CHALLENGE OF THEILERIA PARVA (BOLENI) IMMUNISED CATTLE WITH SELECTED EAST AFRICAN THEILERIA STOCKS


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SUMMARY

Theileria parva (Boleni) stock from Zimbabwe was used to immunise 24 susceptible Friesian calves by infection and treatment with oxytetracycline. Twenty-eight days after immunisation the animals in groups of 6 plus 2 susceptible controls were subjected to challenge: 3 groups with heterologous stocks and one group with the immunising stock. Theileria parva (Boleni) gave good protection against homologous challenge, the T. parva (Muguga, Kenya) and buffalo-derived T. parva (Serengeti transformed, Tanzania) parasite stocks. It did not protect against the T. parva (Kasoba, Malawi) stock and 3 out of 6 immunised cattle died and the remaining 3 had to be treated with parvaquone.

In a second experiment, the 6 T. parva (Boleni) immunised animals which had received homologous challenge, together with the 2 controls which had recovered without treatment from T. parva (Boleni) infection, were challenged with the T. parva (Kasoba) stock. Four out of 6 of the immunised animals resisted the challenge with mild to moderate reactions. The other 2 animals had severe reactions and one died. The 2 control animals which recovered from T. parva (Boleni) infection resisted the T. parva (Kasoba) challenge and both had mild reactions. It is suggested that oxytetracycline used in the first experiment may have interfered with the expression of the full protective capacity against the virulent T. parva (Kasoba) stock. Further studies on the use of the T. parva (Boleni) stock without oxytetracycline treatment could identify a more broadly immunising effect and a more economical vaccination method.

INTRODUCTION

Theileria parva bovis, the cause of January disease and described by Lawrence and Mackenzie (1980), is morphologically and serologically indistinguishable from T. parva parva, the cause of East Coast fever (ECF); both parasites are transmitted by Rhipicephalus appendiculatus. In Zimbabwe, January disease, has been differentiated from ECF on the basis of the severity of the clinical reaction, the level of schizont parasitosis in lymph node biopsy smears and piroplasm parasitaemia (Matson, 1967; Lawrence, 1979). However, it has been concluded that there are no biological grounds for subspeciation of T. parva and it has been recommended that the trinomial system of nomenclature for T. parva parasites be dropped (Anon, 1989).

The characteristic of producing mild reactions and providing a broad immunity by the "T. p. bovis (Boleni)" stock (hereafter called T. parva (Boleni)) suggests that it
might have a potential for wide scale immunisation against ECF (Uilenberg et al., 1982; Irvin et al., 1989). Cross immunity studies showed that the T. parva (Boleni) stock conferred good protection in cattle which were challenged with cattle derived T. parva (Muguga) and the buffalo-derived T. parva (Serengeti-transformed) (Uilenberg et al., 1982; Irvin et al., 1989). The T. parva (Boleni) stock appears to have good potential for immunisation in Zimbabwe since it gave good cross protection against different local T. parva stocks identified as Ardlui, Glenfarg, Avery and Willsbridge (Kock et al., 1988, 1990).

A bulk stabilate of T. parva (Boleni GU79-1), derived from the original T. parva (Boleni GU79) stabilate stock was prepared for testing for national use in Zimbabwe. The original T. parva (Boleni GU79) was prepared in Utrecht from infected R. appendiculatus ticks fed on a bovine animal on the Boleni farm in Zimbabwe where there had been a severe outbreak of theileriosis in 1978 (Lawrence and Mackenzie, 1980). The objective of this study was to examine the protection provided by this new stabilate and to compare the protection observed with that of earlier stabilates. Because the Boleni stock has shown broad protection it was also tested against the virulent Malawi stock, T. parva (Kasoba), to assess its protection for possible more widespread use.

MATERIALS AND METHODS

Animals

Thirty-six Friesian calves were purchased from farms practising strict tick control in the southern region of Malawi where clinical ECF has not been reported. They were transferred to the Central Veterinary Laboratory, Lilongwe, where they were maintained tick-free on concrete floors. The weight of the animals ranged from 80 kg to 245 kg. Prior to the experiment, all were serologically negative to T. parva schizont antigen using the indirect immunofluorescence antibody test (IFAT) (Burridge and Kimber, 1972).

Immunisation regimen

Experiment 1

Twenty-four calves were immunised with 0.5 ml of the T. parva (Boleni GU79-1) stabilate (first passage) in 0.5 ml of stabilate diluent using the method described by Cunningham et al. (1973). The stabilate was administered immediately after injection of long acting oxytetracycline hydrochloride (Vetimycin, C-Vet Product) which was given intramuscularly in the gluteal muscles at a dose of 20 mg/kg body weight. The stabilate was inoculated subcutaneously in front of the right parotid lymph node. Two additional calves were given the stabilate without tetracycline to test its viability and acted as immunisation controls.

On day 28 after immunisation the 24 calves were divided randomly into 4 groups of calves, and 2 susceptible control calves were added to each group. The following stocks were used to challenge the 8 calves in each group: T. parva (Boleni GU79-1), originally isolated by Lawrence and Mackenzie (1980), T. parva (Muguga) originally described by Brocklesby et al. (1961), buffalo-derived T. parva (Serengeti-transformed) originally described by Young and Purnell (1973) and T. parva (Kasoba) originally isolated by Musisi et al. (1989). Each animal was given 1 ml of the undiluted stabilate except for the Boleni which was diluted 1:1 and 1 ml was used per animal. The estimated parasite concentration in each stabilate is shown in