Pakistan Veterinary Journal

ISSN: 0253-8318 (PRINT), 2074-7764 (ONLINE)
Accessible at: www.pvj.com.pk

Effect of Vitamin E-Selenium Administration during Late Gestation on Productive and Reproductive Performance in Dairy Buffaloes and on Growth Performance of their Calves

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ARTICLE HISTORY

Received: February 26, 2009
Revised: November 09, 2009
Accepted: November 16, 2009

Key words:
Dairy buffaloes
Gestation
Production
Reproduction
Selenium
Vitamin E

ABSTRACT

The present study was planned to evaluate the efficacy of vitamin E-selenium administration during last month of gestation in improving the productive and reproductive performance of dairy buffaloes and on growth performance of their calves. For this purpose, 40 Nili-Ravi buffaloes in their last month of pregnancy were randomly divided into two groups. The buffaloes in group 1 were treated with 10 ml of vitamin E-Se (Farvet Holland), containing 50 mg of vitamin E and 0.5 mg of sodium selenite/ml) intramuscularly on day 30 and 15 prior to expected date of parturition, while buffaloes in group II served as control. All the experimental buffaloes were kept under similar management and feeding conditions. The data on productive performance showed that the colostrum production was 22% higher ($P<0.05$) in treated buffaloes (14.15 ± 3.29L) as compared to their counterparts (11.51 ± 3.39L). The average milk production of first 90 days of lactation was 7% higher ($P>0.05$) in Vit E-Se treated buffaloes (706.90 ± 314.29L) as compared to control group (663.85 ± 225.46L). Data on reproductive performance showed that vitamin E-Se administration significantly ($P<0.01$) improved the conception rate (66 vs 45%) and estrus rate (90 vs 55%). The mean calf body weight at birth and at 4 weeks of age was higher by 3 and 12%, respectively, in calves born to vitamin E-Se treated buffaloes, the difference was non significant ($P>0.05$). It was inferred that the administration of vitamin E-Se during late gestation in buffaloes have beneficial effect on colostrum production, post partum estrus rates and conception rates.

To cite this article: Qureshi ZI, M Siddiq, LA Lodhi, G Muhammad and H Jamil, 2010. Effect of vitamin E-selenium administration during late gestation on productive and reproductive performance in dairy buffaloes and on growth performance of their calves. Pak Vet J, 30(2): 83-86.

INTRODUCTION

Management of dairy animals during prepartum period is critical for their health and subsequent performance. Immuno-suppression usually occurs normally during gestation in the presence of persistently high progesterone (Tizard, 1991) and increasing cortisol levels around parturition (Magnusan and Fossum, 1990). Vitamin E and selenium are essential nutrients that are integral components of the antioxidant defense of tissues and cells. Selenium, a component of enzyme glucothionine peroxidase (GSH-Px), in combination with vitamin E serves as a biological antioxidant to maintain cellular integrity. During normal cellular metabolism, highly reactive oxygen radicals are formed. Vitamin E is believed to be active within cell membrane, preventing the formation of lipid hydrogen peroxidase and the lipid peroxidation of cell membrane (Herdt and Smith, 1996). In contrast, GSH-Px converts hydrogen peroxidase and lipid peroxidase that have already been formed, into less harmful alcohols and water. The action of vitamin E and selenium appears to be synergistic (Papas *et al*., 1990).

Deficiencies of either vitamin E or selenium have been associated with increased incidence and severity of intra-mammary infections (IMI), increased clinical mastitis cases and higher milk somatic cell counts (Anke *et al*., 1989; Weiss *et al*., 1990; Ndiweni *et al*., 1991; Smith *et al*., 1997; Morgante *et al*., 1999). Kott *et al*. (1998) reported that vitamin E-selenium supplemented ewes during late gestation had lambs with significantly higher birth weight and reduced mortality compared to lambs from control group. Our previous work (Qureshi *et al*., 1997) showed that immunopotentiation with vitamin E-selenium significantly improved the reproductive

performance of buffaloes in respect of uterine involution period, calving to oestrus interval, service period and services per conception as compared to control. In continuation of work on vitamin E-selenium, the present paper describes the effect of vitamin E-selenium on some of reproductive and lactation performance parameters of Nili-Ravi dairy buffaloes (*Bubalus bubalis*) treated with vitamin E-selenium during late gestation and on growth of their calves.

MATERIALS AND METHODS

Experimental animals

A total of 40 Nili-Ravi dairy buffaloes in their last trimester of pregnancy were selected from the dairy herd of Livestock Production Research Institute (LPRI), Bahadurnagar, Okara, Pakistan. The selected buffaloes were randomly divided into two groups. The buffaloes in group I were treated with 10 ml of vitamin E 50 + Se (Farvet, Holand, containing 50 mg of vitamin E and 0.5 mg of sodium selenite/ml) intramuscularly on day 30 and 15 (twice) prior to the expected date of parturition, while animals in group II served as untreated control. The duration of the study was 10 months (May, 1999 to February, 2000).

Feeding, housing and management

All the experimental animals were kept under same management and feeding conditions. Animals were housed in sheds in the day and in open yard at night. A good quality seasonal green fodder was offered *ad libitum*. In addition, 2 kg pre-mixed concentrate/day/ animal was provided to all animals in their lactation period. In addition to manger feeding, all the experimental animals were also let out for grazing daily for two hours except last week before expected date of calving. Seven days prior to expected date of delivery, pregnant animals were shifted to maternity unit, where water and trace mineral salts were available all the time. Before shifting of animals, the maternity units were cleaned and disinfected. In addition, the fresh bedding was provided every day. After four days of calving, all the experimental buffaloes were returned to milking herd.

Monitoring of productive performance

First colostrum was removed by hand milking within two hours after parturition. Then all the experimental buffaloes were milked after every 12 hours. Total colostrum quantity was measured for three days (six milkings).

All the experimental animals were hand milked twice a day with the interval of 10-12 hours. Milk from all the animals during the study period was weighed and production of 3 months following parturition was recorded.

Surf field mastitis test (SFMT) was used to record the incidence of mastitis in all experimental animals (Muhammad *et al*., 1995). Milk from all four quarters was checked regularly twice a week.

The calves were weighed before the feeding of colostrum then every week till one month of age. Each calf received colostrum from its dam at the rate of 10% of body weight for first 3 days. After this period, the calves were fed milk at the rate of 10% of their body weight.

In order to study the estrus rate and calving to conception interval, the experimental buffaloes were let loose daily together with vasectimized bulls. The buffaloes in both the groups were observed daily for any vaginal discharge and rectal palpation was also performed up till the involution of uterus. Diagnosis of metritis was based on uterine size (Morrow *et al*., 1966) and presence of purulent material (Tennant and Peddicord, 1968; Studer and Morrow, 1978). Animals in both the groups were inseminated with frozen semen collected from one buffalo bull supplied by Semen Production Unit, Qadirabad to exclude the effect of bull on conception rate and to get genetically similar group of calves.

Statistical analysis

Data on all experimental parameters were used to calculate mean ± SD values. In order to assess the significance of variance among the experimental groups, the data were analyzed by "Z'' Test (Steel and Torrie, 1980). Results were considered significant at $P<0.05$.

RESULTS

The data regarding the effect of prepartum administration of vitamin E-selenium during late gestation on dam lactation and growth performance of their calves are summarized in Table 1. The Vit E-Se treated buffaloes produced more colostrum (14.15 ± 3.29 liters) than did their non treated counterparts (11.51 ± 3.39 liters) for the average of 6 milking ($P<0.05$). Overall production of colostrum was 22 percent higher in treated buffaloes. The average milk yield of first 90 days of lactation was non significantly higher (706.90 ± 314.29 liters) in Vit E-Se treated buffaloes as compared to non-treated group (663.85 ± 225.46 liters). Overall milk yield was 7 percent higher in treated group. The occurrence of mastitis in treated buffaloes was 25% compared to 35% in control group ($P>0.05$).

Reproductive performance data showed that prepartum vitamin E-Se administration did not significantly affect ($P>0.05$) calving to conception interval. However, treatment significantly improved ($P<0.01$) the conception rate (66 vs 45%) and estrus rate (90 vs 55%). Mean calf body weight at birth and at 4 weeks of age did not differ between the experimental groups ($P>0.05$). However, there was tendency of higher weight at birth by 3% and by 12% at 4 weeks of age in calves born to vit E-Se treated dams. Calf survival rate was 77.77% in calves belonging to treated group of dams and 72.22% in control group, the difference being non significant ($P>0.05$).

DISCUSSION

In the present study, prepartum administration of vitamin E-Se resulted in 22% more production of colostrum ($P<0.05$) and 7% more milk as compared to buffaloes of control group ($P>0.05$). To our knowledge, little information is available on the milking performance of dairy animals especially in riverine buffaloes given vit E-Se in late gestation. Lacetera *et al*. (1996) reported non

Table 1: Effect of vitamin E-selenium administration on lactation and postpartum reproductive performance of dairy buffaloes and on growth of their calves

Parameters	Control group	Treated group
Lactation performance		
Colostrum production (lit) (first six milking)	11.51 ± 3.39[a]	14.15 ± 3.29 (22%)[b]
Milk production (lit) (90 days of lactation)	663.85 ± 225.46[a]	706.90 ± 314.29 (7%)[a]
Mastitis incidence (%)	35[a]	25[a]
Reproductive performance		
Conception rate (%)	45[a]	66[b]
% animals showed estrus during experimental period (200 d) (estrus rate)	55[a]	90[b]
Average service period (d)	125[a]	105[a]
Postpartum metritis (%)	20[a]	10[a]
Calf weight (Kg)		
at birth	35.22 ± 3.95[a]	36.33 ± 2.28[a]
1 week	38.04 ± 2.84[a]	39.01 ± 2.64[a]
2 week	42.01 ± 0.21[a]	42.78 ± 0.37[a]
3 week	44.93 ± 0.21[a]	45.74 ± 0.37[a]
4 week	47.85 ± 0.22[a]	48.69 ± 0.38[a]
Calf survival rate (%) up to weaning age	72.22[a]	77.77[a]

Means with different letters within a row differ significantly from each other (P<0.05).

significant increase in colostrum and milk production in dairy cows treated with vit E-Se during late gestation. Gwazdauskas *et al*. (1979) also reported that prepartum administration of sodium selenite did not improve the reproduction and lactation performance in dairy cows. Anke *et al*. (1989) reported that Se deficient goats resulted in 33% low conception rate, 50% lower number of kids, decrease milk production by 23%, milk fat by 11% and milk protein by 12%. The well known protective role of GSH-Px on cell membrane might be a possible explanation through which vitamin E-Se non significantly enhanced colostrum and milk production in the treated group of buffaloes.

In the present study, administration of vitamin E-Se treatment had no effect on the incidence of clinical mastitis (P>0.05). Morgante *et al*. (1999) also reported that prepartum administration of vitamin E-Se during late gestation have non significant effect on the incidence of clinical mastitis. Smith *et al*. (1984) reported that duration of clinical symptom was shorter in vitamin E-Se treated cows as compared to the control group. Data on reproductive performance in the present study showed that vitamin E-Se treatment during late gestation significantly (P<0.05) improved the conception and oestrus rates. Meclure *et al*. (1986) and Anke *et al*. (1989) also reported an improvement in the first service conception rate following treatment with vitamin E-Se in cows and goats, respectively. Akhtar *et al*. (2009) recorded lower serum selenium concentrations in anestrus buffaloes compared to controls. However, the effect on the average service period was non significant (P>0.05), which is in agreement with Kappel *et al*. (1984). The effect of vitamin E-Se was also non significant on (P>0.05) postpartum metritis. The overall non significant effect of vitamin E-Se on calf birth weight and calf survival rate up to weaning age suggests that vitamin E-Se treatment did not affect the calf performance which differed from those of Weiss *et al*. (1983) and Chevez and Patton (1986), who reported that vitamin E-Se treatment improved birth weight and growth performance up to the weaning age in cows and piglets, respectively. Thus, the present study shows that supplementation of vitamin E-Se improved the colostrum production, overall conception rate and pronounced sign of estrus in buffaloes but it did not affect on milk production, incidence of mastitis, average service period, postpartum metritis and calf performance.

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