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Research Article

Effect of hormonal treatment on induction of estrus and plasma mineral composition in true anestrus buffalo heifers

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ABSTRACT

Eight true anoestrus mature Murrah buffalo heifers aged 3-4 years and weighing 300-325 kg were randomly divided into two groups. Group 1 was injected with 100 mg progesterone (Duraprogen) daily for 10 days (T1) while group 2 got two doses of 500 mg progesterone at 5 days interval (T2). All animals were injected with 1000 I.U. Folligon (PMSG) a day after progesterone withdrawal (day 12). The treatment resulted in 4-10 times increase in ovarian size and symptoms of estrus were exhibited in 75% and 66.6% animals in T1 and T2, respectively. The number of pregnancies that occurred in T1 and T2 were 0 and 75%, respectively. Serum sodium, potassium, calcium and phosphorus increased from day 1 to day 10, decreased on day 12 and again increased on day 21, which was the expected day of estrus. Calcium: Phosphorus (Ca:P) ratio also increased with progesterone administration.

Key words : Hormone, Induction of Estrus, Mineral composition, Buffalo

INTRODUCTION

It is a matter of concern that in lactating buffaloes, 33.5 to 45 percent had smooth and inactive ovaries (Banerjee *et al.* 1992). This condition of true anestrum also persists in mature heifers. The use of various hormonal combinations has been tried to induce estrus in true anestrus buffaloes (Rajamahendran and Thamotharam, 1983; Rao *et al.* 1985; Pant and Gupta, 1996; Shanker *et al.* 1996). The role of blood minerals and electrolytes has been reported to be related to reproductive function in cattle and buffaloes (Alegro, 1989; Hang-Poung, 1989; Forshel, 1991). The present experiment was conducted to study the effect of administration of Duraprogen (progesterone) and pregnant mare serum gonadotrophin (Folligon) on ovarian activity, conception rate and the consequent effect on blood mineral and electrolyte concentration in true-anestrus heifers.

MATERIALS AND METHODS

Animals and management: Eight adult true anoestrus Murrah heifers aged 3 to 4 years and weighing 300-325 kg were selected for the experiment. The animals showed true-anoestrus, as they were having no corpus luteum or follicle on either ovary as per-rectal examination for 10 days. The animals were kept in standard loose housing conditions. Green forage and wheat straw were fed and fresh clean water was available *ad lib.*

Hormonal treatment: The heifers were randomly divided in to two groups of four each. To prime the ovaries. Group 1 (treatment 1) was injected (i.v) with 100 mg progesterone (Duraprogen) daily for 10 consecutive days while group 2 (treatment 2) got two doses of progesterone @ 500 mg per animal at 5 days interval. On day 12 of the treatment, all the animals in both the groups were given 1000 I.U. of Folligon.

Blood collection and analysis: The animals were bled at the start of the protocol – day 1 and thereafter on days 3, 5, 8 and 10, 12 and 21. The blood was allowed to clot at 4°C for 4 hours and serum was harvested. Serum was frozen at -20°C till analysis. Sodium and potassium were estimated by flame photometry. Calcium and phosphorus was estimated as per Varley (1980), respectively. The data was analyzed for analysis of variance as per Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The treatment proved to be effective in increasing ovarian size and inducting ovarian cyclicity. The ovaries, which were pea to gram sized at the beginning of the experiment increased by 4 to 10 times at the end

of the protocol. The incidence of the occurrence of estrus was 75.0 and 66.6 percent in group 1 and groups 2, respectively within a span of 16 days of the termination of treatment. The percentage of pregnancies in group 1 and group 2 were 0 and 75, respectively. In-group 1, 75% of animals started cycling regularly while in-group 2, one animal died and 75 percent became pregnant within 10 months of start of the treatment. The beneficial effect of ovarian steroids on target tissues has been explained by Cupps (1991) in terms of increase in the activity of specific enzymes.

The average values ± SE of various constituents have been shown in Table 1. Calcium value showed an increasing trend from day 1 to day 10 of treatment was lowest on day12 and again increased on day 21, the expected day of estrus. The differences were highly significant ($P<0.01$). P value increased as the treatment advanced (day 0 – day 10), was lowest on day 12 and highest on day 21. The value of sodium also increased from day 0 to day 8, was lowest on day_{12} and again increased at day 21. The differences were significant ($P<0.01$). Potassium value showed an increasing trend as the treatment progressed, the highest being on day 10, decreased on day 12 and day 21. Highest Ca:P ratio was observed on day 5 and lowest on day2, but, an increasing trend in its value was observed with progesterone administration. No information is available on the effect of progesterone and gonadotropins on mineral metabolism in buffaloes. Some information on the role of ovarian steroids on mineral metabolism in other animals has been cited. Ulrich (1990) reported that steroid hormones are regulators of carbohydrate and mineral metabolism. Michell and Noakes (1980) reported that progesterone did not affect urinary excretion of sodium in sheep, thereby maintaining its plasma levels.

The treatment with progesterone and folligon caused an increase in the circulating levels of Ca and P in all the animals in the present investigation. Behera *et al.* (1993) observed significant higher plasma P and lower Ca:P ratio in cycling compared to non-cycling heifers but Ca level was not different in the two groups. The same authors further observed that mineral supplementation in the deficient animals caused an increase in the level of P in the animals, which responded than those which did not respond. The Ca:P ratio in the cycling and those animals which responded to treatment was lower compared to non-cycling and non-responding ones.

Evidently, the administration of progesterone caused an increase in the plasma levels of calcium, phosphorus, sodium and potassium. These levels decreased on progesterone withdrawal and Folligon administration and were lowest on that day. The values again increased on day 21, the expected day of estrus.

The conclusions of the present investigation are that progesterone and folligon administration in heifers with smooth ovaries initiated ovarian activity in 90 percent animals. Treatment 2 appeared to be more efficient as it led to 75 percent conception rate. The treatments caused elevated levels of serum calcium, phosphorus sodium and potassium which might improve the animal physiology, activate hypophyseal gonadal function and may result in improved ovarian function. Further investigations to explain these mechanisms need to be conducted to explore this important field of buffalo reproductive physiology.

Table 1. Average value ± SE of various serum constituents on different days.

Days Post-Progesterone Administration	Calcium (mg%)	Phosphorus (mg%)	Sodium (meq/1)	Potassium (meq/1)	Ca : P Ratio
1	7.52 ± 0.68^{a}	7.14±0.57	142.21 ± 1.76^{a}	4.26 ± 0.09^{a}	1.04±0.07a
4	7.31 ± 1.10^{ab}	7.92±0.82	146.00 ± 1.33^{ab}	5.82 ± 0.23^{b}	0.90 ± 0.06^{ab}
5	9.31 ± 0.31^{abc}	8.47±1.18	155.10 ± 2.31^{bc}	4.27 ± 0.19^{ac}	1.24 ± 0.07^{ac}
8	8.35 ± 0.83^{abcd}	8.40±1.27	152.60 ± 3.41^{bcd}	4.76 ± 0.16^{d}	1.15 ± 0.16^{acd}
10	9.27 ± 0.39^{abcde}	8.15±0.50	145.83 ± 3.89^{abde}	6.84 ± 0.35^{e}	1.15 ± 0.05^{acde}
12	6.70 ± 0.51^{abb}	6.95±0.33	137.13 ± 2.94^{abef}	5.89 ± 0.32^{bf}	0.91 ± 0.04^{abf}
21	9.39 ± 0.52^{acdeg}	10.00±1.11	147.00 ± 1.67^{abcdeg}	4.97 ± 0.25^{g}	1.04 ± 0.04^{abcdefg}

Values with different superscript differ significantly.

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