PROSTAGLANDIN $F_{2\alpha}$ ADMINISTRATION ON DAY 8 POSTPARTUM LEADS TO EARLY RESUMPTION OF OVARIAN CYCLIC ACTIVITY IN DAIRY CATTLE

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Received: 29.04.2017 Accepted: 25.05.2017

ABSTRACT

Dairy cattle assigned to four treatment groups were administered $PGF_{2\alpha}$ analogue (cloprostenol) on day 8 or day 25 postpartum (n=6 each), or antibiotic from day 1 to 5 postpartum (n=6), or kept as untreated control (n=5). The monitoring of uterine involution of previous gravid and non-gravid uterine horn, and first postpartum ovulatory follicle (OF) and subsequent corpus luteum (CL) was performed by transrectal ultrasound scanning at weekly interval. The appearance of OF and subsequent CL was early (16.17±2.81 and 23.16±2.81 d, respectively; $p<0.05$) in dairy cattle administered $PGF_{2\alpha}$ on day 8 postpartum as compared to other groups. In brief, $PGF_{2\alpha}$ administration on day 8 postpartum can lead to early resumption of ovarian cyclic activity in dairy cattle.

Keywords: Dairy cattle, Ovarian cyclicity, $PGF_{2\alpha}$, Ultrasonography, Uterine involution

INTRODUCTION

Reproductive performance in dairy cattle is a key factor affecting profitability of the dairy industry (Galvao *et al.,* 2013). Elevated circulating estrogen during early postpartum period helps in eliminating bacteria from uterus, timely uterine involution and resumption of ovarian cyclic activity (Lewis, 2004). In fact, the managemental practices that hasten uterine involution during the early postpartum period and lead to early resumption of ovarian cyclic activity within day 60 postpartum are expected to improve reproductive performance in dairy cattle (Cerri *et al.,* 2004). Postpartum administration of Prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) enhances uterine contractility and lochial clearing from the uterus, thus, accelerating the process of uterine involution. Antibiotic administration helps in improving the uterine defense and uterine clearance mechanism, decreasing persistent infections and consequently reducing persistent inflammation in the postpartum uterus (McDougall, 2001). Therefore, the present study aimed to find the effectiveness of $PGF_{2\alpha}$ or antibiotic administration during early postpartum period on uterine involution and resumption of ovarian activity in dairy cattle.

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MATERIALS AND METHODS

The present study was carried out on 23 postparturient dairy cattle (Jersey and Jersey crossbred). Body condition score (BCS) of all the animals was recorded at the time of calving using five point scale of scoring (Edmonson *et al.* 1989). The animals were divided into three treatments and a control group. Two treatment groups were administered (i.m.) 500µg $PGF_{2\alpha}$ analogue (Cloprostenol) either on d8 (PG8) or d25 (PG25) postpartum. The cattle of third group were administered (i.m.) antibiotic (Ciprofloxacin, 4mg/kg body wt.) for first 5 days after calving. The fourth group served as untreated control. Transrectal ultrasonography was performed using linear transducer of frequency 7.5 MHz (Sonosite M turbo; Sonosite India Pvt. Ltd.) on a weekly interval basis between day 8 to 43 postpartum. Uterine involution was considered complete when both gravid and non-gravid horns were nearly in symmetrical measure and no further change took place between two consecutive examinations in diameter of horns or cervix (Abdel-Khalek *et al.,* 2013).

Table 1: Prostaglandin ($PGF_{2\alpha}$) or antibiotic administration during early postpartum period in dairy cattle followed by resumption of ovarian cyclicity on the basis of first appearance of ovulatory follicle (OF) and corpus luteum (CL)

Groups	BCS at calving	Duration of involution, d	First OF (>10 mm), d	First CL, d
PG8, n=6	2.74±0.09	25.50±1.56	16.17±2.81[a]	23.16±2.81[a]
PG25, n=6	2.53±0.08	27.83±2.15	27.83±1.17[b]	34.83±1.17[b]
Antibiotic, n=6	2.69±0.10	29.00±2.56	26.67±2.33[b]	33.67±2.33[b]
Control, n=5	2.66±0.12	30.40±2.62	26.2±2.80[b]	33.20±2.80[b]

[a,b]p<0.05, Values with different superscripts within a same column differ significantly; BCS - Body Condition Score

The data was statistically analyzed using one-way ANOVA with SAS® 9.2 TS level version 2M2 software for windows.

RESULTS AND DISCUSSION

The dairy cattle of present study had similar (p<0.05) BCS between different treatment and control groups (Table 1). Nevertheless, the ultrasonographic evaluation of genitalia of dairy cattle in the present study revealed that the time required for uterine involution was numerically shorter (p>0.05) in PG8 group (25.50±1.56 d), compared to PG25, antibiotic and control groups, (27.83±2.15, 29.00±2.56 and 30.40±2.62 d postpartum, respectively; Table 1). Others also reported a rapid uterine involution (19.40±0.46 d postpartum) in cattle administered $PGF_{2\alpha}$ during early postpartum period (Sharawy *et al.,* 2015). An association exists between $PGF_{2\alpha}$ administration in the early postpartum period and the acceleration of uterine involution (Melendez *et al.,* 2004). Inadequate production of endogenous prostaglandin was associated with delay in uterine involution postpartum (Kindahl *et al.*, 1982). Low endogenous $PGF_{2\alpha}$ production during first 14 days postpartum increases the susceptibility of dairy cattle to uterine infection; thus, the treatment with exogenous $PGF_{2\alpha}$ is an effective preventive measure to reduce postpartum infection (Seals *et al.,* 2002). Moreover, $PGF_{2\alpha}$ helps in expulsion of unwanted uterine contents and resumes first postpartum estrus in cattle (Deori and Phookan, 2015). On contrary, in some other studies, $PGF_{2\alpha}$ treatment in early postpartum period had no beneficial impact on the time to gross uterine involution compared to untreated control (Hendricks *et al.,* 2006).

Ovarian cyclic activity initiation was assessed on the basis of the presence of first postpartum ovulatory follicle (OF, >10 mm diameter) and followed by corpus luteum (CL) formation. In our study, the appearance of an OF and subsequent CL formation was different (p<0.05) between PG8 and other groups (Table 1). The mean time required for the appearance of OF was 16.17±2.81 days postpartum in PG8 group, while in PG25, antibiotic and control groups, this duration was 27.83±1.17, 26.67±2.33 and 26.20±2.80 days postpartum, respectively (Table 2). In another report, postpartum ovulation was reported at 21.20±9.60 d postpartum in cattle, whereas first dominant follicle was evident at 8.3±3.7 d postpartum (Kamimura *et al.,* 1993).

The main objective of antibiotic administration was to eliminate the pathogens from the uterus, the induction of the uterine immune system, elimination of the adverse effects of inflammation products on fertility and improvement in future reproductive performance (Azawi, 2008). However, in this study, antibiotic administration had no impact on resumption of ovarian cyclic activity (p>0.05, Table 1).

In summary, the administration of $PGF_{2\alpha}$ on day 8 postpartum shortened the time required for resumption of ovarian cyclic activity.

REFERENCES

Abdel-Khalek, A.E., El-Harairy, M.A., Mehrez, A.F. and Fouad, W.F.M. (2013). Uterine involution and reproductive performance of lactating friesian cows treated with oxytocin and prostaglandin ($PGF_{2\alpha}$) at calving. *J. Anim. Poultry Prod.,* **4**(6): 349-362.

Azawi, O.I. (2008). Postpartum uterine infection in cattle. *Anim. Reprod. Sci.,* **105**: 187-208.

Cerri, R.L.A., Santos, J.E.P., Juchem. S.O., Galvao, K.N. and Chebel, R.C. (2004). Timed artificial insemination with estradiol cypionate or insemination at estrus in high-producing dairy cows. *J. Dairy Sci.,* **87**(11): 3704-3715.

Deori, S. and Phookan, A. (2015). Bovine Postpartum Metritis and its Therapeutics: A Review*. Indian J. Sci. Tech.,* **8**(23): 1-5.

Edmonson, A.J., Lean, I.J., Weaver, L.D., Farver, T. and Webster, G. (1989). A body condition scoring chart of Holstein dairy cows. *J. Dairy Sci.,* **72**(1): 68-78.

Galvao, K.N., Federico, P., De Vries, A. and Schuenemann, G.M. (2013). Economic comparison of reproductive programs for dairy herds using estrus detection, timed artificial insemination, or a combination. *J. Dairy Sci.,* **96**: 2681-2693.

Hendricks, K.E.M., Bartolome, J.A., Melendez, P., Risco, C. and Archbald, L.F. (2006). Effect of repeated administration of $PGF_{2\alpha}$ in the early postpartum period on the prevalence of clinical endometritis and probability of pregnancy at first insemination in lactating dairy cows. *Theriogenology,* **65**(8): 1454-1464.

Kamimura, S., Ohgi, T., Takahashi, M. and Tsukamoto, T. (1993). Postpartum resumption of ovarian activity and utrerine involution monitored by ultrasonography in Holstein cows. *J. Vet. Med. Sci.,* **55**(4): 643-664.

Kindahl, H., Edqvist, L.E., Larsson, K. and Malmquist, A. (1982). Influence of prostaglandin on ovarian function postpartum. In: *Current Topics in Veterinary Medicine and Animal Science,* **20**. Krag, H., Schallenberger, E. (eds). Martinus Nijhoff, Publishers, The Hague. *pp*. 173-196.

Lewis, G.S. (2004). Steroidal regulation of uterine immune defences. *Anim. Reprod. Sci.,* **82**: 281-294.

McDougall, S. (2001). Effect of intrauterine antibiotic treatment on reproductive performance of dairy cows following periparturient disease. *NZ Vet. J.,* **49**: 150-158.

Melendez, P., McHale, J., Bartolome, J., Archbald, L.F. and Donovan, G.A. (2004). Uterine involution and fertility of Holstein cows subsequent to early postpartum $PGF_{2\alpha}$ treatment for acute puerperal metritis. *J. Dairy Sci.,* **87**(10): 3238–3246.

Seals, R., Matamoros, I. and Lewis, G. (2002). Relationship between postpartum changes in 13, 14-dihydro-15-keto-$PGF_{2\alpha}$ concentrations in Holstein cows and their susceptibility to endometritis. *J. Anim. Sci.,* **80**: 1068-1073.

Sharawy, S., Saleh, N., Ghanem, M., and Hassan, S. (2015). Effect of different treatments at early postpartum period on uterine involution and subsequent reproductive performance in dairy cows. *Global Anim. Sci. J.,* **3**: 155-161.