Pakistan Vet. J., 23 (4): 2003

STUDY OF SOME PRODUCTION TRAITS IN SAHIWAL COWS AND THEIR CALVES AFTER IMMUNOSTIMULATION OF PREGNANT DAMS DURING LATE GESTATION

A. Sattar, L. A. Lodhi[1], I. Ahmad, Z. I. Qureshi[1] and N. Ahmad[1]
Research Institute for Physiology of Animal Reproduction, Bhunikey (Pattoki), Distt. Kasur,
[1]Department of Animal Reproduction, University of Agriculture, Faisalabad

ABSTRACT

Thirty two Sahiwal cows (*Bos indicus*) in the last trimester of pregnancy were used to evaluate the effect of immunostimulation on some production traits in the control and treated dams and calves born to them. The cows were divided into four equal groups. Group-I served as untreated control while groups-II, III and IV were treated with levamisole hydrochloride (0.5 mg/Kg body weight orally), vitamin E-selenium (10 ml intramuscularly per cow) and BCG (*Bacille Calmette Guerin*) vaccine (0.5 ml subcutaneously per cow), respectively. These immunostimulants were given twice with one week interval at about 60 days prior to expected date of calving. Some production traits, *i.e.*, milk yield and lactation length of the control and treated dams while birth weight, weaning weight and growth rate upto weaning of calves born to these dams were determined. Milk yield in Sahiwal cows was the lowest (1032.63 litres) in control group and highest (1341.63 litres) in levamisole treated group while lactation length in both these groups was 224.63 and 266.00 days, respectively. The birth weight was the lowest (21.38 kg) in the calves born to control group of cows while weaning weight and growth rate were the lowest (48.33 kg and 0.302 kg/day) in the calves born to BCG treated group of cows. The highest values of birth weight, weaning weight and growth rate (24.38 kg, 53.86 kg and 0.330 kg/day) were observed in the calves born to levamisole treated group of Sahiwal cows. The differences between all the groups for all the production traits recorded were statistically non-significant except one trait, *i.e.*, growth rate which was significantly higher in the calves born to levamisole treated cows as compared to those born to BCG treated dams.

Keywords: Immunostimulation, levamisole, vitamine E-selenium, BCG vaccine, sahiwal cow.

INTRODUCTION

Calf rearing is an important aspect of livestock production. The livestock production can best be improved by the protection and maintenance of animal's health right from their neonatal age (Umoh, 1982). The survival and better health of calves at birth is always in danger due to immunodeficiency syndrome. Immonodeficiency in the calves can be reduced by the maintenance of appropriate level of immunoglobulins in the neonatal calves. There is very little or no transfer of immunoglobulins through intact placenta in bovine having epithelio-chorial type of placentation leading to agammaglobulinaemic neonatal calves (Deshpande, *et al.*, 1991). Hence the immune status of the newborn calves is dependent upon the passage of immunoglobulins from dams to the calves through the ingestion of colostrum (Notheim *et al.*, 1985) and its subsequent absorption from small intestine.

It is hypothesized that maintenance of optimum level of immunity in pregnant mothers directly or indirectly improves the production performance of cows and also birth and weaning weight in their calves. But advanced pregnancy and lactation, high level of estrogens and corticosteroids around calving (Tizard, 1987) and also high concentration of progesterone throughout pregnancy (Staples *et al.*, 1983) suppress the immune status of the pregnant sheep and goats. For the stimulation of immunity in pregnant mothers and subsequent transfer of immunity to their neonates, various immunostimulants like levamisole hydrochloride, vitamin E-selenium and BCG vaccine have been used with variable degree of success in sows (Purswell, *et al.*, 1988), Nili-Ravi buffaloes (Qureshi *et al.*, 1997) and Holstein-Friesian cows (Flesh *et al.*, 1982) during late gestation.

Levamisole hydrochloride, in addition to its anthelmintic acvtivity, stimulates bone marrow regeneration and enhances maturation of lymphocytes

in vivo, whereas in *in vitro* it acts by enhancing blast transformation of lymphocytes (Brunner and Muscoplat, 1980). Selenium improves the humoral immune response (Roger *et al*., 1991) in cows and calves born to treated dams. In the calves, selenium reaches in their body through transplacental transfer and colostrum feeding (Koller *et al*., 1984). BCG stimulates humoral and cellular immune responses to unrelated antigens in addition to its own antigenic determinants (Ben-Efraim and Diamantstein, 1975). However, little information is available about the use of immunostimulants in Sahiwal cows, especially under environmental conditions of Pakistan.

The present study was, therefore, carried out to evaluate the efficacy of prepartum use of three reported immunostimulants, *i.e.*, levamisole hydrochloride, vitamin E-Selenium and *Bacille Calmette Guerin* (BCG) vaccine, in improving the production performance of Sahiwal cows and calves born to these dams.

MATERIALS AND METHODS

A total of 32 adult Sahiwal cows (*Bos indicus*) in the last trimester of pregnancy were selected at the Livestock Production Research Institute (LPRI), Bahadurnagar, Okara, Pakistan. They were randomly divided into four groups, having eight animals in each group. All the experimental animals were kept under similar managemental conditions and were offered good quality seasonal green fodder *ad libitum*. In addition, each animal was given 2 kg of concentrate daily. The farm record indicated that levamisole hydrochloride was not used for deworming in experimental cows.

The cows in group-I served as untreated control. Those in group-II were treated orally with levamisole hydrochloride (*NoWorm*, Shahani Laboratories, Faisalabad, Pakistan) at dose rate of 0.5 mg/Kg body weight while in group-III each cow was administered with vitamin E-selenium 10 ml intramuscularly (*Etosal-SE*, Aesculaap bv, Boxtel, Holland-each ml containing Natrii selenis pentahydricum 1.5 mg and dl-alfa tocopheroliacetas 50 mg). Similarly, each cow in group-IV was injected with BCG vaccine 0.5 ml subcutaneously (Pasteur Merieux, Lyon, France). The immunostimulants were given twice with one week interval at about 60 days prior to expected date of calving. After calving, milk yield and lactation length of the control and treated dams were recorded while birth weight, weaning weight and growth rate upto weaning of calves born to these dams were determined.

Data were derived for the mean values (± SE) of the above said production traits in cows and calves born to these dams. The data were subjected to one-way analysis of variance to access the significance of variation among the four groups (Steel and Torrie, 1984). Least significant difference test (LSD) was applied to compare treatment means.

RESULTS AND DISCUSSION

Milk yield and lactation length of the control and treated dams are presented in Table-1. Milk yield and lactation length was the highest (1341.63 litres and 266.00 days; P<0.05) in levamisole treated group as compared with the control. Birth weight, weaning weight and growth rate upto weaning of calves are also given in Table-1. In this study, the birth weight, weaning weight and growth rate upto weaning was the highest (24.38 kg, 53.86 kg and 0.330 kg/day, P<0.05) in the calves born to levamisole treated cows as compared to those of control group. The differences between all the groups for all the production traits observed were statistically non-significant except one trait, *i.e.*, growth rate which was significantly higher in

Table 1. Production traits (mean ± SE) in Sahiwal cows and their calves after immunostimulation of dams during last trimester of pregnancy.

Production traits	Group-I (Control)	Group-II (Levamisol treated)	Group-III (Vit E-Sel treated)	Group-IV (BCG treated)
Milk yield (litres)	1032.63 ± 84.83^{a}	1341.63 ± 145.05^{a}	1276.63 ± 225.00^{a}	1161.00 ± 178.44^{a}
Lactation length (days)	224.63 ± 11.27^{a}	266.00 ± 26.24^{a}	243.50 ± 28.85^{a}	226.75 ± 25.22^{a}
Birth weight of calf (Kg)	21.38 ± 1.00^{a}	24.38 ± 0.75^{a}	21.63 ± 1.24^{a}	21.50 ± 1.07^{a}
Weaning weight of calf (Kg)	49.25 ± 1.98^{a}	53.86 ± 1.77^{a}	48.50 ± 2.36^{a}	48.33 ± 2.23^{a}
Growth rate of calf upto weaning (Kg/day)	0.310 ± 0.02^{ab}	0.330 ± 0.02^{a}	0.311 ± 0.01^{ab}	0.302 ± 0.02^{b}

Values bearing different superscripts in the same row differ significantly (P<0.05)

the calves born to levamisole treated cows as compared to those born to BCG treated dams.

In the present study, levamisole hydrochloride improved the milk production and lactation length of Sahiwal cows and birth weight, weaning weight and growth rate upto weaning of the calves born to them as compared to control and other treated groups but the results were not statistically significant except growth rate of the calves born to levamisole treated cows was significantly higher than those born to BCG treated dams. Purswell *et al*., (1988) treated the prepartum gilts with levamisole and studied the pig survival at birth and weaning, and weight at birth and weaning and found no statistically significant difference between treated and control group. Similarly in the present study, production traits in the calves born to levamisole treated cows differed non-significantly as compared to untreated control group.

Pregnant animals are more susceptible to selenium deficiency than non-pregnant animals (Awad *et al*., 1985) leading to increased incidence of prepartum and postpartum reproductive disorders and also decreased milk yield of the cows and birth weight of the calves. In our study, it was observed that vitamin E-selenium improved the production performance in the treated cows and calves born to treated dams as compared to those of untreated group but the difference was statistically non-significant. Whereas, weaning weight of the calves born to the vitamin E-selenium treated cows was lesser (P<0.05) as compared to the calves born to untreated controls. These findings are supported by those of Roger *et al*. (1991), who reported birth weight, daily weight gain from birth to weaning and weaning weight as 39.8 ± 7.1 vs. 41.2 ± 6.1 kg, 1.12 ± 0.18 vs. 1.09 ± 0.17 kg/day and 224 ± 37 vs. 221 ± 35 kg in the calves born to vitamine E-selenium treated vs. control group of cows, respectively. All these differences were statistically non-significant. Similarly, Qureshi *et al*., (2002) reported that treatment of buffaloes with vitamin E-selenium in last trimester of pregnancy resulted into numerical improvement in colostrum and milk production upto 3 months and birth weight of calves born to treated dams as compared to control group.

In the current study, prepartum immunopotentiation with BCG vaccine resulted into non-significant improvement in milk yield and lactation length in treated cows and birth weight of the calves born to them while weaning weight and growth rate upto weaning were lesser (P<0.05) in these calves as compared to those born to controls. But a significant decrease in growth rate upto weaning was found in calves born to BCG treated cows as compared with levamisole treated group. Qureshi *et al*. (1997) treated prepartum Nili-Ravi buffaloes with BCG which resulted into significant (P<0.05) improvement in some of the postpartum reproductive traits. The mechanism by which BCG improves the production performance in cows and their calves is not known but it has been reported to increase nonspecific resistance against various unrelated pathogens, like bacteria, viruses or parasites, (Salwin *et al*., 1975) and potentiates humoral and cell-mediated immune responses to protein antigens (Wendell and Harris, 1982).

REFERENCES

Awad, Y.I., R.H. Youssef and M.F. Mikhail, 1985. Influence of prepartum selenium treatment on the postpartum reproductive pattern of Egyptian buffalo and on the born calves. Egyptian J. Vet. Sci., 22: 55-64.

Ben-Efrain, S. and T. Diamantstein, 1975. Mitogenic and adjuvant activity of a methanol extraction residue (MER) of tubercle bacilli on mouse lymphoid cells *in vitro*. Immunolo. Commun., 4: 565-577.

Brunner, C. J. and C. C. Muscoplat, 1980. Immunomodulatory effects of levamisole. J. American Vet. Med. Assoc., 176: 1159-1162.

Deshpande, A.R., M.B. Gujar and A.S. Bannalikar, 1991. Passive transfer of some immunological activities in newborn calves from levamisole treated dams. Indian Vet. J. 68: 614-620.

Flesh, J., W. Harel and D. Nelken, 1982. Immunopotentiating effect of levamisole in the prevention of bovine mastitis, fetal death and endometritis. Vet. Rec., 111: 56-57.

Koller, L.D., G.A. Whitbeck and P.J. South, 1984. Transplacental transfer and colostral concentrations of selenium in beef cattle. American J. Vet. Res., 45: 2507-2510.

Norheim, K., E. Simensen and K.E. Gjestang, 1985. The relationship between serum IgG level and age, leg injuries, infection and weight gain in dairy calves. Nord. Vet. Med., 37: 113-120.

Purswell, J.B., D.L. Dawe, J. brown and J.B. Williams, 1988. Effect of levamisole on immune function and reproductive performance in first litter gilts. American J. Vet. Res., 49: 856-859.

Qureshi, Z.I., L.A. Lodhi and A. Sattar, 1997. An apparent effect of immunopotentiation during late gestation on the postpartum reproductive performance of Nili-Ravi buffaloes (*Bubalus bubalis*). Vet. Res. Commun., 21: 375-380.

Qureshi, Z.I., I.A. Lodhi, G. Muhammad and M. Siddique, 2002. Effect of vitamin E-selenium administration during late gestation on reproductive and productive performance of riverine buffaloes. Nat. Conf. Fact. Limit. Dairy Prod. Pakistan, Pakistan Soc. Anim. Reprod. Univ. Agric., Faisalabad pp. 18 (Abstract).

Roger, D.H., K.D. Brenda, G. Cheryl and E.D. Jazen, 1991. Effect of prepartum parenteral supplementation of pregnant beef cows with selenium/vitamin E on cows and calf plasma selenium and productivity. Canadian Vet. J., 32: 113-115.

Salvin, S.B., E. Ribi and D.L. Garnger, 1975. Migration inhibitory factor and type II interferon in the circulation of mice sensitized with Mycobacterial components. J. Immunol., 114: 354-359.

Staples, L.D., R.M. Binns and R.B. Heap, 1983. Influence of certain steroids on lymphocyte transformation in sheep and goats studied *in vitro*. J. Endocrinol., 98: 55-69.

Steel, R.G.D. and T.H. Torrie, 1984. Principles and Procedures of Statistics. A biometrical approach, 2nd ed., McGraw Hill, Tokyo.

Tizard, I. R. 1987. An Introduction to Veterinary Immunology. 3rd Ed. W. B. Saunders Co. Philadelphia.

Umoh, J.U., 1982. Relative survival of calves in a university herd in Zaria, Nigeria. British Vet. J., 138: 507-514.

Wendell, W.D. and S.C. Harris, 1982. Interferon induction in healthy and tumour bearing dogs by cell walls of Mycobacterium bovis strain of *Bacille Calmette-Guerin*. American J. Vet. Res., 43: 1232-1237