Indian Journal of Animal Sciences **85** (12): 1370–1374, December 2015/Article

Effect of weaning age on health of Murrah buffalo calves

P K BHARTI[1], TRIVENI DUTT[2], H O PANDEY[3], B H M PATEL[4], K MAHENDRAN[5], S KASWAN[6], PROBHAKAR BISWAS[7] and V K UPADHYAY[8]

Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh 243 122 India

Received: 23 April 2015; Accepted: 26 May 2015

ABSTRACT

The present study was conducted to compare the effect of different age at weaning on health performance of Murrah buffalo calves. Buffalo calves (35) were randomly but alternately assigned into 3 groups as group 1, suckling (14); group 2, weaning of calves at birth (11) and group 3, weaning of calves at 45th day of birth (10). Health parameters of calves and faecal consistency scores were recorded from day of birth to 3 months of age. Immunity of calves was assessed through estimation of serum immunoglobulin by zinc sulphate turbidity test using standards. The occurrence and duration of illness of each calf under different groups were random and common ailments were diarrhoea and alopecia among the groups. The faecal consistency score of calves weaned at birth (1.28±0.02) was significantly higher than suckling (1.34±0.01) but nonsignificant from calves weaned at 45th day of age (1.33±0.02). Total serum immunoglobulin levels of calves had decreasing trends with advancement of age after colostum feeding except at few stages of sampling in weaning at birth. From the present study, it was concluded that weaning did not affect the health and immunity levels of buffalo calves as compared with natural suckling.

Key words: Buffalo calves, Health, Immunity, Murrah, Weaning

Calf rearing includes suckling and weaning. The practice of weaning is more beneficial to calves in terms of scientific feeding and recording actual milk production of dam under most hygienic conditions (Rashid *et al*. 2013). The accidental calf mortality does not affect the letdown and milking of weaned dams. Recent research works have led to the development of an early weaning programme at 2 to 4 weeks of age to stimulate dry feed consumption with no adverse effect on physical (Morrill *et al*. 1984) or immunological (Reddy *et al.* 1985) development. Under artificial rearing system, morbidity and mortality could be reduced significantly (Sharma *et al.*1975). Weaning calves at birth is well established in dairy cattle, however in buffaloes, if the similar system is practiced, it may give significant benefit to dairy producers by saving precious buffalo milk and promoting scientific feeding of calves. However, it is also presumed that weaning at birth may lead to difficulty in pail/bottle feeding due to maternal instinct. Therefore, alternatively buffalo calf can be weaned at 45th day of age. The survivability of weaned calf after 45 days may be higher even on low intake of whole milk in poor learner. Keeping in view these facts, the present study was conducted to compare the effect of weaning age (at birth and 45th day of age) versus suckling on health of Murrah buffalo calves.

Present address: [1,3,5]Scientist (pkish.1002@gmail.com, hariomvet@gmail.com, mahivet2002@yahoo.co.in), [2]Principal Scientist (triveniduttivri@gmail.com), [4]Senior Scientist (mpatellpm@gmail.com), [7]Veterinary officer (probhakarvet @gmail.com), [8]PhD Scholar (vipinupadhyay4@gmail.com). [6]Assistant Professor (deepu02vet@gmail.com), C.V.Sc., Ludhiana.

MATERIALS AND METHODS

Location and climatic conditions: The experiment was conducted on Murrah buffalo calves at farm of the Institute (IVRI). Climatic condition of place touches both the extremes, viz. cold (approximately 5°C in winter) and hot (approximately 45°C in summer). The relative humidity ranges between 15 and 85 %. The average annual rainfall is about 90 to 120 cm and most of which is received during the month of July to September.

Selection and management of calves: Initially, 14 buffalo calves were selected in each group, but due to few cases of weaning failures during the experimental period, the final number of calves studied in group 2 and group 3 were 11 and 10 respectively. The calves were randomly but alternately distributed into all 3 groups to minimize the seasonal variation of birth on their performances.

Group 1/Gr 1 (Suckling or control): Calves were allowed to suckle from their respective dams twice a day from birth to 90 days of age and they were given ample suckling time as per their requirement. The milk consumption of calf was estimated by taking the difference of post-suckling and pre-suckling body weights.

Group 2/Gr 2 (weaning at birth): Calves were weaned immediately after birth. Each calf was fed on colostrum of

its own dam within 30 min after birth and given twice daily for first 3 days of age @ 10% of live body weight. From fourth day onwards, calves were reared artificially by pail feeding of whole milk till 90 days of age (Table 1). Amount of whole milk given to the calves were adjusted as per their increased body weight and age.

Group 3/Gr 3 (weaning at 45th day of age): The calves were weaned at 45th day of age and thereafter feeding protocol was similar to that of Gr 2. All calves were provided with good quality calf starter (CS) during day and night hours along with green fodder roughages from 16th day onwards on free choice basis. The CS was composed of crushed ingredients, viz. maize (45 parts), oat (15 parts), groundnut cake (25 part), wheat bran (12 parts), mineral mixture (2 parts) and salt (1 part). The green roughage was composed of chaffed maize/ oat and berseem fodder. The crude protein and total digestible nutrients of calf starter was 22.75 and 74.15 %, respectively on dry matter basis. The feeding schedule of weaned calves is presented in Table 1.

Housing and health management: The calves were housed individually in well ventilated, clean and dry *pakka* pens for 18 h daily (from 3:00 PM to 9:00 AM) and they were let loose for remaining 6 h during the day time for socialization and expression of playing behavior. They had free access to fresh, clean wholesome water in open paddock. During the months of winter, proper bedding materials were provided to protect them from the cold.

Parameters recorded: The body weight (kg) of calves was recorded at fortnightly interval. The health parameters were recorded based on the direct observation method. The number of calves suffered, kind and duration of illness such as diarrhoea, dysentery, respiratory problems, naval ill or any other health related clinical/sub-clinical symptoms were recorded daily. The faecal consistency score (FCS) was recorded twice daily in morning and evening as per Larson *et al*. (1977). The value of FCS was given numerically based on scoring system as FCS 1: Normal faeces (semi solid consistency), FCS 2: Slightly loose faeces, FCS 3: Moderately loose faeces and FCS 4: Highly loose faeces (watery consistency). The calves with FCS value more than two were considered as diarrheic and equal to/ less than 2 were considered normal.

Blood sampling: Blood samples were collected from buffalo calves by jugular vein-puncture using 18/20 gauze sterilized needle in morning hours after milk feeding. The blood sample was collected on day-0 (at birth), day-1 (24 h after birth; after colostrum feeding), day-4, day-15, day-30, day-45, day-60, day-75, and day–90. Due care was given to avoid unnecessary stress to the calves during collection of the blood samples. Blood samples were collected into 15 ml centrifuge tubes and allowed to clot. Serum was separated from the blood sample after centrifugation at 3000 rpm for 7 min. Separated serum samples were stored in deep freeze (–20ºC) and further analyzed for estimation of total immunoglobulin (Ig) levels by zinc sulphate turbidity test using standards (McEwen *et al*. 1970).

Analytical procedures: The standard statistical analytical procedures (Snedecor and Cochran 1994) were adopted for analysis of the generated data under study using Statistical Analysis System (SAS) 9.2 version software. The one way analysis of variance (ANOVA) was used to see the level of significance for body weight. The random variables of health parameters were expressed in terms of percentage and calf-days suffered in different groups.

RESULTS AND DISCUSSION

Weight gain of calves from birth to 90 days: The mean birth weight (kg) of calves were statistically nonsignificant from each other. The final body weight in Gr 1 was significantly (P<0.01) higher than both the other groups (Gr 2 and Gr 3). Among weaned groups, Gr 3 showed better result which might be due to milk suckling by calves for first 45 days of life. The fortnightly body weight gain (kg) of calves in different groups is presented in Table 2.

The total body weight gain was significantly (P<0.05) higher in Gr 1 than Gr 2. However, it was not significantly different from Gr 3. The body weight gain in Gr 2 and Gr 3 was not significantly different from each other. The lowest growth in Gr 2 might be due to low milk intake by calves as initially some of the calves had shown difficulty in learning to drink milk by pail (Krohn 2001). The effect of rearing system had significant (P<0.05) effect on growth rate of buffalo calves (Roldan 2005, Kantharaja 2011) and

Table 1. Feeding schedule of weaned calves

Age of calf	Colostrum	Whole milk	Calf starter	Green fodder
00-03 days	1/10th ofBody weight	Nil	Nil	Nil
04-56 days	Nil	1/10th of Body weight.	*Ad lib* from 16th day onwards	
57-64 days	Nil	1/20th of Body weight.	*Ad lib*	*Ad lib*
65-90 days	Nil	1/40th of Body weight.	*Ad lib*	*Ad lib*

Table 2. Mean ± SE of body weight gain (kg) of calves at fortnightly interval

Fortnights	Gr 1	Gr 2	Gr 3
I	4.52 ± 0.83	3.88 ± 0.61	5.80 ± 0.20
II	6.53 ± 0.68^{b}	4.03 ± 0.69^{a}	5.20 ± 0.72^{ab}
III	7.22 ± 0.66	7.06 ± 1.11	5.24 ± 0.59
IV	8.08 ± 0.53	6.30 ± 0.85	7.24 ± 0.79
V	8.50 ± 0.61	8.03 ± 1.15	8.77 ± 0.76
VI	10.24 ± 0.83	7.52 ± 1.09	9.04 ± 0.98
Total gain	45.12± 2.21^{b}	36.85 ± 1.95^{a}	41.29 ± 1.22^{ab}

Means bearing different superscripts (a, b) within the row differ significantly (P < 0.05).

had positive influence on growth and health performance during first month of life (Gallego *et al.* 2011).

Health performance of calves: The occurrence and duration of health problems (%) in calves under different methods of rearing are presented in Table 3. The figure in parenthesis indicates the percentage of calf days affected from particular ailments within the group. The calves sufferering from diarrhoea in Gr 1, Gr 2 and Gr 3 were 64.28, 63.63 and 90.00 % respectively, whereas, percentage of total affected days from diarrhoea in the respective groups were 1.74, 2.10 and 3.33 respectively. Higher percentage of calves affected from diarrhoea in Gr 3 might be due to weaning stress and shifting to calf starter/fodder causing diarrhoea of nutritional origin. This was further supported by FCS value as indicated in Table 4. The occurrence of diarrhoea decreased as the age of calves advanced in all groups. The overall percentage of calves sufferering from dysentery in Gr 1, Gr 2 and Gr 3 were 7.14, 9.09 and 0.00 %, respectively, whereas, percentage of total affected days from dysentery in the respective groups were 0.23, 0.30 and 0.00 respectively. Dysentery was caused mainly due to protozoal infection during first few weeks of age and the case was treated successfully. The system of rearing had no effect on occurrence of dysentery. Similar to present findings, Ahmad *et al*. (2004) found no evidence of diarrhoea in buffalo calves reared on calf starter compared with the other groups. Contrary to this, Sikka *et al.* (2002) reported that the frequency of occurrence of diarrhoea in non-suckling buffalo calves was significantly higher than the suckling calves.

The occurrence of alopecia was one of the common ailments observed in all groups other than diarrhoea (Table 3). The percentage of total affected days from alopecia is of little importance as the case was chronic and persisted longer till the calves became completely bald. The reason for lower occurrence of alopecia in Gr 2 than other groups might be due to lesser exposure to sunlight or photosensitization as they were weaned at birth and kept individually in pens. Alopecia might also be due to normal shedding of hair due to physiological changes (Gundran and Simon 1999).

Other health problems: The other health problems observed in calves were lameness, fever, naval ill, weakness, respiratory tract infection or nasal discharge. The percentage of calves affected with lameness/fever/navel swelling were 7.14 %, which were observed in first month of age in suckling group. The percentage of total calf days affected with lameness, fever and navel swelling in suckling group were 0.39, 0.15 and 0.30, respectively. Emaciated body condition or general weakness was observed in Gr 2 (27.27 %) and persisted as chronic which might be due to less intake of milk and temperamental changes resulting from weaning at younger age. The incidence of eye infection or ocular discharge was observed higher in Gr 2 (45.45 %) than Gr 3 (10 %) with varying intensity (1.41 and 0.55 respectively). This ocular discharge in Gr 2 might be due to infectious or allergic origin whereas the ocular discharge in Gr 3 was due to cataract in one eye of calf. Respiratory tract infection or nasal discharge was observed in Gr 2 (9.09 %) and the percentage of calf-days affected were 0.30 which might be due to upper respiratory tract infection in first month of age. Maggot wounds were observed in Gr 2 (9.09 %) and in Gr 3 (10.00 %). The percentage of calf-days affected were 0.30 and 0.44 % respectively for these groups. Maggot wound occurred mainly due to infestation from the larvae of house fly after dehorning or naval cutting. Kantharaja (2011) reported that effect of rearing systems on duration of first sickness was highly significant (P<0.01). The duration of first sickness in suckling calves was comparatively higher than that of weaned calves. Ahmad *et al*. (2009) reported that the most common and frequent occurring disease in buffalo calves was endo-parasite infestation (83.3%), followed by diarrhoea and ecto-parasite infestation, navel ill and pneumonia.

Faecal consistency score (FCS): The fortnightly FCS of calves in different groups is presented in Table 4. The FCS value was comparatively higher in first fortnight and had decreasing trend till the last fortnight in all groups except Gr 3, where only IV fortnights showed higher value than previous fortnight. The overall FCS value was

Table 3. Occurrence of health problems in calves in different rearing methods

Groups	Gr 1 (suckling)				Gr 2 (weaning at birth)				Gr 3 (weaning at 45th day)			
Parameters	M-1	M–2	M-3	Total	M-1	M-2	M-3	Total	M-1	M-2	M-3	Total
Dysentery	7.14 (0.71)	-	-	7.14 (0.23)	9.09 (0.90)	-	-	9.09 (0.30)	-	-	-	-
Diarrhoea	42.85 (3.57)	21.43 (1.66)	-	64.28 (1.74)	27.27 (2.42)	27.27 (3.03)	9.09 (0.90)	63.63 (2.1)	50.0 (5.67)	20.0 (2.7)	20.0 (1.67)	90.0 (3.33)
Alopecia	21.42	14.28	-	35.70	9.09	-	-	9.09	20.0	30.0	20.0	70.0
Body emaciation	7.14	-	-	7.14	-	27.27	-	27.27	-	-	-	-
Eye infection	-	-	-	-	18.2 (1.51)	18.2 (2.12)	9.09 (0.60)	45.45 (1.41)	-	10.0 (1.66)	- (0.55)	10.0
Nasal discharge	-	-	-	-	9.09 (0.9)	-	-	9.09 (0.3)	-	-	-	-
Maggot wound	-	-	-	-	-	-	9.09 (0.9)	9.09 (0.3)	10.0 (1.33)	- (0.44)	-	10.0

significantly (P<0.05) higher in Gr 1 than Gr 2. The FCS value in Gr 3 was not significantly different from Gr 1 and Gr 2. The lower FCS in Gr 2 indicated that less percentage of calves suffered from diarrhoea in this group. Higher FCS value in both groups 1 and 3 might be due to higher occurrence of diarrhoea and large proportion of calves suffered during initial months of age. Higher faecal consistency score in suckling groups indicated that calves might have suffered more due to overfeeding and less efficient to digest during initial months of age.

In addition to selected calf dam pairs, one calf in each group died due to random occurrence of common disease conditions, viz. diarrhoea/ dysentery/ infectious septicemia/ joint ill which occurred within third week of life. The overall mortality in calves was 6.70 % during the experimental period. The overall lower mortality in calves might be due to individual attention and proper management to calf during the weaning programme (Khan *et al.* 2007). Similar finding were also reported with highest mortality in the age group of 6–30 days (67.20%) and lowest in 61–90 days (5.6%) in buffalo calves (Sharma *et al.*1975). Present findings are in agreement with the findings of Santra and Pachalag (1995) who concluded diarrhoea (56.80%) followed by pneumonia (24%) were the main death factors than rest of other diseases.

Evaluation of immunity in calves: The mean total serum immunoglobulin level (g/dl) of calves is presented in Table 5. The total serum immunoglobulin (before colostrums feeding) in calves of groups 1, 2 and 3 were 0.65 ± 0.01g/dl, 0.66 ± 0.03g/dl and 0.64 ± 0.02g/dl respectively.

Table 4. Mean±SE of faecal consistency score (FCS) of calves

Fortnights	Gr 1	Gr 2	Gr 3
I	1.45±0.07	1.44±0.07	1.57±0.08
II	1.38 ± 0.04^{B}	1.24 ± 0.01^{A}	1.24 ± 0.01^{A}
III	1.38±0.03	1.33±0.08	1.28±0.07
IV	1.30 ± 0.01^{a}	1.21 ± 0.01^{a}	1.43 ± 0.08^{b}
V	1.30±0.01	1.24±0.04	1.28±0.05
VI	1.24 ± 0.01^{b}	1.20 ± 0.01^{ab}	1.18 ± 0.01^{a}
Overall	1.34 ± 0.01^{b}	1.28 ± 002^{a}	1.33 ± 0.02^{ab}

Means bearing different superscripts (a, b) within the row differ significantly (P < 0.05).

Table 5. Mean±SE of total serum immunoglobulin-Ig levels (g/dl) in calves

Day	Gr 1	Gr 2	Gr 3
0 (at birth)	0.65±0.01	0.66±0.03	0.64±0.02
1	1.85±0.02	1.86±0.01	1.87±0.02
4	1.82±0.02	1.83±0.01	1.84±0.02
15	1.75 ± 0.02^{a}	1.85 ± 0.02^{b}	1.82 ± 0.02^{b}
30	1.73 ± 0.02^{a}	1.80 ± 0.01^{b}	1.78 ± 0.02^{ab}
45	1.73 ± 0.02^{ab}	1.77 ± 0.01^{b}	1.67 ± 0.03^{a}
60	1.66±0.02	1.69±0.02	1.61±0.04
75	1.59±0.03	1.58±0.01	1.57±0.02
90	1.50±0.02	1.46±0.02	1.44±0.02

Means bearing different superscripts (a, b) within the row differ significantly (P < 0.05).

The total serum immunoglobulin at day-1 (after colostrum feeding) of calves in groups 1, 2 and 3 was 1.85 ± 0.02g/dl, 1.86 ± 0.01g/dl and 1.87 ± 0.02g/dl, which were nonsignificant among each other. Since, IgG constitutes more than 75 % of the total immunoglobulin contents of the serum, the IgG and total immunoglobulin had almost similar trends among the groups as well as stage of sampling. The present findings are in agreement with earlier reports (Verma *et al*. 1996, Sharma *et al.* 2006, Barmaiya *et al*.2009) suggesting the immunoglobulin levels increased with age of the calves after colostrum feeding. Sikka *et al*. (1998) also reported that immunoglobulin levels at the age of 24 h after birth varied individually. However, contrary to this, no effect of abrupt weaning on the humoral immunity of weaned calves was reported (MacKenzie *et al*. 1997, Sikka *et al*. 2002). Similarly, Reddy *et al.* (1985) also reported that weaning programme at different ages had no adverse effect on immunological development of calves.

ACKNOWLEDGEMENT

Authors are highly thankful to the Director, Indian Veterinary Research Institute, Izatnagar for providing all the necessary infrastructure facilities for carrying out the experiment.

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