



# IMMUNE RESPONSE TO FOOT AND MOUTH DISEASE OIL ADJUVANT VACCINES IN CALVES

K. Rajkumar<sup>1</sup> and M. R. Saseendranath<sup>2</sup>

Department of Veterinary Epidemiology and Preventive Medicine  
College of Veterinary and Animal Sciences  
Mannuthy-680651, Thrissur, Kerala

## Abstract

*Immune response to FMD oil adjuvant vaccines in four month old calves born of vaccinated dams showed increased antibodies to FMD type 'O', 'A', Asia 1 and 'C' within a month after primary vaccination. The antibody level remained satisfactory till 270 days post vaccination. It is concluded that FMD oil adjuvant vaccine elicits efficient response against all types of FMD virus in calves even in the presence of maternal antibodies.*

**Key words:** FMD oil adjuvant vaccines, Immune response, calves

Foot and Mouth Disease is an acute febrile disease of mainly cloven footed animals that cause severe economic loss and is mainly controlled by vaccination in India. One of the main problems in mass immunisation against FMDV is inducing protection in young calves in which the presence of maternal antibodies interfere with immune response. Since it has been shown that new born calves with maternal antibodies give very poor or no response to aqueous (Aq) Foot and Mouth Disease virus (FMDV) vaccines (Nicholla *et al.*, 1984), the epidemic waves start in many countries with infection of these unprotected young calves. But it has been demonstrated, both in laboratory and in controlled field conditions, that oil adjuvant vaccines confer a much long lasting protection in cattle (Rivenson *et al.*, 1982). Further Sadir *et al.* (1988) reported that oil emulsion FMD vaccines are highly efficient

from 30 days of age, even in the presence of colostral antibody. The present study was undertaken to study the immune response to Foot and Mouth Disease oil adjuvant vaccines in calves.

## Materials and Methods.

Twelve calves, aged four months born of dams vaccinated against FMDV type O, A, C and Asia 1 were used (Raksha O Vac) for the present study.

All the calves were vaccinated with two ml of FMD Oil adjuvant vaccine intramuscularly.

Serum samples were collected before vaccination and at monthly interval for a period of one year. Liquid Phase Blocking Enzyme Linked Immuno Sorbent Assay (LPB ELISA) was carried out as per the method of Hamblin *et al.* (1986) for the assessment of immune response. The optical density (OD) was read on a titertek multiskan (Flow laboratories) at 492 nm. The OD values were converted to percent of mean OD obtained for virus control, which was taken as the maximum OD. The 50 per cent OD end point of each serum dilution was computed using the slope of regression between serum dilution (log<sub>10</sub>) and per cent OD and expressed as the antibody titre.

## Results and Discussion

The antibody titres to FMDV type O, A, C and Asia -1 are presented in the tables (1 to 4). On examination of the serum sample at

1. Assistant Professor, RGCOVAS, Puducherry  
2. Professor and Head

fourth month of age before primary vaccination, all the animals showed antibody titres to FMD type C virus. But antibody titres to O, A, Asia1 FMD virus were shown to be significantly low. After vaccinating these animals with polyvalent FMD oil adjuvant vaccine, all of them showed increased antibody levels to FMD type C within a month. Immune response against FMD virus type C in the presence of maternal antibodies clearly indicate that there is no interference of maternal antibodies in immune response. The results are in accordance with the observation made by Rao *et al.* (1993) and Sadir *et al.* (1988) who reported that presence of maternal

antibodies did not influence the serological response in animals vaccinated with oil adjuvant vaccine. Antibody titre reached a peak six months after primary vaccination and there after it declined. The serum neutralising antibody titres remained at a protective level for 270 days post vaccination. The antibody response to FMD type 'O', 'A' and Asia 1 were also above the protective level for 270 days post vaccination (Tables 1,2, & 4). Hence it is concluded that FMD oil adjuvant vaccine ensures a protective level of antibody for 270 days post vaccination in calves even in the presence of maternal antibodies.

**Table 1.** Antibody titre to FMDV type O (Mean  $\pm$  SE).

Month	0	1	2	3	4	5	6	7	8	9	10	11	12
Serological Response (log <sub>10</sub> SN <sub>50</sub> )to FMDtypeO antigens	0.600 $\pm$ 0.01	1.938 $\pm$ 0.06	2.101 $\pm$ 0.13	2.187 $\pm$ 0.15	2.197 $\pm$ 0.12	1.575 $\pm$ 0.23	1.393 $\pm$ 0.24	1.646 $\pm$ 0.15	1.741 $\pm$ 0.10	1.529 $\pm$ 0.21	2.009 $\pm$ 0.14	1.952 $\pm$ 0.09	2.028 $\pm$ 0.11

(For the protection of FMDV type 'O' the titre of 1.5 and above is taken as protective)

**Table 2.** Antibody titre to FMDV type A (Mean  $\pm$  SE)

Month	0	1	2	3	4	5	6	7	8	9	10	11	12
Serological Response (log <sub>10</sub> SN <sub>50</sub> )to FMDtypeA antigens	0.600 $\pm$ 0.01	1.827 $\pm$ 0.09	1.332 $\pm$ 0.21	1.371 $\pm$ 0.15	1.649 $\pm$ 0.09	1.658 $\pm$ 0.22	1.556 $\pm$ 0.15	1.615 $\pm$ 0.21	1.222 $\pm$ 0.07	1.294 $\pm$ 0.13	2.101 $\pm$ 0.11	2.060 $\pm$ 0.13	1.864 $\pm$ 0.051

(For the protection of FMDV type 'A' the titre of one and above is taken as protective)

**Table 3.** Antibody titre to FMDV type C (Mean  $\pm$  SE)

Month	0	1	2	3	4	5	6	7	8	9	10	11	12
Serological Response (log <sub>10</sub> SN <sub>50</sub> )to FMDtypeC antigens	1.182 $\pm$ 0.12	1.752 $\pm$ 0.02	1.77 $\pm$ 0.17	1.412 $\pm$ 0.16	1.182 $\pm$ 0.18	1.477 $\pm$ 0.35	2.428 $\pm$ 0.10	1.080 $\pm$ 0.13	1.157 $\pm$ 0.15	1.253 $\pm$ 0.24	1.340 $\pm$ 0.17	2.500 $\pm$ 0.12	2.520 $\pm$ 0.10

(For the protection of FMDV type 'C' the titre of one and above is taken as protective)

**Table 4.** Antibody titre to FMDV type Asia-1 (Mean  $\pm$  SE)

Month	0	1	2	3	4	5	6	7	8	9	10	11	12
Serological Response (log <sub>10</sub> SN <sub>50</sub> )to FMDtypeAsia 1 antigens	0.060 $\pm$ 0.01	2.017 $\pm$ 0.14	2.074 $\pm$ 0.12	2.271 $\pm$ 0.11	1.729 $\pm$ 0.09	1.353 $\pm$ 0.13	1.884 $\pm$ 0.17	1.377 $\pm$ 0.13	1.732 $\pm$ 0.19	1.339 $\pm$ 0.24	2.082 $\pm$ 0.14	2.341 $\pm$ 0.12	2.294 $\pm$ 0.11

(For the protection of FMDV type Asia 1 the titre of 1.4 and above is taken as protective)

## Acknowledgements

We thank the Executive Director, Indian Immunologicals Ltd., Hyderabad for the supply of vaccine and biologicals and the Dean, College of Veterinary and Animal Sciences, Mannuthy for providing facilities and permission to conduct the study.

## References

- Hamblin, C., Barnett, I.T. and Crowther, J. R. 1986. A new enzyme-linked immunosorbent assay (ELISA) for the detection of antibodies against foot-and-mouth disease virus. II - Application. *J. Immunol. Meth.*, **93**: 123-129.

- Nicholla, M. 1., Black, L., Rweyemamu, M. M., Genovese, J., Ferrari, R., Hammant, C.A., De Silva E. and Umehara O. 1984. The effect of maternally derived antibodies on the response of calves to vaccination against foot-and-mouth disease. *J. Hygiene.*, **92**: 105-116.
- Rao, A. K., Palanisamy, R., Kalanidhi, A. P., Azad, H. M. and Srinivasan, V. A. 1993. Use of oil adjuvant foot-and-mouth disease vaccine in cattle. *Indian Vet. J.*, **70**: 493-497.
- Rivenson, S., Sandir, A. M., Gaggino, O. P., Marcovecchio, F. E., Zabal, O. and Laporte O. 1982. Comparison of two foot and mouth disease vaccines (oil emulsion and hydroxyl saponin) in cattle. *Revista de Medicina Veterinaria*, **65** : 364-370.
- Sadir, A.M., Schudel, A. A., Laporte, O., Braun, M. and Margni, R. A. 1988. Response to foot and mouth disease vaccines in new born calves. Influence of age, colostral antibodies and adjuvants. *Epidemiol. Inf.*, **100**: 135-144.

