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A comparative study of immune, growth and health status of primiparous and multiparous Murrah buffaloes calves

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Abstract
The aim of this investigation was to study the effect of parity of Murrah buffaloes on immune, growth and health status in their calves. For this study 14 Murrah buffaloes newly born calves were selected from the Livestock Research Centre of National Dairy Research Institute, Karnal, (Haryana) and were divided in to 2 groups (7 in each) based on the parity of their dams (primiparous and multiparous). Their blood samples were collected after calving on day 2nd, 7th, 28th, 42nd and 56th for estimation of total immunoglobulin concentration by Zinc sulphate turbidity test. The Mean±SE of total immunoglobulin concentration on day 2nd, 7th, 42nd and 56th after birth in calves borne to primiparous and multiparous Murrah buffaloes were 29.65±1.28 vs 33.93±1.47, 23.10±0.61 vs 29.98±0.96, 25.29±1.20 vs 27.21±1.45 and 28.39±0.75 vs 31.28±1.09 respectively. The total immunoglobulin concentration was significantly (P<0.05) higher in multiparous group as compare to primiparous. The final body weigh on 90th day was 70.7±4.89 and 75.98±3.01 for primiparous and multiparous buffaloes born calves, respectively which was significantly higher in later group. Comparatively lower number of total affections were observed in calves born to multiparous buffaloes. It was concluded that in the present study calves borne to multiparous Murrah buffaloes were having better health, immune status and consequently better growth performance as compared to the calves borne to primiparous Murrah buffaloes.

Keywords: Colostrum, immune status, immunoglobulin, multiparous, primiparous

1. Introduction
The careful rearing of young calves is the soundest basis for good livestock husbandry. Raising healthy calf is a challenging but rewarding job. “Today’s calf is tomorrow’s cow”. Calves are the future replacement stock for the cows and bulls. Healthy newborn calves provide the foundation for profitable dairy enterprise.

However, the calves in the dairy herds are often neglected as they do not bring any immediate financial return and their critical role in providing replacement stock is often underestimated. This often results in poor growth, high morbidity and mortality especially among weaned buffalo calves. Neonatal calf mortality is the major cause of economic losses in dairy production. However, the average calf mortality rate reported in cattle was 10% while that in buffalo was 30% upto 3 months of age observed in winter [1]. Upto 50 percent losses may occur in large dairy herds. Under village conditions, calf mortality may even exceed 50 percent. Ideally calf mortality should be ≤5% with the growth rate of 0.5-0.7 kg/day [2].

In the dairy production the importance of high quality colostrum for dairy calves in terms of a high immunoglobulin (Ig) level have long been recognized [3]. In order to rear strong and resistant calves, colostrum of adequate quality must be available. Delay in colostrum feeding leads to decrease immunity level in calves and make them susceptible to disease [4]. Immunoglobulin G is the most abundant Ig in bovine colostrum and therefore assessment of quality most often refers to content of this Ig class [5].

Neonatal dairy calves are born agammaglobulinemic due to syndesmochorial types of placenta. To fight from different pathogens Calves must get immunoglobulin in the initial phase of life through macromolecular transport. Maternal colostrum is a good source of immunoglobulin. Immunoglobulins absorb non-selectively by pinocytosis, which moves proteins into the intestinal epithelium.

In dairy farming, good dairy herds are raised rather than purchased. Thus it is prudent to reduce the mortality of neonatal buffalo calves. The information of various factors that affect

colostrum quality in terms of concentration of immunoglobulin in buffaloes is important to find out the exact cause of poor immune status of calves which results in high calf morbidity and mortality. Thus, the objective of this study was to find the effect of parity of dam on immune, growth and health status of Murrah buffaloes calves.

2. Materials and methods

2.1 Selection of animals: For this study 14 Murrah buffaloes newly born calves were selected from the Livestock Research Centre of National Dairy Research Institute, Karnal. The calves were divided into two group T1 and T2 on the basis of parity of dam (primiparous and multiparous). Each group was comprised of 7 calves.

2.2 Blood Collection and Analysis of blood samples of calves: 5 ml Blood samples were collected in heparinized (20 IU heparin/ml blood) tube at 7:30 am from jugular vein (before offering any feed) posing minimum disturbance during collection on 2nd, 7th, 28th, 42nd and 56th day of parturition. Immediately after collection the samples were transported to the laboratory in ice box for further processing. The plasma was harvested within one hour after sampling following centrifugation at 3000 RPM for 25 minutes at 4°c. The plasma was collected and stored at -20°c in the storage vials of 2 ml capacity till the analysis of estimation of total Immunoglobulin by Zinc Sulphate Turbidity test [6].

2.3 Body weight (kg)

Birth weights of experimental calves were recorded within 2 hours of post-partum. Body weights of experimental calves were recorded fortnightly by weighing balance in the morning hours before the feeding.

3. Results and Discussion

3.1 Effect on parity of dam on calves body weight

The Mean±SE of body weight of calves borne to primiparous and multiparous buffaloes from day of birth to 90th day was recorded at fortnightly interval are presented in the table 1

The mean body weight of calves borne to primiparous and multiparous buffaloes at birth was 29.42±1.23 and 32.16±0.91 kg respectively and mean difference was non-significant (P>0.05). For the first two fortnights i.e. on day 15th and 30th the body wt. of calves borne to primiparous and multiparous buffaloes also did not differed significantly. From day 45th onwards there was significant (P<0.05) difference was found between the mean body weight of calves borne to primiparous and multiparous buffaloes. The final body weight on 90th day was 70.7±4.89 and 75.98±3.01 kg for calves borne to primiparous and multiparous buffaloes respectively with the weight of calves of multiparous group being significantly higher.

This may be attributed to lower incidence of illness in the multiparous groups of calves as compared to primiparous groups of calves. Robinson *et al*., [7] also reported that serum IgG concentration at 24-48 hours was a significant source of variation affecting average daily gain through 180 days of life in case of HF calves.

3.2 Effect on parity of dam on calve's total immunoglobulin

Immune status in calves borne to primiparous and multiparous Murrah buffaloes was evaluated by estimating total immunoglobulin concentration in blood plasma of calves borne to primiparous and multiparous Murrah buffaloes on day 2nd, 7th, 28th, 42nd and 56th after birth and the and the data on Mean ± SE values of total immunoglobulin concentration (mg/ml) are presented in table 2.

The Mean ± SE of total immunoglobulin concentration on day 2, 7, 42 and 56 after birth in calves borne to primiparous and multiparous Murrah buffaloes were 29.65±1.28 vs 33.93±1.47, 23.10±0.61 vs 29.98±0.96, 25.29±1.20 vs 27.21±1.45 and 28.39±0.75 vs 31.28±1.09 respectively. The differences among these mean values were significant (P<0.05). The mean concentrations of total IgG observed in calves of multiparous buffaloes were significantly higher to those observed in the calves borne to primiparous buffaloes. However, there was no significant difference in total immunoglobulin concentration of calves borne to primiparous (22.92±0.58) and multiparous Murrah buffaloes (24.15±2.66) on 28th day after calving. There was a consistent declining trend of total immunoglobulin from the 2nd day of parturition to 28th day in both primiparous and multiparous born calves. There after the total immunoglobulin level increased in both groups of calves. The rise in total Ig levels from day 42nd onwards may be attributed to becoming functional of their own immune system.

Blum [8] reported that calves obtain antibodies from colostrum which are ready-to-use under the form of immunoglobulin, mainly IgG1, IgG2 and IgM, bound to the globulin protein fraction (Globulins present in colostrum are identical to those of maternal blood serum) and during the first days of life, passes in the blood of calves through alimentary tract epithelium. The same trend was observed in plasma IgG.

The earliest colostrum intake is very important for primary immunization in calves, when colostrum's value is most complete from biological point of view (high titre of colostrum Ig) then permeability of the small intestine epithelium is highest, and the acidity of abomasums content is lowest due to the lack of hydrochloric acid. According to Tomov *et al*., [9] during the first hours after birth, IgM are absorbed more rapidly whereas IgG are mostly retained on the apical surface of the intestinal mucous coat, and perform local protective function there.

3.3 Effect on parity of dam on calf health

In the present study the incidences of various kind of diseases were recorded to assess the health status of calves borne to primiparous and multiparous buffaloes from birth to 90th day of age was recorded. Number of health illness observed in calves borne to primiparous and multiparous buffaloes are presented in the table 3.

The lower number of total afflictions observed in calves born to multiparous buffaloes may be attributed to better immune status in the colostrum of these buffaloes as well in the blood plasma of these calves. Windeyer *et al*. [10] reported that serum IgG concentration <24 gm/l negatively affect calves heath and survival.

Table 1: Mean ± SE of body weight (kg) of calves born to primiparous and multiparous buffaloes

Days	Primiparous dam	Multiparous dam	P-Value
0	29.42±1.23	32.16±0.91	>0.05
15	34.47±2.59	37.23±1.85	>0.05
30	40.12±3.26	43.96±2.30	>0.05
45	47.82 ± 2.82^{a}	51.09 ± 2.82^{b}	<0.05
60	54.83 ± 3.44^{a}	59.05 ± 3.27^{b}	<0.05
75	62.86±4.28	66.45±3.53	<0.05
90	70.7 ± 4.89^{a}	75.98 ± 3.01^{b}	<0.05

Values bearing different superscripts (^{a,b}) in rows differ significantly (P<0.05)

Table 2: Mean ± SE of total immunoglobulin concentration (mg/ml) in blood plasma of calves born to Primiparous and Multiparous Murrah buffaloes.

Days after calving	Primiparous buffaloes	Multiparous buffaloes	P-Value
2nd	29.65±1.28[a]	33.93±1.47[b]	<0.05
7th	23.10±0.61[a]	29.98±0.96[b]	<0.05
28th	22.92±0.58	24.15±2.66	>0.05
42nd	25.29±1.20[a]	27.21±1.45[b]	<0.05
56th	28.39±0.75[a]	31.28±1.09[b]	<0.05
Over all	24.86±0.884[a]	28.51±1.526[b]	<0.05

Values bearing different superscripts [(a,b)] in rows differ significantly (P<0.05)

Table 3: Incidences of illness in calves born to primiparous and multiparous buffaloes up to 90 days after birth

Name of illness	Primiparous group	Multiparous group
Naval ill	3	1
Diarrhoea	1	2
Fever	1	0
Eye infection	0	1
Enteritis	1	0
Total afflictions	6	4

4. Conclusions

It can be concluded from present study that the immune system of calves is also not functional at the time of birth and depends on the passive immunity transfer from the colostrum. Therefore acquiring passive immunity quality of colostrum is very important. The poor quality colostrum is responsible for poor immune status of buffalo calves and result in high mortality and morbidity. The calves borne to multiparous Murrah buffaloes were had better immune status, health and consequently better growth performance as compared to the calves borne to primiparous Murrah buffaloes.

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