

DURATION OF MATERNALLY DERIVED ANTIBODIES AGAINST *PASTEURELLA MULTOCIDA* IN COW CALVES

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ABSTRACT

The present study was conducted on 30 pregnant, randomly selected Sahiwal cows and their calves, maintained at a Government Livestock farm. The animals were routinely vaccinated against haemorrhagic septicaemia (HS), using alum-precipitated formalin killed HS bacterin. The antibody titres (GMT) in the sera of vaccinated dams against *P. multocida*, 15 days before the expected date of parturition and soon after parturition (before feeding colostrum to their young) detected using indirect haemagglutination (IHA) test were 213 and 182, respectively. The antibody titres (GMT) of calves' sera examined before consuming colostrum and then 6 hours, 3 days, 15 days, 30 days, 45 days and 60 days post-colostrum feeding were 44, 69, 70, 97, 96, 72, and zero respectively, indicating the duration of maternal immunity to be 45 days in the experimental animals. The most startling revelation of this research work is the transplacental transfer of antibodies in Sahiwal cows.

Key words: Maternal immunity, *Pasteurella multocida*, calves.

INTRODUCTION

Haemorrhagic septicaemia (HS) is an acute, highly fatal, septicaemic pasteurellosis of cattle and other ruminants caused by *Pasteurella multocida* (Bain *et al.*, 1982). It occurs predominantly in Asia and Africa. This disease may be placed amongst the most formidable bacterial diseases of cattle and buffaloes (Afzal and Muneer, 1988), responsible for gigantic economic losses, worth more than Rs. 1.887 billion per annum (Chaudhry and Khan, 1978).

The young ones become susceptible to HS when maternal immunity wanes off and this is probably the most appropriate time for vaccination. The present study was designed to determine the immune status against HS of the vaccinated pregnant cows, a few days before parturition, and in newborn calves before and after colostrum consumption.

MATERIALS AND METHODS

Experimental animals and vaccination

A total of 30 pregnant Sahiwal cows and their calves maintained at the Livestock Production Research Institute (LPRI), BahadurNagar, Okara, Pakistan were used for this study. The animals kept at this institute were regularly vaccinated with alum precipitated formalin killed HS bacterin prepared at the Veterinary Research Institute (VRI), Lahore, Pakistan.

Sampling schedule

Two blood samples were obtained from the experimental cows, one about 15 days before the expected date of parturition and second just after parturition before feeding colostrum to calves. The blood samples of newborn calves were obtained just after birth before consuming colostrum (zero hours) and at 6 hours, 3 days, 15 days, 30 days, 45 days and 60 days of age. Indirect haemagglutination test was used to measure specific serum antibodies against *P. multocida* (Bain *et al.*, 1982). The time period for which the antibodies against HS were detectable in the serum of newborns was estimated (Alwis and Sumanadasa, 1982).

RESULTS AND DISCUSSION

The sera of experimental cows about 15 days before parturition had Geometric mean titre (GMT) of 213. These animals were regularly vaccinated with an alum precipitated vaccine and according to Bain (1956), vaccinated animals show high antibody titre against HS. Hussain *et al.* (1986) recorded the highest antibody titre (GMT) in the range of 10-280 and 12.5-1120 in animals immunized with half and double doses of capsular material, respectively.

The second serum sample of dams, obtained just after parturition before feeding colostrum to the newborns, had GMT value of 182, which was lower than 213 observed for first sample, 15 days pre-parturition.

This fall in GMT can be attributed to the transfer of serum antibodies to the udder (Moraes *et al.*, 1998).

The serum samples of 30 calves, taken immediately after birth, before the consumption of colostrum, showed a GMT value of 44. There was not a single calf-serum sample showing a titre of zero at this stage. The majority of calves exhibited the titre of 1:8. The GMT of 44 in the sera of calves before the intake of colostrum clearly indicates the presence of antibodies against HS. Previous workers observed that there was no transfer of antibodies through the placenta in ruminants as their placenta was of syndesmochorial type through which transplacental passage of immunoglobulin molecules is totally impeded (Tizard, 1987). The newborns of these species were thus entirely dependent on antibodies received through colostrum (Brambell, 1961). However, many workers had detected antibodies belonging mostly to class IgG, and IgA and rarely IgM (Merriman 1971; Husband *et al.*, 1972; Kulkarni, 1974, Shalaby *et al.*, 1995) in the sera of fetuses at different intervals of gestation and in unsuckled calves (Chaturvedi *et al.*, 1996). Though different techniques in different ruminant species were used to detect antibodies against *P. multocida* in the serum of fetuses or unsuckled calves, but no such findings have been reported in the Sahiwal breed of Pakistan. The source of antibodies in the serum of fetuses and unsuckled calves needs to be ascertained.

In the present study, there could be different reasons for the positive IHA tests in the sera of calves that had not suckled their dams. Considering the transfer of antibodies through placenta, the first possibility might be the transfer of only LPS portion of *P. multocida* through the placenta, which did not show its deleterious effects on the fetus. The second possibility could be some non-specific factors, which interfered in the reaction and showed positive IHA results in which antibodies were not involved i.e., non-specific reaction. The third possibility might be the species specificity of the Sahiwal breed.

The second sample of the calves was obtained 6 hours after colostrum consumption. The GMT found at this time was 69, being higher than that obtained before the consumption of colostrum. This rise in titre of antibodies in calves indicates the transfer of maternal antibodies through colostrum. This is in agreement with the findings of Logan *et al.*, (1978), Sawada *et al.*, (1985) and Garry *et al.* (1996).

The next blood sample of calves was obtained at 3 days after colostrum consumption and the GMT against HS at this age was 70, approximately the same as at 6 hours after colostrum feeding. According to Logan *et al.* (1973), the absorption of immunoglobulins in the serum reached a peak in 24 hours postpartum and fell at

different rates thereafter, reaching a minimum at 2–4 weeks. In a later study, (Logan *et al.*, 1978) these workers found that under natural conditions considerable amounts of immunoglobulins appeared by 3 hour after suckling, and at least 5 hours were required for half maximal saturation level to be achieved.

The next blood sample of calves was obtained at the age of 15 days and the GMT was still rising and had reached 97 by that time. This indicates that the animals were still deriving antibodies from the dam through milk. This was the peak GMT observed in the calves and sustained for up to the 30th day when the titre dropped to 96. Then GMT kept on decreasing till 45th day of age where it was 72. The young calves showed highest antibody titre against HS between 15th and 30th day. The last blood sample obtained at the age of 60 days revealed that GMT against HS had dropped to zero. Out of 30 calves born, two died by the 3rd day of life before the collection of samples and another two died before the 15th day of life. None of the 26 surviving calves showed the presence of antibodies in their serum at the age of 60 days. Similar findings have been recorded earlier (Mahmood, 1990).

Conclusions

Based on the findings of present study it can be concluded that there was transfer of maternal immunity in calves both through placenta and colostrum in Sahiwal cattle. The maternal immunity was exhausted at the 60th day of life and the calf probably needs vaccination before this stage.

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