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PROBLEMS ENCOUNTERED IN THE CONTROL OF HEARTWATER IN ANGORA GOATS

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ABSTRACT

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This preliminary investigation confirmed that when Angora goats were immunized against heartwater, either when kids or young goats, they still had an immunity to heartwater a year later when they were challenged with a vaccine containing *Cowdria ruminantium*. An overwhelming majority of the uninoculated animals which were challenged at the same time were susceptible to clinical heartwater. Strategic immunization to obtain enzootic stability to heartwater is suggested. In these experiments the immunization of Angora goats was not accompanied by severe losses.

INTRODUCTION

The Angora goat industry is firmly established in the Republic of South Africa, mainly in the Eastern Cape Province, where about 750 000 of these animals are kept in heartwater enzootic areas. Du Plessis, Jansen & Prozesky (1983) have established that Angora goats are highly susceptible to heartwater and that immunization of these animals may be difficult and hazardous. In an earlier communication Erasmus (1976) indicated standards and methods which may be used for the immunization of goats under field conditions.

Gruss (1981) described a possible practical solution to the problem of the immunization of these animals in large flocks, a method that is currently applied and integrated into the dipping practice. The success of any inoculation programme is dependant on the number of *Cowdria ruminantium*-infested *Amblyomma hebraeum* ticks that are capable of restimulating the immunity of the previously immunized or immune animals. MacIvor & Horak (1984) have determined the seasonal prevalance of *A. hebraeum* on Angora goats (Fig. 1). The larvae are present on these animals in significant numbers from May to October, while the nymphae predominate from September until December. Adult ticks are present for most of the year, albeit in low numbers.

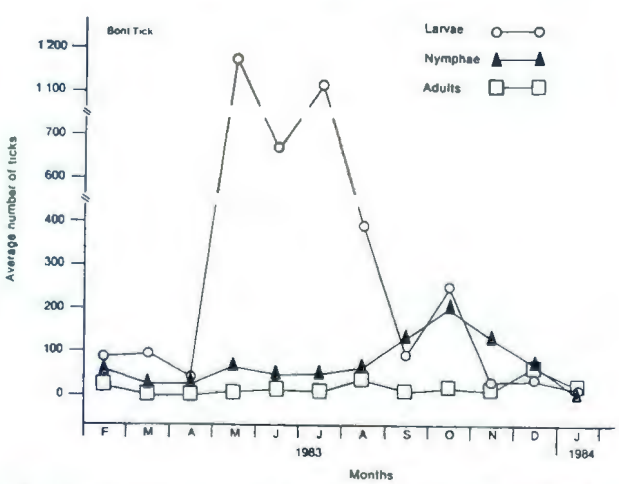

FIG. 1 The seasonal abundance of bont ticks on goats in Valley Bushveld (reproduced from MacIvor & Horak, 1984, by kind permission of the Editor, *Angora Goat and Mohair Journal*).

Van der Westhuizen, Wentzel & Grobler (1980) have shown that the Angora goat is a strictly seasonal breeder, the mating season occurring from March until May and the kidding season in turn from August until October. If these data are compared with the graph in Fig. 1, it can be seen that the mating season occurs when the numbers of *A. hebraeum* larvae begin to rise while the kidding season in turn occurs during the nymphal cycle. The pregnant Angora doe is very prone to abort, so subjecting the animals to stress by dipping them during the autumn, when the tick larvae are most active, is not recommended. The concept of "Total tick control" is not feasible with Angora goats because they are very susceptible to cold weather. Consequently breaks in the dipping programme occur rather frequently during the winter. Furthermore, no acaricide will totally eradicate the heartwater ticks.

It was therefore decided to initiate a preliminary investigation during the spring of 1981.

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MATERIALS AND METHODS

The initial experiment was carried out on Farm No. 1, Doornkom, in Uitenhage District. Twenty-eight Angora goats were randomly selected from 3 age groups, as follows: Group A, 8 Angora kids, all about 3 months old; Group B, 14 young Angora goats, about 15 months old, and Group C, adult Angoras, 2–3 years old. They were eartagged for future recognition and inoculated intravenously with Onderstepoort heartwater vaccine. Rectal temperatures of all animals were taken daily and all

TABLE 1 Febrile reactions of Angora goats inoculated with Ball 3 heartwater vaccine on Farm 1 (Doornkom) in October 1981

Group	Goat No.	Day of onset of fever	Duration of fever (days)	Max. rectal temp. (°C)	Treated (+)
A	1	—	—	—	–
	2	—	—	—	–
	3	—	—	—	–
	4	15	1	40	+
	5	—	—	—	–
	6	—	—	—	–
	7	—	—	—	–
	8	—	—	—	–
B	1	—	—	—	–
	2	13	2	40,7	+
	3	—	—	—	–
	4	—	—	—	–
	5	—	—	—	–
	6	13	2	41,5	+
	7	12	3	41	+
	8	14	1	40	+
	9	—	—	—	–
	10	13	2	41,3	+
	11	11	4	40,8	+
	12	13	2	41	+
	13	13	1	40,3	+
	14	—	—	—	–
C	1	—	—	—	–
	2	—	—	—	–
	3	—	—	—	–
	4	13	1	40	+
	5	—	—	—	–
	6	—	—	—	–

reactors, i.e. goats with a rectal temperature over 40 °C, were treated with oxytetracycline (Table 1). These goats were then placed with the rest of the flock and for a year were subjected to the normal dipping procedures practised on that farm.

One year later these animals were challenged with the same type of vaccine and monitored as before. At the same time, further experiments were started on 2 farms in Albany District, which is also an enzootic heartwater area. Flocks of Angora goats had already been selected on these farms and marked for future identification. On Farm No. 2, Bucklands, which adjoins a game reserve, 37 1-year-old Angora goats were inoculated against heartwater and monitored as described above (Table 2). On Farm No. 3, Glenboyd, along the Fish River, 38 1-year-old goats were similarly subjected to the intravenous infusion of *C. ruminantium* vaccine (Table 3). All animals reacting to the vaccine with a rectal temperature above 40 °C were treated.

TABLE 2 Febrile reactions of Angora goats inoculated with Ball 3 heartwater vaccine on Farm 2 (Bucklands) during October/November 1982

Goat No.	Day of onset of fever	Duration of fever (days)	Max. rectal temp. (°C)	Treated (+)
1	14	3	41	+
2	—	—	—	–
3	—	—	—	–
4	13	3	42,4	+
5	10	3	41,2	+
6	11	5	41,6	+
7	14	2	41	+
8	—	—	—	–
9	12	4	41,2	+
10	—	—	—	–
11	11	5	41,3	+
12	—	—	—	–
13	12	4	41,5	+
14	14	5	41,6	+
15	11	5	41,3	+
16	12	3	40,8	+
17	13	6	41,3	+
18	13	3	41	+
19	—	—	—	–
20	13	8	42,8	+
21	13	3	42,2	+
22	14	9	40,8	+
23	11	12	42	+
24	—	—	—	–
25	11	8	41,5	+
26	—	—	—	–
27	14	2	41,5	+
28	13	3	41,4	+
29	11	5	41,4	+
30	13	3	41,4	+
31	—	—	—	–
32	11	5	41,5	+
33	13	7	41,5	+
34	11	6	41	+
35	11	5	41,2	+
36	—	—	—	–
37	11	5	41	+

RESULTS AND DISCUSSION

During the preliminary investigation on Farm No. 1 in Group A (kids) 1/8 (12,5 %) animals reacted to the vaccine and it was judged to have been susceptible to heartwater. In Group B (15-month-old goats) 8/14 (57 %) of the animals were found to be susceptible to artificial infection with heartwater, and in Group 3 (adult animals) 1/6 (16,6 %) proved to be susceptible to this disease (Table 1).

The following year the goats in Group A, which were by then 15 months old, all had a solid immunity to the disease. In Group B only 1/14 (7 %) of the population

TABLE 3 Febrile reactions of Angora goats inoculated with Ball 3 heartwater vaccine on Farm 3 (Glenboyd) during October/November 1982

Goat No.	Day of onset of fever	Duration of fever (days)	Max. rectal temp. (°C)	Treated (+)
1	11	9	41,5	+
2	11	6	41,1	+
3	—	—	—	–
4	20	1	40,5	+
5	—	—	—	–
6	19	1	40,5	+
7	16	4	42	+
8	—	—	—	–
9	—	—	—	–
10	17	3	41,8	+
11	14	4	40,7	+
12	17	3	41,2	+
13	17	3	41,4	+
14	13	7	42	+
15	—	—	—	–
16	—	—	—	–
17	17	3	40,9	+
18	—	—	—	–
19	—	—	—	–
20	16	4	41,5	+
21	16	4	41,6	+
22	16	4	41,2	+
23	16	4	40,4	+
24	16	4	42	+
25	—	—	—	–
26	16	4	40,8	+
27	14	6	40,9	+
28	15	5	41,3	+
29	16	3	40,9	+
30	14	6	40,9	+
31	15	5	41	+
32	—	—	—	–
33	17	2	41	+
34	14	4	41,3	+
35	18	2	41,6	+
36	19	1	40,5	+
37	16	4	41,5	+
38	17	3	41,4	+

was susceptible, and in Group C all the animals were found to be resistant, when they were challenged with the Ball 3 heartwater vaccine.

At the same time on Farm 2 27/37 (73 %) of the 1-year-old animals developed clinical disease after challenge and had to be treated (Table 2). On Farm 3, 30/38 (79 %) of the population, which were similar in age to those on Farm 2, were found to be susceptible to heartwater (Table 3).

During the 1st year of this preliminary field trial, therefore, it can be seen that only about an eighth of the young kids developed the disease, while 17 % of the adult animals were susceptible to heartwater. The following year the young goats, which had been inoculated when they were kids (Group A) were all refractory to artificial infection, while only 7 % of the goats inoculated when they were 15 months old (Group B) developed the disease. The adults (Group C) were all found to be immune. On the other 2 control farms, where larger groups of 1-year-old goats were similarly challenged, it was found that 73 % and 79 % respectively of the animals had developed no immunity to heartwater during their 1st year of life.

All the farms had regular dipping programmes and all 3 farmers had similar high levels of management. Differences between the 2 years and between the 2 areas (which are about 125 km apart), as well as differences in the numbers of *A. hebraeum* and the percentages of nymphae and adults infected with *C. ruminantium*, could account for the differences in the percentages of animals found susceptible to heartwater on these 3 farms (57 %, 73 % and 79 % respectively). The most significant finding in this study was that, apart from 1 goat in Group B

of the inoculated animals on Doornkom, the goats that were inoculated as kids and as adults respectively became solidly resistant.

CONCLUSION

The main conclusion to be drawn from this study is that to remove the threat of large losses of these valuable animals from heartwater, a state of enzootic stability must be achieved. Data produced by MacIvor & Horak (1984) (Fig. 1) show a rise in *A. hebraeum* larvae during autumn. Should the kid crop be immunized at this stage a higher percentage of larvae may become infected. This in turn would facilitate natural immunization of the goats and the creation of enzootic stability. Moreover, i.v. vaccination at this stage will be easier because the goats will be bigger.

According to Gruss & Van Tonder (unpublished data, 1986), Angora goats are very responsive to oxytetracycline medication. When animals infected with heartwater are treated with high dosages of oxytetracycline the disease should be easily contained. Immunity will be maintained in these newly immunized animals by tick challenge throughout the year with infected *A. hebraeum*.

The idea of autumn inoculation is a concept that must be investigated further. If this procedure is found to be effective it would ensure that a stable situation with regard to heartwater in Angora goats is eventually developed. Finally, under field conditions the vaccination of goats with the Onderstepoort vaccine apparently is not as risky as has been suggested by some laboratory trials (Du Plessis *et al.*, 1983).

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