment, the mass of data has been put into the computer and is now being analysed. This is likely to take some time but a report on the final findings will be available for the annual report in August.

3.3. Comparison of field and laboratory strains of R appendiculatus: Egg number and viability assessments are now completed. No differences in egg viability between the two cattle fed strains of tick were demonstrated, however the laboratory strain of ticks produced significantly fewer eggs when fed on immune cattle. This confirms the results obtained in rabbits that the laboratory rabbit adapted strain of ticks is much more susceptible to feeding on resistant hosts than the field strains.

This result is important as it provides a possible explanation for the failure to protect cattle by artificial stimulation of immunity in the Intona Ranch paddock experiments. In that experiment immunity prior to field exposure was assessed using the laboratory strain of ticks, and a high level of immunity was indicated which is now shown to be artificially elevated.

Because of these results, a field strain of ticks was used to challenge the cattle immunised with various extracts of tick stages and organs, thus obtaining a result nearer to an actual field challenge.

3.4. Intradermal Test in Cattle: Twenty so called tick naive Freisian heifers, eighteen months of age, were tested. These animals have been maintained under twice weekly dipping since birth and no ticks have ever been seen on them. Forty percent positive reactions were obtained. Possible explanations are:-

a) The animals have been exposed to ticks at some time.

b) There are common antigens in the saliva of biting flies which induce antibodies in the bovine that react to the tissue culture intradermal antigen.

Until the actual position is clarified more field work will be done with the test. The tissue culture antigen contains many antigens and needs to be purified and the antigen specifically responsible for the reaction identified.

4.0. Inducement of artificial immunity with tick derived antigens

4.1. Rabbits: Laboratory work to isolate, purify and characterise the antigens responsible for antitick effects in rabbits continues slowly. The supply of rabbits for this and other studies has been completely interrupted due to colony breeding problems.

4.2. Goats: Immunisation of the goats has been completed. The paddocks have been seeded with 9,000 nymphs per paddock and the challenge of the goats commenced by placing them in the infested paddocks. Whole body counts on the goats are being carried out weekly and pasture blanket draggings every two weeks. Todate no adults have appeared on the goats.

4.3. Sheep: Midgut antigen, and ovaries have been collected and processed into vaccines as per protocol. The initial vaccination has been completed. The sheep are still being maintained in a tick free environment indoors until the vaccination regimen and challenge is complete - a futher three months.

4.4. Cattle:

4.4.1. The 28 cattle immunised with extracts of various tick stages and organs (see 4.5.5. of the November 1985 report) have been challenged with 100 larvae, 50 nymphs, and 25 male and 25 female adults by placing in ear bags. Challenge tick collections are complete and moulting egg weights and egg hatch data are awaited and will not become available for a further two months.

Preliminary results indicate variability in animal response but some cattle have caused moderately severe effects on the

challenge ticks. When all the results are available, sera from animals with a positive effect will be the basis for identifying specific antigens in the laboratory.

4.4.2. Following the failure of R. appendiculatus cell line cultures to immunise in rabbits (see August 1985 report 4.5.2.), a further experiment using surviving primary R. appendiculatus embryonic cells has commenced. The vaccination regimen of one primary dose and two booster vaccinations is complete and challenge with larvae, nymphs and adults is scheduled for July 1986.

5.0. Future Plans for the next three months

5.1. Rusinga Island: Continue the monthly tick survey on five farms. Repeat collections of R. appendiculatus unfed females until sufficient E.C.F. isolates are made (say five) to prepare an E.C.F. stabilate.

Appoint the veterinarian for the project and send him on a short diagnostic refresher course for two weeks. Over the next period he will be engaged in setting up the laboratory at Mbita Point, training technical staff and establishing a laboratory routine.

5.2. Intona Ranch: Complete assessment of data from the paddock experiment.

A new experiment has commenced to assess the tick resistance of various breeds of cattle in terms of beef productivity. Groups of Hereford, Ayshire, Freisian cross Sahiwal, Boran, and native Maasai animals will be subjected to three weekly exposures in the paddocks which now have a very high mixed tick population. After three such exposures, with three weekly rests in the dipped herd in between exposures, the groups will be split and one half kept on thrice weekly dipping while the second half of each group will be placed in the paddocks and not dipped.

All animals will be weighed weekly, half body tick counts performed weekly and examined daily for signs of tick borne disease.

Tick burdens and productivity in the paddock animals will be compared with the dipped controls.

Ten animals of each group have been placed in the paddock for the initial exposure. Over the next period two further immunising exposures and rest periods are planned.

5.3. Intradermal Test: No further field tests are planned. When current studies on isolation of antigens using rabbit sera are complete, the tissue culture extract used as antigen will be examined to identify the number and characterise the antigens it contains.

5.4. Induction of artificial immunity

5.4.1. Rabbits: The supply of rabbits is expected to return to normal over the next period and it is planned to continue the preparation of nonspecific sera to proteins and subunits isolated from *R. appendiculatus* midgut. Such sera will be used to immuno-purify large quantities of individual midgut antigens for subsequent vaccination of rabbits.

5.4.2. Goats: The paddock challenge will continue with weekly tick counts and biweekly blanket draggings. Engorged females will be weighed and observed for egg laying and hatchability. This challenge will not be complete until November 1986.

5.4.3. Sheep: The vaccination regimen will be completed, and the ear bag challenge commenced on all 24 sheep.

5.4.4. Cattle: In the next period egg hatching will be complete and the data on the tick stages and organ immunisation experiment will be fed into the computer for analysis.

The tissue culture cell vaccine experimental cattle will be challenged and the collection and processing of ticks from the challenge will carry on throughout the period.