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EFFECT OF PREPARTUM TREATMENT OF VITAMIN E-SELENIUM ON POSTPARTUM REPRODUCTIVE AND PRODUCTIVE PERFORMANCE OF EXOTIC COWS AND THEIR CALVES UNDER SUBTROPICAL CONDITIONS

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ABSTRACT

This study was carried out at the Livestock Experiment Station, Bhunikey (Pattoki), District Kasur, Pakistan. Forty exotic cows (20 each of Holstein Friesian and Jersey breed) in their last trimester of pregnancy were randomly selected. These cows were divided into two equal groups. Animals of group-I served as control and were injected with 20 ml sterile normal saline intramuscularly, while each cow in group-II was treated with vitamin E-selenium (vitamin E acetate 50.0 mg and sodium selenite 0.5 mg/ml) twice (20 ml at each time) with one-week interval. First injection was given at about 40-60 days prior to the expected date of calving. Calves born to the experimental cows were monitored to study the carry over effect of treatment, if any, from dams to the calves. The reproductive parameters, viz. placental expulsion period, uterine involution period, postpartum insemination interval, service period and number of services per conception in the cows of treated group were significantly ($P<0.05$) lesser compared with those of the control group. However, the differences in production parameters, *i.e.,* lactation milk yield, lactation length and wet average between the two groups were statistically non significant. The same was true for birth weight, weaning weight and growth rate upto weaning between calves of the two groups. In conclusion, it appears that administration of vitamin E-selenium before calving may be beneficial in improving the postpartum reproductive parameters in exotic cows. However, number of animals used in each group was too small to draw any definite conclusion.

Key words: Vitamin-E, selenium, reproductive and productive performance, exotic cows, calves, subtropical conditions.

INTRODUCTION

The economy of livestock production largely depends upon the reproductive efficiency of the animals. The major causes of low reproductive efficiency in cows are delayed age of puberty and longer calving intervals. Successful attempts to improve the reproductive and productive efficiency by providing vitamin E-selenium in exotic cows (Harrison *et al.,* 1984), Sahiwal cows (Sattar *et al.,* 2003b&c), Egyptian buffaloes (Youssef *et al.,* 1985) and Nili-Ravi buffaloes (Qureshi *et al.,* 1997; Sattar *et al.,* 2003a) during late gestation have been reported previously.

Among postpartum reproductive disorders, placental retention is a common, but poorly understood disorder that seriously taxes on reproductive efficiency and milk production of dairy cattle (Fonesca *et al.* 1983). The release of fetal membranes postpartum is a physiological process, involving detachment of fetomaternal adherence, combined with contraction of uterine musculature (Bjorkman and Sollen, 1960). Placental retention has a multifactorial etiology; it is either due to an abnormal physiological process for the release of fetal membranes or pathological factors that affect the loosening mechanism of the placentomes (Paisley *et al.,* 1986). The reduced incidence of placental retention when vitamin E and selenium were administered alone or in combination (Campbell and Miller, 1998) suggested a role of oxidative stress in the etiology of placental retention. Acting in conjunction with selenium, vitamin E prevents oxidative damage to sensitive membrane lipids by suppressing hydroperoxide formation (Putnam and Comben, 1987) and protects cellular membranes and lipid containing organelles from peroxidative damage by inhibition and destruction of endogenous peroxides, thus maintaining membrane integrity and reducing oxidative stress (Hogan *et al.,* 1993).

Administration of vitamin E-selenium in late pregnancy resulted in 10% increase in milk production compared with untreated cows (Lacetera *et al.,* 1996). But the body weight during the first 56 days after birth did not differ between calves born to treated or untreated cows. This study was planned to investigate the effect of pre-partum treatment of vitamin E-selenium on postpartum reproductive and productive

performance in the exotic cows and their calves kept under subtropical conditions of Pakistan.

MATERIALS AND METHODS

This study was carried out at the Livestock Experiment Station, Bhunikey (Pattoki), District Kasur, Pakistan. Forty exotic cows (20 each of Holstein Friesian and Jersey breed) in their last trimester of pregnancy were randomly selected. The age and parity of the cows were almost similar. All the cows were kept under similar managemental conditions. These cows were divided into 2 groups. Each group contained 20 cows, including 10 each of Jersey and Holstein-Friesian breed. The calves born to these cows were also used in this study to observe the carry over effect of treatment, if any, from dam to the calves.

Animals of group I served as control and were injected with 20 ml sterile normal saline intramuscularly, while each cow in group II was treated with "Vit. E50 + SE" (Farvet Laboratories, Bladel, Netherlands) which contained vitamin E acetate 50.0 mg and sodium selenite 0.5 mg/ml. It was administered twice (20 ml at each time) with one-week interval. First injection was given at about 40-60 days prior to the expected date of calving.

All the experimental cows were kept under close observation during parturition and in the postpartum period until they were confirmed pregnant again. After the birth of their calves, the animals were kept individually in open pens and the period upto the expulsion of the fetal membranes was recorded. In order to study the uterine involution period, rectal palpation was started one week postpartum and performed twice a week until completion of involution. Different locations of the uterine horns (abdominal, half pelvic and pelvic) were palpated. Pelvic location of the uterine horns was considered to be the indication of completion of uterine involution (Chaudhry, 1985).

Similarly, different tonic conditions of the uterine horns (erect and turgid, good tone less turgid than at estrus, fair tone with flaccid horns and poor tone in horns which offer no resistance to touch) were noted. Erect and turgid condition of the uterine horns was considered to be the indication of completion of uterine involution.

Estrus was detected through visual observation of estrus signs twice a day (morning and evening) and later on confirmed by rectal palpation. The cows in true estrus were inseminated using frozen thawed semen of acceptable quality. Postpartum insemination interval of each cow was recorded. The pregnancy was confirmed by rectal palpation two months after insemination. Service period and number of services per conception were noted. Lactation length, wet average and lactation yield were also recorded. The birth weight, weaning weight and growth rate upto weaning of the calves born to the control and treated cows were also recorded.

Mean values (± SE) of the reproductive and productive traits were calculated. The data were subjected to t-test to access the significance ($P<0.05$) of variation between control and treated groups (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Vitamin E-selenium supplementation has been reported to improve humoral immune responses to bacterial and viral antigens (Larsen, 1988), leading to reduced neonatal mortality and improved vigor of the young calves (Spears *et al.,* 1986). Furthermore, vitamin E-selenium treatments during the dry period are recommended for reducing postpartum reproductive disorders in cows (Cortese, 1988).

In the present study, the differences in reproductive parameters, *i.e.,* placental expulsion period, uterine involution period, postpartum insemination interval, service period and number of services per conception between control and treated groups of cows were significant ($P<0.05$; Table 1), the values being higher in the control than the treated cows. This indicates that vitamin E-selenium treatment improved postpartum reproductive performance of exotic dairy cows.

According to Youssef *et al.* (1985), pregnant animals are more susceptible to selenium deficiency than non-pregnant animals, which increases the incidence of prepartum and postpartum reproductive disorders. The shorter placental expulsion period in the vitamin E-selenium treated cows in this study may have been due to improved uterine muscular function (Youssef *et al.,* 1985). Harrison *et al.* (1984) and Sattar *et al.* (2003b) reported significantly lesser placental expulsion period and uterine involution period in vitamin E-selenium treated compared to control cows.

The significant reduction in service period (309.43 ± 35.80 vs 167.82 ± 49.73 days) in the cows treated with vitamin E-selenium versus control animals in the present study is supported by the findings of Allen *et al.* (1975) and Hemken *et al.* (1978). These workers reported that the length of the service period was significantly ($P<0.05$) reduced in cows treated prepartum with vitamin E-selenium. Similarly, Sattar *et al.* (2003b) reported significantly lesser service period (115.00 ± 19.75 vs. 286.88 ± 39.04 days) in vitamin E-selenium treated cows compared to those of control cows. However, Gwazdauskas *et al.* (1979) reported that prepartum injections of vitamin E-selenium did not improve the postpartum reproductive performance in terms of the length of the service period. This

Table 1: Effect of pre-partum treatment of vitamin E-selenium on postpartum reproductive and productive performance parameters in exotic cows and their calves (mean ± SE).

Reproductive/productive parameters	Control group	Treated group
Placental expulsion period (hours)	8.93 ± 0.25[a]	5.38 ± 0.44[b]
Uterine involution period (days)	51.42 ± 1.00[a]	41.41 ± 1.90[b]
Postpartum insemination interval (days)	124.88 ± 23.37[a]	68.77 ± 7.56[b]
Service period (days)	309.43 ± 35.80[a]	167.82 ± 49.73[b]
Number of services per conception	5.29 ± 0.71[a]	2.91 ± 0.83[b]
Lactation milk yield (litres)	2499.65 ± 357.28[a]	2062.00 ± 284.69[a]
Lactation length (days)	270.65 ± 30.85[a]	198.85 ± 24.42[a]
Wet average (litres)	8.42 ± 0.64[a]	10.01 ± 1.11[a]
Birth weight of calves (Kg)	24.65 ± 2.67[a]	25.50 ± 2.66[a]
Weaning weight of calves (Kg)	70.00 ± 4.40[a]	71.57 ± 4.53[a]
Growth rate of calves upto weaning (Kg/day)	0.493 ± 0.03[a]	0.502 ± 0.03[a]

The values bearing different superscripts in a row differ significantly ($P < 0.05$).

difference may be attributed to differences in the pretreatment selenium status of the animals, the frequency of the treatment given or the dose rate (Awad *et al.*, 1985). Cortese (1988) and Roger *et al.* (1991) reported a significant decrease in the number of services per conception following prepartum treatment by vitamin E-selenium treated cows, as was found in the present study.

The differences in production parameters, *i.e.*, lactation milk yield, lactation length and wet average between control and treated groups were statistically non-significant (Table 1). Similarly, Sattar *et al.* (2003a and c) reported non-significant effect of vitamin E-selenium treatment on lactation milk yield and lactation length in Nili-Ravi buffaloes and Sahiwal cows.

In the present study, the differences in birth weight, weaning weight and growth rate upto weaning of the calves born to the cows of control and treated groups were statistically non-significant. Sattar *et al.* (2003a and c) also reported non-significant effect of vitamin E-selenium treatment on birth weight, weaning weight and growth rate upto weaning of the calves born to the Nili-Ravi buffaloes and Sahiwal cows.

In conclusion, it appears that administration of vitamin E-selenium before calving may be beneficial in improving the postpartum reproductive parameters of exotic cows. However, number of animals used in each group was too small to draw any definite conclusion.

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