EFFECT OF INSULIN ON PROGESTERONE PROFILE AND CONCEPTION RATE IN CROSSBRED COWS

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ABSTRACT

The present study was conducted on 48 crossbred cows aged 4-12 years, divided into four groups (n=12 in each group). In I, II and III (Treated) groups, insulin @ 0.25 IU/Kg (Human Mixtard®, Torrent Pharmaceuticals Ltd., India) was given subcutaneously daily for 4 days on days 0-3, 4-7 and 8-11 of estrous cycle, respectively and in control group PBS (s/c) was administered comparable to insulin suspension on 4-7 days of estrous cycle. Blood samples were collected on day 0, 5, 10, 16 and 21 and serum was separated for estimation of progesterone (P4). Serum P4 concentration on day 10 and 16 was significantly ($P<0.05$) higher in group I compared to other groups. Its concentration in all groups was significantly ($P<0.05$) lower on day 0 compared to day 16. It was also significantly ($P<0.05$) lower on day 0 and 5 compared to day 21 in I, II and III groups. P4 level in blood, on day 21 was significantly ($P<0.01$) higher in pregnant animals compared to non pregnant animals of all the groups. Conception rate in group I was higher, *i.e.* 58.33% followed by 41.66%, 25% and 16.67% in groups III, II and IV, respectively. Present study could be concluded that the treatment of cows with insulin on days 0-3 of estrous cycle had positive effect on improvement of conception rate.

Key words: Insulin, Progesterone, Conception rate, Crossbred cows

INTRODUCTION

It has been estimated that fertilization rates in the bovine ranged from 88 to 90 % and only 60% of these embryos are converted into live calves (De Los Santos -Valadez *et al.,* 1982). One factor that contributes to the loss of embryos is deficiency of progesterone, which might be due to insufficiency of corpus luteum. High proportion of embryonic and early fetal losses in dairy cattle are associated with low peripheral concentrations of progesterone, which could result from increased catabolism, decreased production, or both (Lemley *et al.*, 2008). The increased plasma IGF-1 level during follicular phase following administration of insulin may affect the development of the follicles and function of corpus luteum (Leeuwenberg *et al.*, 1996). In bovine, binding sites for insulin, IGF-1 and GH have been demonstrated in ovary, oviduct, uterus and embryo (Pawshe *et al.*, 1998 and Daliri *et al.,* 1999). Matsui *et al.* (1997) reported that blood insulin at concentrations of 0.5–10 µg/ml had a beneficial effect on the rate of embryonic development up to the morula stage on day 5 of embryo culture. In the light of above discussion the present study was undertaken to determine the effect of insulin administration during post AI period on conception rate.

MATERIAL AND METHODS

The present study was conducted on 48 crossbred cyclic cows aged 4-12 years, maintained at Instructional Dairy Farm, GBPUA&T, Pantnagar (Uttarakhand). Cows were divided into four groups (n=12), on the basis of day of insulin (0.25 IU/kg subcutaneously) treatment. It was day 0-3, 4-7 and 8-11 of estrous cycle in group I, II and III. Fourth group served as control and PBS was injected in equal amount to insulin suspension. Blood samples were collected on day 0, 5, 10, 16, and 21 of estrous cycle. Animals were detected in estrus and artificially inseminated with frozen semen. Blood samples (5-10 ml) were collected and serum was stored at -20°C till analysis. Progesterone was assayed by

RIA kits (Immunotech, France) as per guidelines of manufacturer. Pregnancy was confirmed by rectal examination of the genital organs after 60 days of service. The data obtained in the present study was analyzed statistically as per the methods described by Snedecor and Cochran (1994).

RESULT AND DISCUSSION

Serum progesterone (P4) concentration on day 10 and 16 of estrous cycle was significantly ($P<0.05$) higher in group I compared to other groups. Higher P4 in group I on day 10 and 16 might be due to synergistic role of insulin in the gonadotrophin mediated stimulation of steroidogenesis (Veldhuis and Demers 1985).

Serum progesterone in treatment groups and control was significantly ($P<0.05$) lower on day 0 compared to day 16 and 21 and day 10 and 16, respectively. Its concentration was significantly ($P<0.05$) lower on day 0 and 5 compared to day 21 in treatment groups. There was significant difference in P4 concentration in all groups during various days of study because of change in ovarian physiology during various phases of estrous cycle or due to maintenance of pregnancy. Lamming *et al.* (1989) found that progesterone concentrations in pregnant and non-pregnant cow rise indifferently until day 9, which later on diverged and the concentrations in pregnant cows remained higher.

Serum P4 in pregnant animals of treatment groups showed a significant increase from day 10 in group I and from day 16 to day 21 in group II and III compared to control, where this increase was on day 21, indicating the positive effect of insulin on progesterone secretion as it enhances gonadotrophin stimulated progesterone production in the bovine granulosa (May and Schomberg, 1981) and luteal (Saurerwein *et al.*, 1992) cell culture. Stewart *et al.* (1995) also reported that insulin enhances growth and proliferation of theca cells leading to production of progesterone. Several *In vitro* studies have also shown that insulin directly stimulates both mitosis and steroid production of cultured bovine granulosa (Gutierrez *et al.*, 1997), theca (Stewart *et al.*, 1995) and luteal cells (Mamluk *et al.*, 1999).

Serum P4 concentration on day 21 was significantly ($P<0.01$) higher in pregnant animals compared to nonpregnant animals of all the groups since plasma and milk progesterone concentrations rise similarly in early luteal phase in pregnant and non-pregnant animals but the higher concentrations are maintained in pregnant cows for duration of pregnancy which is essential for maintenance of pregnancy (Bajaj and Neelesh, 2011)

Conception rate in all the treated groups was higher compared to control though Group I had maximum conception rate. This indicated the role of insulin in enhancement of follicular growth, oocyte quality and early embryonic development (Robinson *et al.*, 2000) and stimulation of glucose uptake, general metabolism and mitosis of cultured bovine granulosa cells (Langhout *et al.*, 1991).

On the basis of findings, it can be concluded that post AI insulin treatment had beneficial effect on conception rate, it was higher when treated on day 0, 1, 2 and 3 of estrous cycle. Thus, post AI insulin administration could be used to increase the conception rate in cows.

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