

ESTRUS AND OVULATION INDUCTION OF POSTPARTUM LACTATING ONGOLE COWS WITH STEROIDS, GONADOTROPINS AND PROSTAGLANDIN

G. VENKATA NAIDU¹, A. SESHAGIRI RAO²,
K. VENUGOPAL NAIDU³ and K. BABU RAO⁴

Cattle Project, Live stock Research station LamFarm, GUNTUR-522 034 (A.P.), India

ABSTRACT

In the present study with a view to obviate prolonged calving interval, four estrus and ovulation induction hormonal protocols were initiated on day 45 postpartum with 20 postpartum lactating cows in each group. The cows in the treatment group 'A' (CIDR_{EB} ± PGF_{2α} + EB) exhibited 100 per cent response and ovulation with a better degree synchrony. The estrus duration was found to be significantly ($P < 0.05$) longer in treatment A and B (20.60 and 18.40 hours) than C, D and E (control) (15.24, 14.66 and 15.54) groups. The reproductive performance of A, B, C treatments were found to be superior over D and E (control) group. The mean interval from calving to fertile estrus (68.11, 73.44, 71.80, 76.71 vs 113.52 days) and the AI index (1.63, 1.84, 1.70, 1.83 vs 2.42) of the treatment groups was superior over control group. Shortened service period by 45.41, 40.08, 41.72 and 36.81 days with treatment A, B, C and D treatments over control group. It is concluded that treatment of PP lactating Ongole cows with hormonal agents including progesterone, EB, GnRH and PGF_{2α} reduced the service period and improved the reproductive performance.

Keywords: Estrus, Ovulation induction, Postpartum lactating Ongole (zebu) cows, Reproductive performance, EB, GnRH, and PGF_{2α}

INTRODUCTION

The reproductive impediments like long service period of 241 days, (Venkateswarlu, 1971), calving interval of 528-530 days (Acharya and Bhat, 1990), short estrus duration, (Valle *et al.*, 1994), onset and end of estrus at night (Pinheiro *et al.* 1998) are the limiting factors that prevent the use of Ongole cattle economically.

Programs involving progesterone, estradiol benzoate, GnRH and PGF_{2α} have been used to treat

postpartum lactating cows (Xu and Burton, 1997). Large-scale field trials have shown that inclusion of estradiol benzoate in Brahman cows with progesterone improved the estrus response and first service conception rates. The present experiment was designed to determine the effect of hormonal treatments in inducing estrus and ovulation response in postpartum lactating Ongole cows.

MATERIALS AND METHODS

Postpartum (211) parous (1 to 6) lactating Ongole (*Bos Indicus*) cows calved from March, 2001 to June, 2002 aged between 4-10 years and weighing between 350 to 500 kg were monitored and cows which did not exhibit estrus, by day 45 postpartum, free from palpable genital abnormalities were randomly selected for estrus and ovulation induction with four hormonal treatment regimens. The cows were maintained under standard feeding and management at Cattle Project, Live stock

This article is based on the Ph.D. work done by the first author

Corresponding author: ¹ Associate Professor & Head, NTR CVSc, Gannavaram ² Professor & Director of Research (Rtd), SVVU, Tirupati. ³ Professor, Dept. of Animal Reproduction & Gynaecology, College of Veterinary Science, Tirupati, AP ⁴ Principal Scientist (Animal Reproduction)

Research Station, Lam Farm, Guntur. (15° 00 and 16° 10 North latitude and 79° 04 and 80° 02 East Longitude), Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India.

Postpartum lactating Ongole cows in group A (n=20 cows) were treated by inserting a controlled intravaginal drug releasing device (CIDR) containing 1.9 g of progesterone along with 10 mg of estradiol benzoate (EB) capsule placed in the grooved surface of CIDR (Inter Ag, Hamilton, New Zealand), 25 mg of PGF_{2α} was injected (Lutalyse, Pharmacia and Upjohn) on day 7 and CIDR was removed and the cows were observed for a period of 6 days. At the observed estrus, one mg of Estradiol benzoate (CIDROL) was injected and AI was done. Similarly, cows in B group (n=20) were treated as that of group 'A' except for 10mg GnRH (Buserelin acetate) administration at the time of CIDR insertion, instead of EB capsule. In group C (n = 20) cows were injected 10mg of GnRH on day 45 (day 0 of the treatment). Seven days later, 25 mg of PGF_{2α} (Lutalyse) and again 10mg of GnRH on day 9 and AI was done at observed estrus. Cows in group D (n=20 cows) received 2 injections of 25 mg of PGF_{2α} (Lutalyse) 12 days apart and AI was performed at observed estrus. The remaining (131) untreated cows served as controls (Group E).

Blood sampling at the initiation of estrus and ovulation induction treatment (day 0) on day 5, 7 of the treatments on the day of estrus and day 25 following AI was done for A, B and C treatments. In case of D, before injection of first PGF_{2α} (day 0) and before injection of second PGF_{2α} (day 12), on the estrus day and on day 25 after AI. The blood (10ml) was collected and allowed to clot for 30 – 60 minutes at 15 to 20° C and serum was separated by centrifuging the clotted blood at 3000 rpm for 15 minutes. Serum was separated and stored at -20° C in plastic bullets until assay. Serum progesterone concentration was estimated using ELISA technique with the help of progesterone kit (Microwell™ progesterone EIA, lot 104296 A) Syntron Bio-research, Inc.

The estrus response rate, time interval of onset of estrus, conception rate and service period of different treatment groups was compared. One-way ANOVA using MTB statistical package (Snedecor and Cochran, 1989) statistical) was done.

RESULTS AND DISCUSSION

Estrus response: Detection of estrus over the first 6 days after the treatment (i.e. after CIDR removal) in case of A and B after PGF_{2α} injection in group C and second PGF_{2α} in group D) using a teaser. Cows in-group A and B exhibited 100 percent estrus followed by 80, 60 and 64.21 per cent in C, D and control groups respectively (table). The estrus response observed in Group A (CIDR_{EB Cap} + PGF_{2α} + EB) is in close agreement with the observations made by Bridges *et al.* and (1999), Lane *et al.* (2001). However the 100 percent estrus response observed in-group B (CIDR_{GnRH} + PGF_{2α} + EB) was higher than the previous reports of (100 vs 90.47, 95.70 and 92.10 percent) Ryan *et al.* (1999), Xu *et al.* (2000) and Lemaster *et al.* (1999). The 80 percent response observed in group C (GnRH + PGF_{2α} + GnRH) is in close agreement with the observations of Mialot *et al.* (1999), Pursley *et al.* (1995). The estrus response recorded in the present study is lower (60 vs. 92) than earlier findings of Pinheiro *et al.* (1998) in Nelore cows. Leblanc *et al.* (1997) reported higher estrus response in *Bos indicus* cows. The differences might be due to breed of cattle, lactational yield and location differences.

Onset of estrus: Significantly early onset of estrus in progesterone treated (group A & B) cows was observed than non-progesterone treated (group C and D) cows. The early onset of estrus in progesterone treated cows could be attributed to formation of ovulatory size follicles towards the end of the treatment. The delayed onset of estrus in group C and D when compared to group A and B might be due to delayed follicular wave emergence.

Estrus duration: In the present study, cows with CIDR_{EB Cap} + PGF_{2α} + EB (A) and CIDR_{GnRH} + PGF_{2α} + EB (B) have shown significantly (p<0.01) increased duration of estrus than GnRH + PGF_{2α} + GnRH (C) and

Double PGF_{2α} (D) 12 days apart. This might be due to higher concentration of estradiol in the circulation (Schams *et al.*, 1978).

Ovulation response: The ovulatory response (100 & 80) recorded in the present study in-group A and B is in close agreement with the findings of Xu *et al.* (2000). The 80 per cent ovulation rate observed in ovsynch (GnRh + PGF_{2α} + GnRH) treatment (C) is in close agreement with the ovulations of Barros *et al.* (2000) in Nelore cows. Estradiol benzoate used in treatment A and B groups might have induced an ovulatory LH surge.

Conception rate at induced estrus: The conception rate (50%) observed at induced estrus in treatment group A (CIDR_{EB Cap} + PGF_{2α} + EB) was lower than the observation made by Xu and Burton (1997), but higher than (80 vs 43.2%) the observations of Ryan *et al.* (1999). The 40 per cent conception rate recorded in-group B (CIDR + PGF_{2α} + EB) was lower (40 vs 43.9, 63.3%) than the observations of Ryan *et al.* (1999) and Xu *et al.* (2000). The 50 per cent conception in-group C (ovsynch) is similar (47.60, 53.30 and 50.00%) to the reports of Mialot *et al.* (1999) and Pursley *et al.* (1995). However, Fernandes *et al.* (2001) reported lower (40.0 and 35.3%) conception rate in Nelore cows. The 30 per cent conception at induced estrus with double PGF_{2α} is lower (30 vs 57, 38.8, 53.7 and 33.3%) than the reports of Mialot *et al.* (1999). The difference in conception rate might be due to the ovarian status of cows at which treatment was induced and the type of PGF_{2α} preparation used. The overall conception rate observed in treatment A, B, C, D and natural (control group) were 95, 95, 100, 60 and 90 per cent.

Progesterone concentration in treatment groups: Increased levels of serum progesterone (P4) concentration in CIDR inserted (A & B) cows and GnRH (C) injected cows was observed on day 5 and 7 of the treatment (Salfen *et al.*, 1999). The rise in serum P4 might be due to exogenous (CIDR), GnRH administration (luteinization of large follicles)

AI index and Service Period: The number of services required (AI Index) was significantly ($P < 0.05$) reduced with the treatment of postpartum cows at day 45 than the natural (control) group (table). Similarly, the service period was significantly ($P < 0.05$) shortened by 45.41, 40.08, 41.42 and 36.81 days in the responded cows.

ACKNOWLEDGEMENT

Authors thank the authorities of Acharya N.G. Ranga Agricultural University, AP., India for providing the necessary facilities and granting study leave to the first author for conducting the above trial.

REFERENCES

- Acharya and Bhat (1990). Productive and reproductive traits in Ongole cows. ICAR Bulletin.
- Barros C M Moreira M B P Figueiredo R A Teixeira A B and Trinca LA (2000). Synchronization of ovulation in beef cows (*Bos Indicus*) using GnRH, PGF_{2α} and Estradiol Benzoate. *Theriogenology* 53: 1121-1134.
- Bridges P J Lewis P E Wagner W R and Inskip E K (1999). Follicular growth, estrus and pregnancy after fixed time insemination in beef cows treated with intravaginal progesterone inserts and estradiol benzoate. *Theriogenology* 52: 573-583.
- Fernandez - Limia O Murphy B D and Manns J G 1977 Synchronization of preovulatory L H surges after PGF_{2α} in beef cattle. *Theriogenology* 7: 73-81.
- Lane E A Austin E J Roche J F and Crowe M A (2001). The effect of estradiol benzoate or a synthetic gonadotropin releasing hormone used at the start of a progesterone treatment on estrous response in cattle. *Theriogenology* 56: 79-90.
- Le Blanc S J Leslie K E Ceelen H J Kelton D F and Keefe G P (1997). Measures of estrus detection and pregnancy in dairy cows after administration of Gonadotropin releasing hormone within an estrus synchronization program based on prostaglandin F_{2α}. *Journal of Dairy Science* 81: 375 - 381.
- Lemaster J W Yelich J V Kempfer J R and Schrick F N 1999 Ovulation and estrus characteristics in cross bred Brahman heifers treated with an intravaginal progesterone releasing insert in combination with

- prostaglandin $F_{2\alpha}$ and estradiol benzoate. *Journal of Animal Science* 77:1860-1868
- Mialot J P Laumonier G Ponsart C Fauxpoint H Barassin F Ponter A A and Deletang F (1999). Postpartum subestrus in dairy cows; comparison of treatment with prostaglandin $F_{2\alpha}$ or GnRH + prostaglandin $F_{2\alpha}$ + GnRH. *Theriogenology* 52 : 901-911.
- Pinheiro O L Barros C M Figueiredo R A Dovalle E R Encarnacao R O and Padovani C R (1998). Estrus behaviour and estrus to ovulation interval in Nelore Cattle (*Bos indicus*) with natural estrus to Estrus induced with PGF_{2 α} or norgestomet and estradiol Valerate. *Theriogenology* 49 : 667-681.
- Pursley J R Mee M O and Wiltbank M C (1995). Synchronization of ovulation in dairy cows using PGF_{2 α} and GnRH. *Theriogenology* 44 : 915.
- Ryan DP Snijders S Aarts A and O'Farrell KJ (1999). Effect of estradiol subsequent to induced luteolysis on development of the ovulatory follicle and interval to estrus and ovulation. *Theriogenology* 43 : 310 (Abstracts).
- Salfen B E Cresswell J R Xu ZZ Bao B and Garverick H A (1999). Effects of the presence of a dominant follicle and exogenous estradiol on the duration of the luteal phase of the bovine estrous cycle. *Journal of reproduction and fertility*. 115: 15 – 21.
- Schams D F Hofer B Hoffman M E and Karg H (1978). Effects of synthetic L H – R H treatments on bovine ovarian function during estrous cycle and postpartum period. *Acta Endocrinologica Suppl.* 177: 273.
- Valle E R Encarnacao R O Schenk and Curro J B E (1994). Duracao do cio e momento de ovulacao em vacas Nelore. *Rev Soc Bras zotech* 23: 852 – 858.
- Venkateswarlu M (1971). Studies on genetic correlation and inheritance of economic characteristics of Ongole cattle, Thesis submitted to Agra University.
- Xu ZZ and Burton L J (1997) Reproductive performance of postpartum anestrous dairy cows treated with progesterone and estradiol benzoate. *New Zealand Veterinary Journal* 45 : 213-214.
- Xu Z Z, Burton L J, McDougall S and Jolly P D (2000). Treatment of non-cyclic lactating dairy cows with progesterone and estradiol or with progesterone, GnRH, prostaglandin $F_{2\alpha}$ and estradiol. *Journal of Dairy Science* 83(3): 464-470.

ISSAR AWARDS

BEST CHAPTER AWARD

- ☛ The best chapter award will be given to a chapter based on its performance during the period between two successive conventions. The award will be in the form of trophy and a certificate of merit
- ☛ Eight copies of application for the best chapter award in the prescribed format should be forwarded to General Secretary, ISSAR at least two weeks before the convention.

Application form may be obtained from General Secretary, ISSAR.