EFFECT OF hCG BEFORE, DURING AND AFTER INDUCED ESTRUS ON CONCEPTION AND PROGESTERONE IN REPEAT BREEDER COWS*

M.SELVARAJU[1] , C.VEERAPANDIAN[2], D.KATHIRESAN[3], K.KULASEKAR[4] and C.CHANDRAHASAN[5]

Department of Animal Reproduction, Gynaecology and Obstetrics, Madras Veterinary College, Chennai- 600 007.

ABSTRACT

The repeat breeding syndrome in cows is the most commonly encountered and poorly understood condition causing economic loss to the farmers. A total of 64 repeat breeder cows were treated with 0.98 mg of Tiaprost on day 10 following natural estrus and were equally divided into 4 groups as PG-N, PG-P, PG-O and PG-E and were treated with no hCG, 1500 IU hCG at 24 hrs before first AI, at first AI and at 4 days following first AI, respectively. Sixteen untreated repeat breeder cows served as control. In the treated cows AI was done at 72 (first AI) and 96 hrs (Second AI) after $PGF_{2\alpha}$ injection. In control group, AI was carried out twice at 24 hrs interval in natural estrus. Blood was collected at different phases of treatment for progesterone assay. First service conception rates obtained were 43.75, 43.75, 62.50 and 37.50 per cent in PG-N, PG-P, PG-O and PG-E, respectively and the same in control was18.75 per cent. The overall mean level (ng/ml) of serum progesterone at the time of natural estrus, $PGF_{2\alpha}$ injection, induced estrus and at 2nd, 4th and 6th day following first AI in cows which became pregnant was 0.36±0.08, 7.19±0.46, 0.18±0.05, 1.05±0.20, 1.70±0.22 and 3.37±0.77 and corresponding values in non pregnant cows were 0.51±0.09, 5.24±0.43, 0.23±0.03, 0.57±0.15, 0.99±0.27 and 1.62±0.26, respectively. It is concluded that $PGF_{2\alpha}$ in combination with hCG at AI, improved the conception rate in repeat breeder cows.

Key words : hCG administration, Conception rate, Repeat breeder cows.

INTRODUCTION

It was estimated that even in well managed herds, the incidence of infertility ranged from 15 to 20 per cent, majority of which was due to repeat breeding syndrome. This situation was aggravated in case of small holders and marginal farmers owning 2 to 5 cows, mainly due to lack of appropriate managerial practices and proper technical know how (Kaikini,1989). Control of estrus using prostaglandin preparations (Xu *et al.*, 1997) has been found to be effective in achieving good fertility in normally cycling dairy cattle. Goley and Kadu (1995) reported that prostaglandin increased the conception rate in repeat breeders.

Lowered conception rate with prostaglandin$F_{2\alpha}$ ($PGF_{2\alpha}$) in some studies were related to reduced corpus luteum weight and subsequent lower serum progesterone content (Rentfrow *et al.*,1987). Human Chorionic Gonadotropin (hCG) has been demonstrated to be luteotropic in the bovine species and to increase the progesterone synthesis from bovine corpus luteum. The hCG caused an increase in progesterone concentrations when injected on day 4 following breeding (Breuel *et al.*,1989) and increased the

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1.Associate Professor and Head, Dept. of ARGO and 5. Dean, Veterinary College and Research Institute, Namakkal .2.Professor and Head 4. Professor 3. Director of Extension Education, TANUVAS, Chennai-51

pregnancy rate in cyclical cows. Therefore it was postulated that supplementation of hCG at various stages following $PGF_{2\alpha}$ injection may improve conception rate in repeat breeder cows.

MATERIALS AND METHODS

A total of 80 healthy, parous crossbred cows which failed to conceive after three or more AI were selected for this study. They were having regular estrous cycle length of 18-24 days with clear mucus discharge during every previous estrus. They were free from gross palpable abnormalities and obvious infections of the genital tract. Out of 80 selected animals, 64 cows were treated with 0.98 mg of Tiaprost trometamol intramuscularly on day 10 following natural estrus and were equally divided in to 4 treatment groups. Depending on group they were administered with no hCG (PG-N), 1500 IU hCG at 24 hrs before first AI (PG-P), at first AI (PG-O) and at 4 days after first AI (PG-E), respectively. AI was done at 72 (first AI) or 96 hrs (Second AI) after $PGF_{2\alpha}$ injection. Sixteen repeat breeder cows without any treatment served as control and were artificially inseminated twice at 24 hrs interval during natural estrus. Rectal examination was carried out in all the treated and control cows at 60 days after AI to confirm pregnancy. First service conception rate was calculated in all the groups. Blood samples were collected from all the treatment groups at natural estrus, at the time of $PGF_{2\alpha}$ injection, at the time of first AI at induced estrus and at second, fourth and sixth day following first AI for progesterone assay. In control groups, blood was collected at natural estrus and on day 10 and at the time of first AI and at second, fourth and sixth day following first AI. Serum progesterone assay was carried out using progesterone RIA kit (PROG-CTK - 4; DiaSorin, s.r.l. Saluggia (vc), Italy) employing solid phase Radioimmunoassay technique. The radio activity was measured in I^{125} gamma counter. All the collected data were analyzed statistically by the method described by Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

In the present study, injection of $PGF_{2\alpha}$ on day 10 after natural estrus resulted in 100 per cent estrus response. This was in agreement with the finding of Goley and Kadu (1995) in repeat breeder cows. The 100 per cent efficacy of $PGF_{2\alpha}$ treatment in inducing estrus in repeat breeder crossbred cows in this study might be due to the day of the cycle in which the drug was administered, higher sensitivity of the corpus luteum on day 10 of the cycle to $PGF_{2\alpha}$ treatment (Odde,1990) and good nutritional status of the cows selected.

In $PGF_{2\alpha}$ (PG-N) treated cows, the first service conception rate obtained was 43.75 per cent in this study. However, higher conception rate of 80.00 (Kumar *et al.,* 2000) per cent was reported in repeat breeder cows. On comparison between control and PG treated cows (PG-N), the conception rate obtained was higher in PG-N group (43.75 per cent) than in control (18.75 per cent) in this study. Goley and Kadu (1995) reported that the prostaglandins corrected the uterine milieu and increased the conception rate by preventing early embryonic mortality. Further, they stated that it checked mild endometritis by increasing the phagocytic activity by uterine leukocytes and stimulatory actions on smooth muscles of uterus. Moreover, double inseminations at induced estrus with good quality semen improved the pregnancy rates in other study (Kumar *et al.,* 2000). These factors might have contributed to achieve a higher conception rate in PG-N group than the control.

In PG-P group, the pregnancy rate obtained was 43.75 per cent which was lower than the conception rate (67.20 per cent) reported by Sandhu and Singh (1992) in crossbred normal cows. In this study, hCG injection at first AI resulted in the conception rate of 62.50 per cent in PG-O group.In the present investigation, injection of hCG at 4 days after AI resulted in 37.50 per cent conception in PG-E group. Almost similar percentage of conception was noticed in repeat breeder cows treated with 1000 IU of hCG on day 5 of the cycle (Walton *et al.,* 1990). However, very high conception rate of 92 per cent was reported in heifers treated with hCG on day 4 of the post breeding estrous cycles (Breuel *et al.,* 1989).

Considering all the groups, the higher conception rate in PG-O group in this study indicated that hCG

administration at the time of AI had more favorable effect on fertility rate when compared to other times in repeat breeder cows. Luteal dysfunction or inadequacy leading to inadequate progesterone production was reported to be a cause of repeat breeding cattle (Dhabale *et al.,* 2000). Administration of hCG promoted the differentiation of theca and granulosa cells into large and small lutein cells and a greater transformation of small to large luteal cells (Schmitt *et al.,* 1996) and hypertrophy of the corpus luteum due to increased blood flow to the developing CL and ultimately increased CL weight and higher progesterone production (Nephew *et al.,*1994). These findings, might explain the higher conception rate after hCG administration at AI in this study.

The overall mean level (ng/ml) of serum progesterone at the time of natural estrus, $PGF_{2\alpha}$ injection, induced estrus and at 2nd, 4th and 6th day following first AI in cows which became pregnant was 0.36±0.08, 7.19±0.46, 0.18±0.05, 1.05±0.20 and 3.37±0.77 and the corresponding values in non pregnant cows were 0.51±0.09, 5.24±0.43, 0.23±0.03, 0.57±0.15, 0.99±0.27 and 1.62±0.26 respectively. The higher concentration of progesterone observed on the day of estrus induction (day 10 of the previous cycle) in pregnant cows (7.19±0.46) compared to non pregnant cows (5.24±0.43 ng/ml) was in accordance with the finding of Breuel *et al.* (1989). In the present study, both natural estrus and induced estrus in pregnant cows showed marginally lower progesterone profile when compared to non-pregnant cows. Higher progesterone level at the time of estrus might affect sperm and ovum transport as well as the fertilization process and subsequent embryo passage to the uterus (Breuel *et al.,* 1989).

In the present investigation, from day 2 to 6 post AI, the concentration of progesterone was higher in pregnant cows than in non-pregnant cows. Further, the difference was statistically significant ($P<0.01$) on day 6 after AI. Many investigators studied the progesterone concentrations in pregnant and non-pergnant cows to determine whether these affected the fertility. Lukaszewska and Hansel (1980) found a higher plasma progesterone concentration in pregnant cows between day 10 and 18 than in non-pregnant females. Peters (1996) suggested that progesterone secretion could be a limiting factor to embryonic development during the first few days of pregnancy in bovines. The more rapid increase in progesterone level from day 2 to 6 post insemination in pregnant cows compared to non-pregnant cows in this study indicated a higher level of luteal activity which might have resulted in conception.

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