Vol.3 No.4 Apr-June 2016 ISSN : 2321-6387

Effect of Different Progestagens on Plasma Progesterone and Estradiol Profile in Postpartum Anestrus Buffaloes

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Article Received on 03.02.2016 *Article Published on 07.04.2016*

Abstract

An experiment was carried out to assess the plasma progesterone and estradiol profile in buffaloes administered with progestagens for the treatment of anestrus condition in buffaloes. The ovarian steroid profile in this study indicated that the anestrus buffaloes responded well to the progesterone treatment and exhibited steroid hormone profile comparable to regular cyclic animals.

***Key words**: Anestrus, Buffaloes, Progesterone, Estradiol*

Introduction

Buffaloes as dairy animal occupy significant place in the indian dairy industry and account for 56 per cent of nation's total milk production. Buffaloes are well known for efficient conversion of low grade fibrous food into high value milk. A major factor of economic importance in buffalo reproduction is the postpartum fertility. Anoestrus due to ovarian inactivity is considered to be the most important cause of lowered fertility in buffaloes, and is responsible for tremendous economic losses to farmers by decreasing milk yields in addition to lowering calf production (Hiremath and Ramesha, 2015). True anoestrus is a condition in which both ovaries are small, smooth, inactive with the absence of a Graafian follicle or corpus luteum, and characterised by cessation of the sexual cycle and psychic manifestation of oestrus (Nayak et al. 2009).

Intravaginal progesterone releasing devices have been used for the induction of cyclicity in true anestrus bovines as well as for synchronization of ovulation and oestrus (Singh *et al.,* 2006). However, changes in steroid hormone profiles during induction of cyclicity with progesterone therapy have not been well documented. Hence, an investigation was carried out to study the progesterone and estradiol hormone profile in postpartum anestrus buffaloes treated with different progesterone preparations.

Materials and methods

Healthy she buffaloes (43 Nos., in 2nd to 4th parity, did not express estrus signs for more than 5 months post partum) having smooth ovaries with no palpable structures by rectal examination done twice at 10 days interval were confirmed as true anesrus. These animals belonged to small farmers in rural areas of Namakkal, Salem and Karur districts of Tamil Nadu state. The animals were maintained on grazing for 3-4 hours per day and supplemented with mixed ration of paddy straw, dried jowar, greens along with little concentrate feed. The animals had access

to drinking water *ad lib*. The animals were routinely being subjected to bathing under tap water/ wallowing in pond water by the owners.

The selected animals were divided into four groups namely, group I (10 Nos., CIDR), group II (10 Nos., CIDR + GnRH), group III (13 Nos., Progesterone impregnated intravaginal sponge) and group IV (10 Nos., Progesterone depot injection). The CIDR and intravaginal sponges were retained in the vagina for 9 days and manually removed on 10th day in respective groups. In addition, the group II animals received 5 ml of GnRH at the time of AI. The group IV animals were injected with 500 mg hydroxyprogesterone caproate i.m. twice at 10 days interval. Ten numbers of regular cycling buffaloes maintained at similar management and feeding conditions were selected to serve as control. Blood samples were collected from jugular vein before the initiation of treatment as well as on the day of estrus, day 10 and day 21 post estrus in treatment and control groups for the analysis of progesterone and estradiol hormone level in plasma.

Plasma samples were analysed in duplicate for progesterone and estradiol by radioimmunoassay technique. The 125I labelled antigen, antibody-coated tubes and standards procured from Immunotech (Marseille, France) were used for the assay. The radioactivity in the samples was measured in gamma counter (HIDEX, Finland).

Results and discussion

Mean plasma progesterone level (ng/ml) of treatment and control group of buffaloes between days is presented in Table 1.

Table 1: Mean (±SE) plasma progesterone level (ng/ml) before inducing ovarian cyclicity and during estrous cycle in anestrus and regular cyclic buffaloes

	Before treatment	On the day of estrus	Day-10 post estrus	Day-21 post estrus	
				Pregnant	Non-pregnant
Group I (CIDR)	0.29^{A} ± 0.03	0.24^{A} ± 0.02	4.29^{B} ± 0.43	4.22^{B} ± 0.53	0.39^{A} ± 0.11
Group II (CIDR +GnRH)	0.32^{A} ± 0.04	0.28^{A} ± 0.03	3.91^{B} ± 0.56	5.53^{B} ± 0.47	0.36^{A} ± 0.09
Group III (Progesterone sponge)	0.32^{A} ± 0.03	0.31^{A} ± 0.03	3.94^{B} ± 0.28	4.26^{B} ± 0.23	0.30^{A} ± 0.07
Group IV (Progesterone depot injection)	0.39^{A} ± 0.04	0.34^{A} ± 0.05	3.69^{B} ± 0.27	4.27^{B} ± 0.43	0.42^{A} ± 0.10
Group V (Regular cyclic)	0.37^{A} ± 0.04	0.31^{A} ± 0.04	3.59^{B} ± 0.31	4.37^{B} ± 0.21	0.39^{A} ± 0.05

Means within the same row bearing different superscripts differ significantly (P<0.01)

It was observed that the plasma progesterone level was ranged between 0.24 and 0.39 ng/ml before treatment as well as at estrus in all the groups. Subsequently the level rose to between 3.59 and 4.29 ng/ml on day 10 of estrous cycle in all the groups, which indicated the active state of corpus luteum. On day 21, the level remained elevated in the pregnant animals indicating the continuation of life of corpus luteum. The progesterone level in non-pregnant animals in all the groups returned to basal level on day 21 and is similar to day 0 value of the cycle. There was no significant variation in the progesterone level between groups at different days of estrous cycle.

Kavani *et al.* (2005) reported that the mean progesterone level rose significantly by day 14 of the cycle compared to the day of estrus and then remained almost at the same level even at day 21 of estrous cycle and this was associated with the presence of active corpus luteum due to establishment of pregnancy. The results of this study are in agreement with Takkar *et al.* (1982) and Dugwekar *et al.* (2008) who reported similar trend in progesterone level on day 0 and day 10 of estrous cycle.

Gupta *et al.* (2011) and Soni *et al.* (2015) also reported similar trend of progesterone level in plasma of anestrus buffaloes treated with hormonal therapy. The trend observed for serum progesterone during different phases of estrous cycle represents the growth and functional status of corpus luteum (Batra *et al.,* 1979).

Mean plasma estradiol level (pg/ml) of treatment and control group of buffaloes between days is presented in Table 2.

Table 2: Mean (±SE) plasma estradiol level (pg/ml) before inducing ovarian cyclicity and during estrous cycle in anestrus and regular cyclic buffaloes

	Before treatment	**On the day of estrus**	**Day-10 post estrus**	**Day-21 post estrus**	
				Pregnant	**Non-pregnant**
Group I (CIDR)	12.66 ^{a} ± 1.76	21.36 ^{b} ± 2.34	15.05 ^{a} ± 1.99	15.40 ^{a} ± 1.36	21.53 ^{b} ± 2.88
Group II (CIDR +GnRH)	9.62 ^{A} ± 1.21	23.64 ^{C} ± 2.58	15.77 ^{B} ± 1.69	14.25 ^{B} ± 1.34	24.05 ^{C} ± 2.78
Group III (Progesterone sponge)	9.28 ^{A} ± 0.91	29.39 ^{C} ± 2.04	12.08 ^{AB} ± 1.65	13.90 ^{B} ± 1.21	29.63 ^{C} ± 2.37
Group IV (Progesterone depot injection)	8.70 ^{A} ± 1.36	22.63 ^{B} ± 2.11	10.88 ^{A} ± 1.90	12.48 ^{A} ± 1.29	26.03 ^{B} ± 2.71
Group V (Regular cyclic)	11.25 ^{A} ± 0.91	26.79 ^{B} ± 1.96	13.50 ^{A} ± 1.92	13.04 ^{A} ± 1.73	28.23 ^{B} ± 2.85

Means within the same row bearing different upper case ($P<0.01$) and lower case ($P<0.05$) superscripts differ significantly.

The mean estradiol level before inducing ovarian activity was between 8.70 and 12.66 pg/ml in all the groups. The estradiol level was elevated to between 21.36 and 29.39 pg/ml on the day of estrus in all the groups. On day 10 of estrous cycle, the level ranged between 10.88 and 15.77 pg/ml. On day 21, the animals that conceived had estradiol level similar to the level on day 10 of estrous cycle. The non-pregnant animals showed estradiol value as that of previous estrus which indicated resumption of ovarian cyclicity for next cycle. However, no significant difference was noticed between groups during different days of estrous cycle.

The mean estradiol level in anestrus and regular cyclic buffaloes of the present study concurs with the findings of Sarvaiya and Pathak (1992) who reported 9.82 and 10.31 pg/ml in anestrus and regular cyclic buffaloes. The significantly higher ($P<0.01$) concentration of estradiol observed at estrus in this study is in agreement with the findings of Sharma *et al.* (1999) in buffaloes at estrus.

The estradiol level on day 10 of estrous cycle observed in this study might have resulted from the waves of follicular growth. Baruselli *et al.* (1997) reported that buffaloes have undergone two or three waves of follicle growth during the estrus cycle, the second wave occurring during day 10-11 of the cycle. Gupta *et al.* (2011) also reported similar trend of estradiol level in plasma of anestrus buffaloes treated with hormonal therapy.

It can be inferred from the results that the anestrus buffaloes responded well to the progesterone treatment and exhibited steroid hormone profile comparable to regular cyclic animals. Further studies with large number of animals are required to support the results and to elucidate the changes in other hormones involved in reproduction.

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