

The ixodid tick, *Rhipicephalus appendiculatus*, the vector of the cattle disease East Coast Fever, remains attached to its hosts for several days thus providing a sustained antigenic stimulus. In the present investigation, it has been demonstrated that goats become resistant to ticks after natural infestations and after immunization with crude midgut antigens.

Resistance to the three stages of *R. appendiculatus* was investigated in goats following immunization by natural infestations and by crude midgut antigens. The immunity was assessed by artificial challenge on the ears using larvae, nymphs and adult ticks, and by placing the immunised goats in discrete paddocks seeded with ticks and observing the effect of feeding on the population development. In addition studies to determine the effects arising from the transfer of maternal immunity from naturally immune dams to their offspring was investigated. The passive transfer of resistance to *R. appendiculatus* by serum from dams immunized with crude midgut antigens was also studied. Goat dermal responses to infestation of feeding ticks were examined histologically.

The results presented in this study indicate that the goat responds well to tick antigens and produces a high level of immunity to natural infestation; inoculation of isolated tick midgut protein mixtures and a combination of both types of methods of immunisation.

The effects of immunisation on the tick life cycle were found to be significant. There were reductions in larval, nymphal and adult engorged weights by up to 75 percent. Egg-mass weights were reduced by up to 76 percent by both types of immunity.

There were deaths of ticks fed on immunized goats in all groups. The number of tick deaths caused by tick midgut antigen immunisation approached 37 percent.

A varying percentage of adults and nymphs fed on immunized goats turned black and usually died. Some white, reddish-pink and bright red larvae and nymphs were seen. These colours were probably caused by host erythrocytes or haemoglobin leaking into the haemolymph following midgut damage in ticks engorging on immunized animals. Many of the adults that survived were infertile and others laid eggs of which only a low percentage hatched. The percentage of eggs hatching was less than 50 percent in all the immunized groups.

Similar results were found following the transfer of maternal immunity. Mother that had been naturally immunized with ticks transfer considerable immunity in the colostrum against ticks to their progeny. In the passive transfer studies, similar results were obtained.

The dermal responses to infestation indicate that the nature of the cellular infiltrates changed in character and magnitude during the feeding process and again these differed during successive infestations. The principal cells involved in these infiltrates were eosinophils, mast cells, basophils and neutrophils.

Other studies have shown that eosinophil major basic proteins have a protective function in a number of host-parasite systems. In addition to modulating the effect of mast cell/basophil-derived mediators, eosinophils can damage the cheliceral receptors or the gut epithelia of the tick, thus leading to poor feeding. Similar results were found during this study.

The immunity to ticks produced in goats by natural tick infestation or by the injection of midgut tick antigens or a combination of both methods effectively controlled the development of tick populations on experimental paddocks. If immunity to ticks persists long enough in practice, it is possible that immunization of goats would greatly reduce the economic losses due to ticks.

In summary, tick-resistant goats reduced tick populations by death and impaired feeding, leading to a reduced production of larvae. This tick resistance is an acquired immune response associated with both humoral and cellular reactions. The results show that it should be possible to protect goats from *R. appendiculatus* thus reducing losses due to tick damage.