SERO-DYNAMICS OF MATERNALLY DERIVED ANTIBODY IN NEW-BORN CALVES AGAINST FMD

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Maternal antibody confers passive protection to the new-born calves so as to defend an array of infection until their immune system gets molded to a self competent body. Bovine neonates rely solely on colostrum to acquire passive immunity because their placentation is syn-epitheliochorial, where immune transfer via placenta is not possible (Chucri, 2010 and Hurley, 2011). The interference of maternal antibody with effective induction of immunity in primi-vaccinated calves is a well documented and undeniably accepted fact. Vaccination of calves retaining a part of passively acquired maternal antibody creates a 'window of susceptibility' period, where the maternal antibody is too low to protect the animals from getting infection but high enough to interfere with vaccine response. This can potentially create a vulnerable period with high susceptibility to FMD not only for the calves but also to the entire herd. Hence the period to which maternal antibody persisted in the system of colostred calves born to vaccinated dams were assessed for a period of five months.

Seven cross-bred day-old calves, born to vaccinated cows at University Livestock Farm, Mannuthy during a period from March to April 2014 were included in the study. Animals were bled immediately after birth feeding colostrum through jugular venipuncture using 22 gauge needles. Blood was collected subsequently after consumption of colostrum from the same animals on days 3, 7, 14, 30, 60, 90, 120 and 150. Serum samples were separated and stored at -20^{o}C until serological analyses. Serum samples were subjected to single dilution Liquid Phase Blocking ELISA(LPB ELISA) for detection of antibody titre against FMDV serotypes O, A and Asia1, following the protocol of Sharma *et al*., 2015.

The passive-immunity against FMDV serotypes O, A and Asia 1 obtained through colostrum in calves born to vaccinated dam are shown in the figure 1. The LPB ELISA titre for type O antibody (table 1) detection with serum sample collected from new born calves before and after colostrum consumption. The mean antibody titre before colostrum feeding was 1.210 ±0.07 and it increased thereafter. The peak mean level 2.252±0.05 was attained at day seven post colostrum feeding and the value remained significantly high up to day 60. The mean antibody titre on days 90 to 150 showed not statistically significant difference.

The mean antibody titre for serotype A (table 2) before colostrum feeding was observed to be 1.301± 0.02 and it reached peak (2.224±0.00) at day 14 after consumption of colostrum. Highly significant increase was noticed from day 3 to day 90, after which the titre showed progressive decline with lowest value 1.614±0.02 observed on day 150. The mean protective titre was maintained up to day 90. The mean antibody titres were below protective level both at days 120 and 150 with titres 1.678±0.04 and 1.614±0.02 respectively.

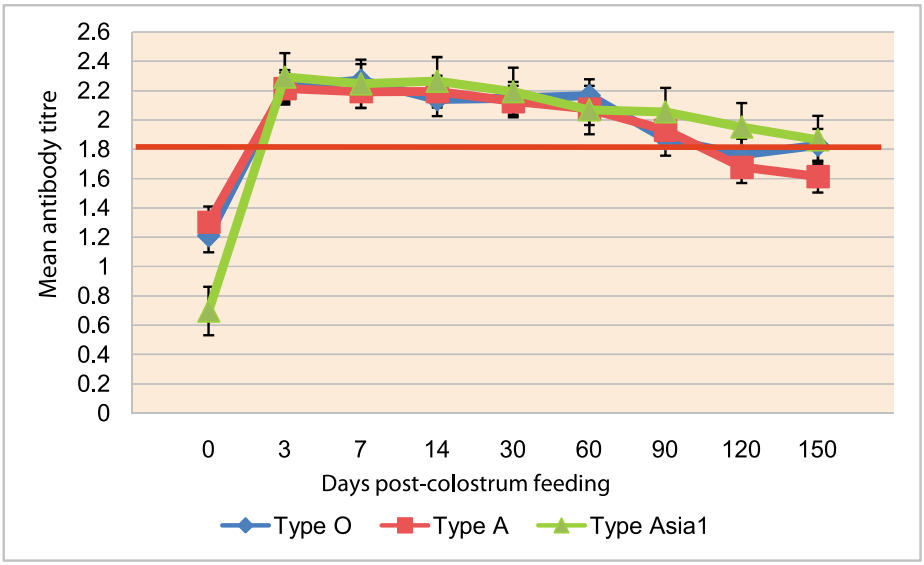

Fig. 1. Mean Maternal antibody titre against FMDV serotype O, A and Asia 1 in colostrum fed calves

Table 1. Maternal antibody titre of Group II animals to FMDV serotype O

Calf no.	Mean antibody titre								
	Day 0	Days Post-colostrum							
		3	7	14	30	60	90	120	150
E064	1.23	2.25	2.38	2.25	2.38	2.38	1.84	1.65	1.93
E063	1.36	2.24	2.25	2.25	2.24	2.22	1.65	1.42	1.91
M444	0.92	2.25	2.38	2.24	2.38	2.25	2.22	2.03	1.85
M445	1.39	2.25	2.38	2.25	2.24	2.25	2.10	1.77	1.91
M446	1.16	1.99	1.88	1.94	1.81	1.52	1.45	1.63	1.62
E065	1.19	2.38	2.25	2.25	2.38	2.37	1.96	2.07	1.74
E066	1.22	2.24	2.37	1.79	1.61	-	-	-	-
Mean ± S.E	1.210 ±0.07^{c}	2.226 ±0.05^{a}	2.252±0.08^{a}	2.197±0.05^{a}	2.237±0.09^{a}	2.165±0.13^{a}	1.869±0.12^{b}	1.761±0.10^{b}	1.827±0.05^{b}

F-value = 29.758**

Table 2. Maternal antibody titre of Group II animals to FMDV serotype A

Calf no.	Mean antibody titre								
	Day 0	Days Post-colostrum							
		3	7	14	30	60	90	120	150
E064	1.33	2.23	2.19	2.23	2.19	2.19	1.90	1.67	1.61
E063	1.21	2.22	2.23	2.23	2.22	2.18	2.05	1.70	1.59
M444	1.37	2.23	2.19	2.22	2.19	2.22	2.17	1.63	1.65
M445	1.23	2.23	2.19	2.23	2.20	2.06	2.09	1.66	1.67
M446	1.34	2.21	2.13	2.21	2.03	1.61	1.29	1.55	1.53
E065	1.32	2.19	2.23	2.23	2.19	2.18	2.09	1.85	1.63
E066	1.30	2.20	2.19	2.02	1.85	-	-	-	-
Mean ± S.E	1.301± 0.02^{c}	2.217±0.01^{a}	2.193±0.02^{a}	2.224±0.00^{a}	2.1720±03^{a}	2.074±0.10^{a}	1.931±0.13^{ab}	1.678±0.04^{b}	1.614±0.02^{b}

F-value = 43.96**

Table 3. Maternal antibody titre of Group II animals to FMDV serotype Asia 1

Calf no.	Mean antibody titre								
	Day 0	Days Post-colostrum							
		3	7	14	30	60	90	120	150
E064	0.61	2.29	2.26	2.30	2.25	2.23	2.17	2.36	2.17
E063	1.00	2.29	2.30	2.30	2.28	2.24	2.21	1.77	2.21
M444	0.58	2.30	2.23	2.29	2.23	2.30	2.29	2.32	1.88
M445	1.00	2.30	2.26	2.30	2.29	2.23	2.23	1.89	1.93
M446	0.50	2.30	2.18	2.29	1.96	1.16	1.13	1.03	1.24
E065	0.62	2.27	2.30	2.29	2.26	2.24	2.29	2.35	1.76
E066	0.57	2.31	2.19	2.09	2.06	-	-	-	-
Mean ± S.E	0.697 ±0.10^{c}	2.290±0.00^{a}	2.255±0.02^{a}	2.293±0.00^{a}	2.214±0.05^{a}	2.068±0.18^{ab}	2.054±0.19^{ab}	1.951±0.21^{ab}	1.864±0.14^{b}

F-value = 25.81** ** significant at 0.01 levels

Values in coulmns bearing same letter as superscript donot differ significantly

The pre-colostral mean antibody titre against serotype Asia 1 (table 3) at the time of birth was 0.697 ±0.08 and it increased to 2.290±0.00 on third day after colostrum feeding. The protective level was maintained up to day 150. No significant difference detected between days three to 120 and between days 60 to 150. Even though there observed a veining trend in the mean antibody titre during consecutive collection, the values always remained above threshold protective level of $\log_{10}$ 1.8.

All the calves selected for this study were born to multi-parous dams, which received more than three FMD vaccinations at regular interval before parturition. This justifies the higher mean antibody titre that was detected on day three post colostrum feeding. It maintained without much decline up to fifth month except for serotype A, for which it reduced by day 120. Analogous observations were previously made by Kitching and Salt (1995). According to them, calves born to heifers had lower levels of specific anti-FMDV antibody in their circulation than calves born to cows in their second or third lactation. The expected half life of maternally derived antibody against FMD was previously estimated to be 18 to 22 days (Bucafesco, 2014 and Dekkar, 2014). But in this study, the waning trend exhibited by maternally derived antibody within the system of calves was not in much harmony with these earlier propositions.

Maternal antibody persisted for a period of five months in calves born to vaccinated dams. Hence consideration must be given while developing vaccination protocol for calf hood vaccination.

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K.V. Mini[1]., P.V. Tresamol[2]., M. R. Saseendranath[3]., K. VinodKumar[4]., C. Latha[5] and G. K Sharma[6]

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

1. *MVSc Scholar. E-mail address: minivijayan07@gmail.com*
2. *Professor and Head*
3. *Professor& Head (Retd)*
4. *Assistant Professor*
5. *Professor and Head, Veterinary Public Health, CVAS, Mannuthy*
6. *Scientist, PD-FMD, Muktheswar*