Haryana Vet. **47** (December, 2008), pp 107-109

Short Communication

PREVALENCE OF PROTECTED ANIMALS AGAINST FOOT AND MOUTH DISEASE IN UTTAR PRADESH

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SUMMARY

Liquid phase blocking enzyme linked immunosorbant assay (LPB-ELISA) was implemented as diagnostic tool for the assessment of antibody titre against different types of foot and mouth disease virus during FMD control programme. Out of 1740 serum samples of pre-vaccinated animals examined by LPB-ELISA, 72 (4.13%), 108 (6.2%) and 135 (7.75%) samples showed protective antibody titre (ELISA titres ≥ log 2.1) to FMD virus type O, A, and Asia-1, respectively. After third round of vaccination with FMD vaccine (Indian Immunologicals, Hyderabad), 1027 serum samples were collected from the different districts of Uttar Pradesh. Out of 1027 samples, 336 (32.7%), 409 (39.82%) and 619 (60.2%) samples showed protective antibody titre to FMD virus type O, A, and Asia-1, respectively.

Key words: FMD, prevalence, LPB-ELISA, Uttar Pradesh

Foot and mouth disease (FMD) is a highly contagious disease of cattle, buffalo, pigs, sheep, goats and wild ruminants, characterized by fever, vesicles on the feet, mouth and udder and mortality in young ones. Morbidity can approach 100% OIE, 2007), while mortality is rare in adult animals, but it may be as high as 50% (Bachrach, 1977, Donaldson *et al.,* 1984, Mckercher *et al.,* 1985) when the virus replicates in the heart muscles of younger animals (Gulbahar *et al.,* 2007) resulting in death. The recovered animals remain in poor physical condition over long periods of time leading to sustained economic losses for the livestock industry. The cost due to eradication or control is high and there are major indirect losses due to the imposition of trade restrictions (Pereira, 1981, Rweyemamu and Leforban, 1999, Anon., 2001).

In India, the disease is caused by FMD virus (FMDV) type O, A, C and Asia-1. However, serological investigations assume far more significance in this country, where the disease is endemic. Since, the protective immune response to FMD virus is heavily dependent on humoral antibodies (McCullough *et al.,* 1992) and thus, the serological monitoring forms an important component of any FMD control programme. This report describes the results of the FMD control programme during 2006-07 in cattle and buffalo from nine districts of Uttar Pradesh state.

Under FMD control programme a total of 2767 serum samples including 1740 pre-vaccinated and 1027 post-vaccinated animals from nine districts of Uttar Pradesh were analyzed for the presence of antibodies against FMD virus type O, A and Asia-1 using liquid phase blocking ELISA (LPB-ELISA) as per the methodological principles described by Hamblin *et al.* (1986). The reagents for the test (serotype specific rabbit and guinea pig anti-146S FMDV O, A and Asia-1 serum) were kindly supplied by central laboratory of the All India co-ordinated research project on FMD, IVRI Campus, Mukteswar, Nainital, Uttarakhand. Briefly, the FMD antigen of a specified serotype was incubated with test serum and transferred to an ELISA plate already coated with rabbit anti-FMD polyclonal IgG, specific for the serotype under assessment to 'trap' any unbound antigen. The bound FMD antigen in the sample was detected by guinea pig anti-FMD polyclonal IgG, followed by the addition of an anti-guinea pig IgG-HRPO conjugate and the substrate, OPD.

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Table 1

Number of animals showing protective antibody titre against different types of FMD virus

Districts	Pre-vaccination samples				Post-vaccination samples			
	Total samples tested	Samples showing antibody titre ≥ 2.1 against			Total samples tested	Samples showing antibody titre ≥ 2.1 against		
		Type O	Type A	Type Asia-1		Type O	Type A	Type Asia-1
Agra	110	0	0	0	130	2	7	46
Aligarh	-	-	-	-	210	78	103	147
Buland Sahar	120	0	0	0	80	10	13	34
Etah	97	0	3	8	140	11	19	23
Firozabad	163	0	0	0	20	0	4	9
G.B.Nagar	420	0	0	0	189	69	83	140
Ghaziabad	358	20	31	44	198	151	149	175
Hathras	130	52	74	83	60	15	31	45
Mathura	342	0	0	0	-	-	-	-
Total	1740	72 (4.13)	108 (6.20)	135 (7.76)	1027	336 (32.72)	409 (39.82)	619 (60.27)

Figures in parentheses are percentage

The reaction was stopped by the addition of 1M H_2SO_4 and the optical density was observed at 492 nm. The result for each serum sample was calculated to determine the percentage inhibition (PI) of FMD antigen binding by the sample using following formula.

$$\% \text{ inhibition} = 100 - \frac{(\text{Test well OD} - \text{Background OD})}{(\text{Antigen control OD} - \text{Background OD})} \times 100$$

Where, samples with a PI greater than 50% were considered positive for FMD antibody

Out of 1740 sera samples of pre-vaccinated animals, 72 (4.13%), 108 (6.2%) and 135 (7.75%) samples have shown the protective antibody titre (ELISA titres ≥ log 2.1) to FMDV type O, A, and Asia-1, respectively. Out of 1027 sera samples collected after third round of vaccination, 336 (32.7%), 409 (39.82%) and 619 (60.2%) samples showed the protective antibody titre (ELISA titres ≥ log 2.1) to FMDV type O, A, and Asia-1, respectively (Table 1).

From the result, it can be concluded that although the protective immunity was developed in animals after third round of vaccination but could not achieved the target level even after third round of vaccination. When the proportion of protected animals reaches a critical level (probably around 80% for FMD) then herd immunity is achieved and new introductions of virus will not result in an outbreak of disease (Anderson and May, 1985). Analysis of data from serological surveys is naturally broken down by the relevant virus types in the area. Laboratory procedures commonly available are not able to distinguish between natural immunity and titres resulting from vaccination (Chamnanpood *et al.*, 1994). Hence a high prevalence of protected animals may be due to a high level of disease in the population rather than effective vaccination. Thus, to truly understand if a vaccination programme is achieving its ultimate aim, measures of disease incidence are also needed. It can also be advised that regional laboratories should be invited to participate in the field evaluation of an ELISA-based serological test to distinguish antibody responses to infection from vaccination responses. Introduction of such a serological procedure could have a profound effect on FMD control programme.

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