PATTERN OF INDUCED OESTRUS AND FERTILITY RATE FOLLOWING hCG INJECTION AT EARLY LUTEAL PHASE IN $PGF_{2\alpha}$ TREATED 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

A total of 48 repeat breeder cows were divided into three groups viz., group I, II and III. Cows in group I and II were treated with 0.98mg of Tiaprost ($PGF_{2\alpha}$) on day 10 following natural oestrus (day 0). Group III cows, served as control without any treatment. AI was done at 72 and 96 h following $PGF_{2\alpha}$ therapy in group I and II. Group III cows were artificially inseminated twice at 24 h interval during natural oestrus. Group II cows were injected with 1500 IU hCG on day four following first AI. There was cent per cent oestrus response in $PGF_{2\alpha}$ treated cows. The mean onset of oestrus was 59.38±0.81 and 59.63±0.74 h and the mean duration of induced oestrus was 28.50±0.56 and 27.50±0.70 h in group I and II, respectively. In control, the mean duration of oestrus was 29.38±0.77 h. The occurrences of very good and good oestrus intensities were 12.50 and 87.50 (group I) and 25.00 and 75.00 (group II and III) per cent. The first service conception rate obtained was 43.75, 37.50 and 18.75 per cent, in group I, II and III, respectively. It is concluded that administration of $PGF_{2\alpha}$ on day 10 following natural oestrus may improve the conception rate in repeat breeder cows and that injection of hCG on day four after fixed time AI is unnecessary.

Key words: *Induced oestrus and fertility rate, hCG injection, early luteal phase, repeat breeder cows.*

Control of oestrus using prostaglandin preparations ($PGF2_{\alpha}$) has been found to be effective in achieving good fertility in cycling cows (Xu *et al.,* 1997). Odde (1990) stated that $PGF_{2\alpha}$ treatment has been highly effective in regulating oestrous cycle by inducing complete luteolysis in dairy cows. However, such studies in repeat breeding crossbred cows are lacking. Further lowered conception rate with $PGF_{2\alpha}$ in some studies were related to reduced CL weight and subsequent lower serum progesterone content (Rentfrow *et al*., 1987). Time of administration of hCG (human chorionic gonadotropin) in relation to the occurrence of oestrus influenced the conception rate in cyclical cows (Hixon *et al.,* 1981). Hence, the present investigation was undertaken to study the fertility rate following administration of hCG at early luteal phase in $PGF_{2\alpha}$ treated repeat breeder cows.

Materials and Methods

A total of 48 healthy, parous crossbred cows which failed to conceive after three or more AIs were selected for this study. They were having regular oestrous cycle length of 18 to 24 days with clear genital mucous

** Part of Ph.D. thesis submitted by the first author to the Tamil Nadu Veterinary & Animal Sciences University, Chennai- 51*

1. Associate Professor and Head, Dept. of ARGO, VC & RI, Namakkal
2. Professor and Head
3. Director of Extension Education, TANUVAS, Chennai-5
4. Professor
5. Dean, VC & RI, Namakkal

discharge during every previous oestrus. They were free from gross palpable abnormalities and obvious infections of the genital tract. Out of 48 selected animals, 32 cows were treated with 0.98 mg of Tiaprost intramuscularly on day 10 following natural oestrus and were equally divided into two treatment groups *viz*., group I and group II. AI was done at 72 and 96 h after $PGF_{2\alpha}$ injection in these cows. Cows in group II were administered with 1500 IU hCG on day 4 following first AI. Sixteen repeat breeder cows without any treatment served as control (Group III) and were artificially inseminated twice at 24 h interval during natural oestrus. Oestrus response was calculated in percentage (number cows exhibited oestrus out of number of cows treated in group I and II). Onset of oestrus was recorded from the time of $PGF_{2\alpha}$ injection to the expression of oestrus signs. Duration of oestrus was estimated in hours in the experimental and control groups from the time of first appearance of oestrus sign to the detection of last oestrus sign. Intensity of natural and induced oestrus in control and treatment group was scored according to the method described by Rao and Rao (1981) with slight modifications. Based on the score card the intensity of oestrus was classified as very good (> 15 points), good (11 to 15 points), fair (6 to 10 points) and poor (< 5 points). Rectal examination was carried out in all the treated and control cows at 60 days after the AI to confirm pregnancy. First service conception rate was calculated in treatment groups (number of animals conceived at induced oestrus divided by number animals treated in each group) and was expressed in percentage. Similarly, in control group first service conception rate was calculated following AI at natural oestrus.

Results and Discussion

In the present study, injection of $PGF_{2\alpha}$ on day 10 after natural oestrus resulted in cent per cent oestrus response in both the treatment groups. This was in agreement with the findings of Zaayer and Van der Horst (1986) and Goley and Kadu (1995) in repeat breeder cows. Lower oestrus responses of 80 to 92 per cent to $PGF_{2\alpha}$ treatment in cows were reported in Rentfrow *et al*. (1987). However, Hixon *et al*.(1981) reported only 54 to 57 per cent oestrus response in cows treated with $PGF_{2\alpha}$ The cent per cent efficacy of $PGF_{2\alpha}$ treatment in inducing oestrus in repeat breeder crossbred cows in this study might be due to the day of the cycle in which the drug was administered (Odde, 1990), higher sensitivity of the corpus luteum on day 10 of the cycle to $PGF_{2\alpha}$ treatment (Berardinelli and Adair, 1989) and good nutritional status of the cows selected.

In this experiment, in group I and II the mean onset of oestrus was 59.38±0.81 and 59.63±0.74 h respectively. No significant difference was observed between two groups. Goley and Kadu (1995) recorded the mean onset of oestrus in repeat breeder cows treated with $PGF_{2\alpha}$ plus GnRH and PGF_2á plus hCG and the values were 63.71± 6.76 and 67.59±5.00 h, respectively. The mean onset of oestrus in repeat breeder cows found in this study was in concurrence with the observations of Jain and Dave (1992) and Cavalieri *et al.* (1997). Similar interval to onset of oestrus with double injection schedule of $PGF_{2\alpha}$ in cows was reported in a study by Jimenez *et al.* 1988. Longer interval (3.66 days) and shorter interval (32 h) between $PGF_{2\alpha}$ injection and onset of oestrus were recorded in cows by Jochle *et al.* (1982).

The mean duration of induced oestrus (28.50±0.56 and 27.50±0.70 h in group I and II, respectively) recorded in this study was in accordance with the findings of Selvaraju (1997) in anoestrus cows treated with norgestomet ear implants and in crossbred cows treated with $PGF_{2\alpha}$ (Jochle *et al.,* 1982). However, Goley and Kadu (1995) recorded an oestrus duration of 35.57±1.02 h in repeat breeder cows treated with $PGF_{2\alpha}$ which was higher than the duration obtained in this study. In control, the mean duration of oestrus was 29.38±0.77 h. More or less similar duration of oestrus in repeat breeder cow was reported by Gustafsson *et al.* (1986) and Goley and Kadu. (1995). It was concluded that oestrus induction with $PGF_{2\alpha}$ did not influence the duration of oestrus in repeat breeder crossbred cows.

In this study, the occurrences of very good and good oestrus intensities were 12.50 and 87.50 (group I) and 25.00 and 75.00 (group II and III) per cent respectively. None of the treated and control cows showed fair or poor oestrus intensity. Duchens *et al.* (1995) observed 40 each and 20 per cent of intense, intermediate and weak oestrus following $PGF_{2\alpha}$ injection in cows, respectively. However, Peters (1996) found 94.74 per cent good and 4.26 per cent poor intensity in crossbred cows treated with $PGF_{2\alpha}$. In repeat breeder cows, the

percentage of intense, medium and weak oestrus intensity recorded earlier was 64.28, 28.58 and 7.14 in $PGF_{2\alpha}$ induced oestrus (Goley and Kadu, 1995). Therefore, it was inferred that oestrus induction programmes may alleviate the problems of oestrus detection in repeat breeder crossbred cows as recommended by Goley and Kadu, (1995) and provide good opportunity for fixed time insemination.

In $PGF_{2\alpha}$ alone treated cows (Group I), the first service conception rate obtained was 43.75 per cent in this study. Almost similar conception rate was reported in repeat breeder cows by Stevenson *et al.* (1988). However, higher conception rates of 76.92 (Zaayer and Van der Horst, 1986) and 80.00 (Kumar *et al.,* 2000) per cent were reported in repeat breeder cows. On comparison between control and group I cows, the conception rate obtained was higher in group I (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 oestrus with good quality semen improved the pregnancy rates in many studies (Kumar *et al.,* 2000). These factors might have contributed to achieve a higher conception rate in group I cows than the control cows.

In the present investigation, injection of hCG at 4 days after AI resulted in 37.50 per cent conception in group II animals. Almost similar percentage of conception was noticed in other studies in oestrus synchronised cows treated with 1000 IU of hCG on day of 4 of the oestrous cycle (Holness *et al.,* 1982) and repeat breeder cows treated on day 5 of the cycle (Kumar *et al.,* 2000). However, very high conception rate of 92 per cent was reported in heifers treated with hCG on day 4 of the post breeding oestrous cycles (Peters, 1989). In this study, the conception rate (37.50 per cent) in post breeding hCG groups was marginally lower than the conception rate (47.75 per cent) obtained in group I without hCG supplementation. Day of administration of hCG at post breeding was critical and variations in follicular wave pattern between cows (Peters, 1989) might be the reason for marginal reduction in conception rate in early luteal hCG group.

It is concluded that the induction of oestrus with $PGF_{2\alpha}$ alone and breeding at fixed time might have helped in eliminating errors in oestrus detection and possibly in bringing more favourable hormonal and uterine milieu and might have resulted in increased conception rate in group I than in group II and control. From this study, it is clear that hCG administration on day 4 following AI after $PGF_{2\alpha}$ treatment is not necessary and hence it is concluded that $PGF_{2\alpha}$ treatment on day 10 following natural oestrus and fixed time double AI at induced oestrus may be followed to augment fertility in repeat breeder cows under field conditions.

References

Berardinelli, J.G. and Adair R. 1989. Efffect of Prostaglandin $F_{2\alpha}$ and stage of oestrous cycle on the oestrous response and corpus luteum function in beef heifers. *Theriogenology,* **32**:301-313.

Cavalieri, J., Rubio, I., Kinder, J.E., Entwistle, K.W and Fitzpatrick, L.A. 1997. Synchronisation of oestrus and ovulation and associated endocrine changes in *Bos indicus* cows. *Theriogenology,* **47**: 801-804.

Duchens, M., Maciel, M. Gustafsson, H., Forsberg, M., Rodriguez-Martinez, H. and Edquist, L.E. 1995. Influence of perioestrous suprabasal progesterone levels on cycle length, oestrous behaviour and ovulation in heifers. *Anim. Reprod. Sci.,* **37**: 95-108.

Goley, R.R. and M.S. Kadu. 1995. Efficacy of prostaglandin $F_{2\alpha}$ (Lutalyse) GnRH analogue (Receptal) and hCG (Chorulon) in treatment of repeat breeder cows. *Indian. Vet. J.,* **72**: 472-475.

Gustafsson, H., Larson, K., Kindahl, K. and Madej, A. 1986.Sequential endocrine changes and behaviour during oestrus and metoestrus in repeet breeder and virgin heifers. *Anim. Reprod. Sci.,* **10**:261-273.

Hixon, D.L., Kesler, D.J., Trroxel, T. R., Vincent, D.L. and Wiseman, B.S. 1981. Reproductive hormone secretions

and first service conception rate subsequent to ovulation control with synchromate B. *Theriogenology,* **16**: 219-229.

Holness, D.H., McCabe, C.T. and Sprowfon, G.W. 1982. Observations on the use of human Chorionic Gonadotrophin (hCG) during the post-insemination conception rates in synchronized beef cows wit sub-optimum reproductive performances. *Theriogenology,* **17**: 133-140.

Jain, A. and Dave, B.K. 1992. Effect of hormonal treatment on conception rate and biochemical constituents of cervico-vaginal fluids of anoestrus and repeat breeding crossbred cows. *National Symposium on recent advances in clinical reproduction in dairy cattle reproduction. Chennai*. pp. 16-17.

Jimenez, F. Galina, C.S., Duchateau, A. and Fierro, R.N. 1988. Levels of LH, progesterone and estradiol-17α during natural and $PGF_{2\alpha}$ induced estrus in Indobrazil and Brown Swiss cows in the tropics. *Anim. Reprod. Sci.,* **16**: 199-206.

Jochle, W., Kuzmano,D. and Vujosevic,J. 1982. Oestrus cycle synchroni-zation in dairy heifers with the prostaglandin analog alfaprostal. *Theriogenology,* **18**: 215-225.

Kumar, P., Roy, G.P., Singh, A.P., Prasad, K.M., Singh, R.B. and Akhahar, M.H. 2000. Fertility in repeat breeder crossbred cows. In: *ISSAR XVI Annual convention and national symposium on reproduction management for optimizing reproduction from livestock, BAU, Ranchi,* pp. 47

Odde, K.G., 1990. A review on synchronization of estrus in post partum cattle. *J. Anim. Sci.,* **68**: 817-830.

Peters, A.R. 1996.Embryo mortality in the cows. *Anim.Br.Abstr.,* **64**: 587-598.

Rao, S.V. and Rao, A.R. 1981. Oestrous behaviour and ovarian activity of crossbred heifers. *Indian Vet. J.,* **58**: 881-884.

Rentfrow, L.R., Randel, R.D. and Newendroff, D.A. 1987. Effect of estrus synchronization with synchromate-B on serum luteinizing hormone, progesterone and conception rate in Brahman heifers. *Theriogenology*, **28**: 355-362.

Selvaraju, S. 1997. Effect of GnRH and eCG on oestrous response and fertility in norgestomet primed post partum anoestrus cows. *M.V.Sc thesis*. Tamilnadu Veterinary Animal Sciences University, Chennai-51.

Stevenson, J.S., Schmidt, M.K. and Call, E.P. 1988. Stage of the oestrous cycle, time of insemination and seasonal effects on oestrus and fertility in Holstein heifers after prostaglandin $F_{2\alpha}$, *J. Dairy. Sci.,* **67**: 140-145.

Xu, Z.Z., Burton, L.J. and MacMillan, K.L. 1997.Reproductive performance of lactating dairy cows following estrus synchronization regimens with $PGF_{2\alpha}$ and progesterone. *Theriogenology,* **47:** 687-701.

Zaayer, D. and Van der Horst, C.J.G. 1986. Non-fertility in cows; Treatment with $PGF_{2\alpha}$ and investigation of uterine biopsy. *Cytobios.*, **45**: 55-70.

❑