

IMMUNE RESPONSE OF ADULT CATTLE VACCINATED WITH OIL ADJUVANTED FOOT-AND-MOUTH DISEASE VACCINES

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SUMMARY

Two-year old cattle which had been vaccinated 3 times against foot-and-mouth disease at 6-month intervals with inactivated oil adjuvanted vaccines showed a very satisfactory immune response with an expected percentage of protection over 80% during 12 months following the fourth revaccination.

These results suggest the following vaccination scheme for this type of vaccine: vaccination at 6-month intervals of cattle up to 2 years of age followed by a yearly revaccination.

INTRODUCTION

An earlier paper (1) described the immune response of young, 5-7 month old cattle after vaccination and revaccination with oil adjuvanted foot-and-mouth disease (FMD) vaccine. These vaccines were prepared from virus suspensions inactivated with acetylethyleneimine (AEI). The results of these experiments showed that this type of vaccine induces a high level of circulating antibody which persists for long periods. It was possible therefore to vaccinate young cattle every 6 months.

Earlier papers (6,7) reported on the immune response of adult cattle to oil adjuvanted vaccine maintained under controlled laboratory conditions. In the present work the immune response of a group of cows under controlled field conditions was studied. Two vaccination schemes of oil adjuvanted vaccination were tested in order to establish the most efficient vaccination scheme for a cattle population.

MATERIALS AND METHODS

The oil adjuvanted vaccine studies were done at the experimental station "Cinco Cruzes" of the "Empresa Brasileira de Pesquisas Agropecuárias" Brazilian Agricultural Research Agency, (EMBRAPA) of the Ministry of Agriculture of Brazil (1).

From a group of 128 adult cattle (5/8 Aberdeen-Angus and 3/8 Nelore) 40 cattle were randomly selected for the study. The mean age of the group was 2 years. All had been vaccinated with inactivated oil adjuvanted FMD vaccine at 6-month intervals and were kept under the same management and ambient conditions.

The 40 selected cattle were divided randomly into 2 groups of 20. The cattle of Group 1 were revaccinated every 6 months and those of Group 2 were vaccinated once a year.

The vaccine was prepared with FMD virus subtype O₁ strain Campos, A₂₄ strain Cruzeiro and C₃ strain Resende, grown in BHK-21 C13 cells (5) and inactivated with AEI as described (1).

The cattle were bled every 2 months, and circulating antibodies were assayed by the mouse protection test (2). The expected percentage of protection (EPP) was calculated from the mouse protection test results according to Gomes and Astudillo (3).

RESULTS

Table 1 summarizes the results, expressed in EPP, for the 3 FMD virus strains. For both groups the mean EPPs at 6 and 12 months after vaccination indicate a protection of more than 80%, a

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value which is considered an acceptable population immunity (3). Group 2 had a higher protection level and a smaller degree of variation. The largest differences between the groups were observed for virus O₁.

DISCUSSION

Contrary to FMD vaccines with aluminum hydroxide adjuvant with or without the addition of saponin, the vaccination and revaccination at 6-month intervals of young cattle with inactivated oil adjuvanted FMD vaccine produce a satisfactory immune status in those animals (1). Moreover, it is more difficult to vaccinate young cattle against FMD than adults (4).

Therefore, it can be expected that young cattle which have been systematically vaccinated with oil adjuvanted vaccines will have an immune status which permits longer vaccination intervals. The results show that adult cattle which have been vaccinated as calves and heifers at least 3 times show a highly satisfactory immunity which makes it unnecessary to continue with 6-monthly vaccinations.

With the use of oil adjuvanted vaccines it appears feasible to use the following vaccination scheme in young cattle: up to 2 years of age, vaccination at 6-month intervals; from that age on, revaccination at yearly intervals. The practical use of this scheme, and its acceptance by the agricultural community, should be tested in a large field experiment.

TABLE 1. Mean expected percentage of protection of adult cows after revaccination with oil adjuvant FMD vaccine

FMD Virus	Group*	Months after revaccination		
		0**	6	12
O ₁	1	86 ± 6	93 ± 6	83 ± 7
	2	94 ± 3	96 ± 3	93 ± 3
A ₂₄	1	96 ± 4	96 ± 4	99
	2	99	99	99
C ₃	1	88 ± 9	94 ± 6	94 ± 5
	2	90 ± 6	96 ± 4	95 ± 3

* Group 1: vaccination 6-month intervals.
Group 2: vaccination 12-month intervals.

** At the start of the study all cattle had received 3 vaccinations with oil adjuvant FMD vaccine at 6-month intervals.

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