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THE INTERNATIONAL CENTRE OF
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USAID GRANT DAN. 4083-G-SS-3063-00
HOST RESISTANCE - INTEGRATED TICK CONTROL
SEPTEMBER - NOVEMBER 1985.

3RD DECEMBER 1985.

1.0. INTRODUCTION.

There have been no major changes in research direction or outputs during the period under review.

2.0. PERSONNEL

The programme staff has been complemented by the addition of an ecologist DR. F. GIGON from the University of Neuchatel, Switzerland for a two-three year period to study the ecology of Amblyomma sp.

3.0. PROGRESS AGREED OUTPUTS.

3.1. Rusinga Island

Forty farms in the survey have now been sampled. A summary of the statistics associated with the survey is at Appendix I. Identification of the ticks from farms is not yet complete; details of the results to date are given in Appendix II.

It is evident that there is a considerable variation in the numbers of ticks per animal, in addition some seasonality is detectable as increasing numbers of ticks have been collected on animals sampled in this quarter. This seasonality should be clearly demonstrated in the next year's regular monthly survey figures.

3.2. Intona Ranch

Cattle in the paddocks have been tested by ear challenge for resistance to R. appendiculatus and A. variegatum the two main 3-host tick species present. Despite being under a relatively heavy tick challenge, resistant cattle have maintained similar levels of resistance to those demonstrated in May 1985.

Tick populations in both susceptible and immune paddocks are on the increase and there are now very heavy infestations in all paddocks.

Cattle tick levels continue to rise but susceptible animals have many more ticks than the resistant groups.

Seven susceptible animals died from the effects of tick infestation during the period August to November 1985. No resistant animals were lost. No tick borne diseases were diagnosed.

3.3. Kuja River. - Abandoned.

3.4. Laboratory Experiments

3.4.3. Effective of tick resistance on T. parva infection

The collaboration with KARI Muguga on this expt., is being revived and subject to the demonstration of suitable resistance in Bos. taurus cattle (see 4.5.5) the expt. will be repeated in 1986.

4.0. NEW OUTPUTS

4.1. Comparison of Rhipicephalus field and laboratory strains

The finding that the lab. strain of Rhipicephalus is more susceptible to immunity in host rabbits is now being confirmed in cattle. Susceptible cattle have been located and both field and laboratory strains of tick have been reared on cattle. Unfed adults will be fed on the susceptible cattle and the adult size and reproductive performance of the strains compared.

4.4. Assessment of host resistance by intradermal test

Tissue culture extract has been selected as the antigen of choice for the test and experiments carried out to confirm the reactivity of a solution containing

0.75 mg protein/ml. in both naive and tick exposed cattle. Naive cattle failed to react. Exposed animals reacted as expected. There is some dubiety of the true status of the "naive" animals used and attempts are being made to confirm naive non reactivity in animals in Europe.

It is possible that the i/d test itself could actually immunise cattle thus rendering the test useless. To examine this, immune and "naive" animals have been injected twice intradermally at a monthly interval, and bled serially every 7 days. Serum is being assessed by haemagglutination, Eliza and Auchterlony for antibody response. There was no positive reaction in the naive animals to the second inoculation.

Fully fed Amblyomma and Boophilus female ticks have been collected from the field and have commenced to lay eggs. After approx. 15 days embryonation these eggs will be used to develop tissue cultures. If successful, it is intended to use these tissue cultures to initiate cross immunity studies between Rhipicephalus, Amblyomma and Boophilus tissue cultures by intradermal test.

4.5. Inducement of artificial Immunity with selected antigen

4.5.1. Rabbits

The following immunised groups of rabbits were challenged during the period with 100 larvae, 50 nymphs and 50 adults on the ear.

- a) Aqueous midgut extract antigens
- b) Solubilised midgut membrane extract
- c) Insoluble midgut membrane.

Preliminary results indicate antibodies in the rabbits to all antigens. Larvae and nymphs show reduced feeding weights and adults reduced egg mass weights in some groups. Hatchability results are awaited.

Antigen fractions derived from aqueous extracts of 5 day fed midgut have been used to immunise rabbits.

4.5.3. Goats

The groups of goats immunised by natural exposure, crude midgut homogenate and a combination of both are ready for challenge. Larvae nymphs and adults are being bred for ear challenge.

4.5.4. Sheep

30 pregnant sheep have been purchased and have commenced parturition. The naive lambs will be used for the immunisation studies described in 4.5.4 of 28 October 1985. Collection of the necessary antigens has commenced.

4.5.5. Cattle

After a considerable search, two sources of tick naive calves has been located. One source can supply approximately 35 calves aged 3 months per year. The other up to 120 calves at 6 month of age. 28 calves have been purchased for an experiment to assess the biological effect of immunising with

- i) Larval extract (larvae fed 2 days)
- ii) Nymphal extract (nymphs fed 2-4 days)
- iii) Adult Salivary Gland (adults fed 6 days on bovines)
- iv) Midgut antigens (from 6 day fed adults)
- v) Midgut antigens plus reproductive organ extract
- vi) Midgut antigens plus all internal organs.

5.0 FUTURE PLANS in next three months.

5.1. Rusinga Island

Carry out tsetse survey. Commence monthly tick survey. Commence health survey.

5.2. Intona Ranch

Future uncertain. May have to terminate due to overwhelming tick burdens. If not terminated experiment will continue as planned.

5.3. Intradermal Test

Complete serological assessment of immun response to chosen tissue culture dose level

Test both immune and naive animals in the field to validate "naive/exposed" lab. results.

5.4. Comparison of Rhipicephalus field and laboratory strains

Complete immunisation of cattle. Feed field and lab. strains on immunised cattle and observe biological effect on development.

Inducement of artificial immunity

5.5.1. Rabbits. Complete 4.5.1. study hatchability results and immunise rabbits with a further 5 fractions of aqueous midgut.

5.5.2. Goats. Complete biopsies at tick feeding sites and put goats to pasture challenge.

5.5.3. Sheep. Prepare antigens and immunise sheep

5.5.4. Cattle. Immunise cattle and bleed weekly.

RUSINGA ISLAND 1985Farm Statistics

Species	Sex	Total No. of animals on farms	Mean no. per farm	No. of animals sampled	%
Bovine	Male	128	3.2	56	44
	Female	266	6.60	144	54
	Calf	204	5.1	155	76
Sheep	Male	67	1.7	27	40.5
	Female	260	6.5	77	30
	Lamb	124	3.1	39	31
Goat	Male	58	1.5	27	46.
	Female	260	6.5	143	55
	Kid	133	3.3	62	47

NUMBER AND SPECIES OF TICK AND HOST LOCATION -
RUSINGA ISLAND
TO 30TH NOVEMBER, 1985

Tick species	Tick stage	Mean no. per host.		
		Adult Cattle*	Calves**	Goats***
<u>R. appendiculatus</u>	Adult	411.8(129-871)	186.2(61-499)	113(1-710)
	Nymph	71.2(0-363)	28.5(0-185)	99.3(0-87)
	Larvae	31.1(0-209)	7.6(0-65)	11.4(0-71)
<u>R. evertsi evertsi</u>	Adult	34.3(6-91)	19.2(2-45)	45.0(4-200)
	Nymph	0.5(0-4)	0.5(0-3)	132 (0-9)
	Larvae	1.0(0-9)	0.2(0-2)	482 (0-450)
<u>A. variegatum</u>	Adult	147.2(29-385)	82.3(26-230)	4.1(0-20)
	Nymph	154.6(11-385)	60.5(10-141)	47.5(0-100)
	Larvae	87 (0-292)	39.6(0-227)	142.1(0-100)
<u>B. decoloratus</u>	Adult	10 (0-82)	4.6(0-20)	0.4(0-4)
	Nymph	5.8(0-76)	3.7(0-23)	0.2(0-2)
	Larvae	1.8(0-20)	1.1(0-27)	NIL
<u>H. rufipes</u>	Adult	1.0	1.0	-
<u>R. pulchellus</u>	Adult	3.0	1.0	1
<u>A. gemma</u>	Adult	-	1.0	-

* Total Sample size 154

** Total Sample size 125

*** Total Sample size 200

(-) Range