

Investigating Post-partum Ovarian Cyclicity Following Various Treatments in Dairy Cows

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Abstract. The present study envisages the effect of $\text{PGF}_{2\alpha}$ and antibiotic treatment on ovarian cyclic activity and regression of corpus luteum verum in post-partum dairy cows. Cows were divided into three treatment (PG8, PG25, antibiotic) and a control group. Ovarian activity was studied by examining follicular dynamics upto 42 days post-partum in which diameter of dominant follicle before first ovulation, the number of days to first ovulation and complete regression of corpus luteum verum were evaluated. Body condition score was recorded for all the cows in different groups. Also, ovulation on ovary ipsilateral or contralateral to previous gravid uterine horn was noted. On transrectal ultrasonography at a 3-day interval, dominant follicle diameter prior to ovulation was significantly higher ($p < 0.01$) in PG8 group. The mean time required for complete regression of CL verum was not significantly ($p > 0.05$) lower in PG8 group i.e. 24.33 ± 1.48 days in comparison to PG25, antibiotic and control group (26.67 ± 1.48 , 29.00 ± 1.81 and 27.60 ± 1.40 days post-partum, respectively). A subsequent ovarian activity was affected as 70.83 and 66.33% Ist and IInd ovulations occurred on the ovary contralateral to corpus luteum verum. In conclusion, contralateral ovary was more active in terms of ovulation whereas presence of corpus luteum verum had no effect on post-partum ovarian cyclic activity.

Keywords: body condition score, corpus luteum verum, dairy cows, $\text{PGF}_{2\alpha}$, ovarian cyclicity, ultrasonography.

Introduction

Ovarian activity plays an irreplaceable role in the chain of events leading to pregnancy and delivery. Each cow needs to calve regularly in order to maximize the economic output of milk production. Post-partum ovarian cyclic activity is beneficial for reproductive health and successive fertility (Sharma *et al.*, 2018). Emergence of the first follicular wave and selection of the dominant follicle (DF), which can ovulate or develop into a cyst or non-ovulatory follicle is the crucial event in post-partum ovarian cyclic activity (Rajmonet *et al.*, 2012). Therefore, management practices which help in early resumption of ovarian cyclic activity should be followed to improve further reproductive performance (Cerri *et al.*, 2004). Administration of $\text{PGF}_{2\alpha}$ after parturition enhances uterine contractility and lochial clearing from the uterus which helps in clearance of uterine infection and timely resumption of ovarian cyclic activity (Nanda, Brar, & Prabhakar, 2003). In improving the uterine defense and uterine clearance mechanism

and consequently reducing persistent inflammation, antibiotic administration is required (McDougall, 2001). Therefore, the present study was conducted to investigate the effect of $\text{PGF}_{2\alpha}$ and antibiotic treatment on ovarian cyclic activity and regression of corpus luteum verum in post-partum dairy cows.

Materials and Methods

Twenty Jersey crossbred post-partum dairy cows (Parity 2-5) of Livestock farm, CSKHVKV, Palampur were enrolled for study. Cows were divided into three treatment and a control group. The first two treatment groups were administered 500 mcg $\text{PGF}_{2\alpha}$ analogue (Cloprostenol; Zydus Animal Health Ltd.) intramuscularly either on day 8 (PG8) or 25 (PG25) postpartum. In the third group, cows were administered antibiotic Ciprofloxacin@ 4mgkg⁻¹ body wt. intramuscularly for first 5 days after calving (C-Flox Power; Intas Pharmaceuticals Ltd.). The fourth group served as an untreated control.

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Transrectal ultrasonography was done immediately after parturition using linear transducer of frequency 7.5 MHz (Sonosite M turbo; Sonosite India Pvt. Ltd.) on a 3-day interval upto day 42 postpartum to assess the size of dominant follicle, subsequent ovulation on contralateral and ipsilateral ovary was recorded. Day of complete regression of corpus luteum verum was also noted. Body condition score (BCS) of the cows was recorded at the time of calving using five point scale of scoring (Edmonson *et al.*, 1989). The data was statistically analyzed using one-way ANOVA with SAS (Statistical Analysis Software), SAS® 9.2 TS Level version 2M2 for windows.

Results and Discussion

The mean size of ovulatory dominant follicle (Figure 1), first post-partum ovulation (Figure 2) and regression of corpus luteum verum (Figure 3-6)

and BCS have been shown in Table 1. However, the relationship of side of CL verum, subsequent ovarian cyclic activity and body condition score (BCS) at calving in post-partum dairy cows have been shown in Table 2.

Mean follicular diameter for cows administered PGF_{2α} on day 8 after parturition was significantly higher ($P<0.01$) as compared to other groups. The first ovulation post-partum is silent and followed by a short cycle. Mean time taken for the first ovulation was significantly earlier ($P<0.01$) in PG8 group as compared to other groups in our study. Post-partum ovulation has been reported at 21.20 ± 9.60 days post-partum in cows whereas first dominant follicle was evident at 8.3 ± 3.7 day post-partum (Kamimura *et al.*, 1993). Sharma *et al.* (2018) also found a positive effect on resumption of ovarian cyclicity following administration of PGF_{2α}.

Table 1
Size of ovulatory dominant follicle (mm) and regression of corpus luteum verum (days)
following different treatments after parturition in dairy cows (Mean \pm S.D.)

Treatment (n=5)	Ovulatory dominant follicle size (mm)	First post-partum ovulation (d)	Complete regression of CL verum (d)	BCS at calving
PG 8	12.86 \pm 0.39 ^a	17.16 \pm 1.22 ^a	24.33 \pm 1.48	2.62 \pm 0.07
PG 25	10.13 \pm 0.27 ^b	28.83 \pm 1.16 ^b	26.67 \pm 1.48	2.58 \pm 0.09
Antibiotic	9.67 \pm 0.26 ^b	27.67 \pm 1.12 ^b	29.00 \pm 1.81	2.56 \pm 0.14
Control	9.75 \pm 0.40 ^b	27.20 \pm 1.58 ^b	27.60 \pm 1.40	2.63 \pm 0.12

^{a,b} Values with different superscripts within the same column differ significantly ($P<0.01$).

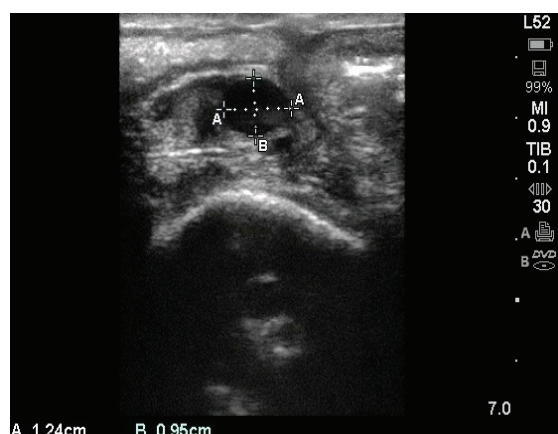


Figure 1. Ultrasound image of a dominant follicle which appears black and is considered as ovulatory (12.4 \times 9.5 mm).



Figure 2. Ultrasound image of first corpus luteum (12.6 \times 11.2 mm) which appears greyish (hyperechoic).

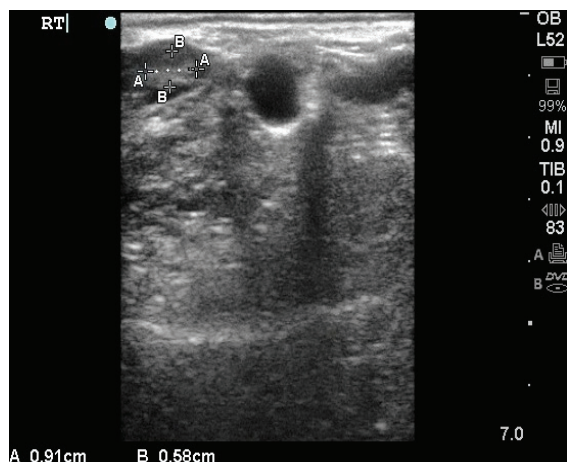


Figure 3. A and B showing presence of CL verum (approx. 7.4 mm) on day 8 post-partum.

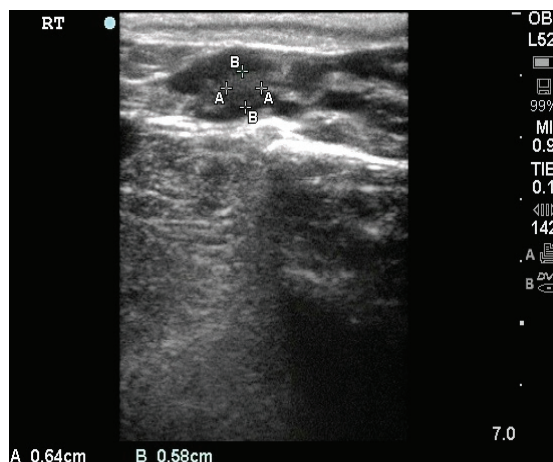


Figure 4. Decrease in size of CL verum on day 15 post-partum (approx. 6.1 mm).

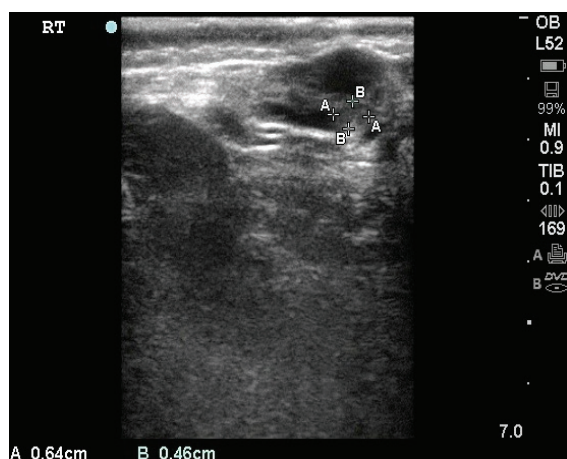


Figure 5. More decrease in size of CL verum is evident on day 22 post-partum (approx. 5.5 mm).

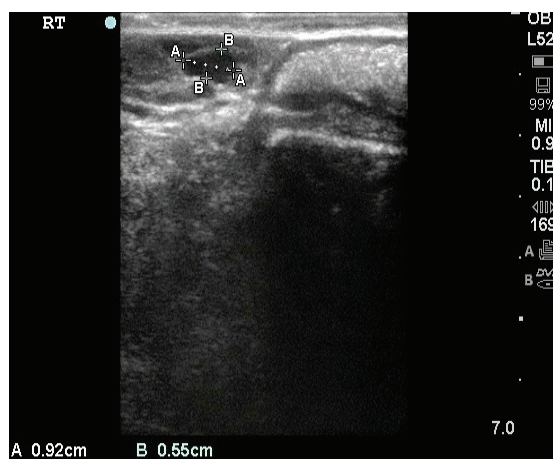


Figure 6. Complete regression of CL verum and presence of emerging follicle on day 29 post-partum

Table 2

Relationship of side of CL verum and subsequent ovarian cyclic activity in post-partum dairy cows

Number of ovulations post-partum		1st ovulation		2nd ovulation	
Side of ovary		Contralateral	Ipsilateral	Contralateral	Ipsilateral
Treatment Groups (n=5)	PG 8	4	2	3	3
	PG 25	5	1	4	2
	Antibiotic	4	2	5	1
	Control	4	2	4	2
Total		17 70.83%	7 29.17%	16 66.33%	8 33.67%

Complete regression of CL verum was not having significant difference between the treatment and control group (Table 1). Labhsetwar *et al.* (1964) revealed that CL verum was mainly a structural entity with no progesterone being secreted by it either on the day of parturition or at day 21 post-partum. Also, Patel *et al.* (2005) reported that even if CL verum persists for about 2 weeks post-partum, it does not prevent follicular development. Body condition score (BCS) recorded at the time of calving by the visual technique on 1-5 point scale of all the cows included in the study and it was not significantly different ($P>0.05$) in all the cows under different groups i.e. PG8, PG25, the antibiotic and control group.

In majority of the cows, the first (70.83%) and second (66.33%) ovulation occurred on the contralateral ovary to the previous gravid uterine horn. In concurrence to our findings, Kamimura *et al.* (1993) stated that there is a great predilection for folliculogenesis on the contralateral ovary in the first four weeks after parturition. Similarly, Usmani *et al.* (1992) reported that this may be due to less selection of dominant follicles on the ipsilateral ovary. Sheldon *et al.* (2003) also confirmed that previous gravid uterine horn could suppress the localized function of ovarian function of ipsilateral ovary. Thus, timely uterine involution and elimination of bacterial contamination can facilitate the ovarian function on the ipsilateral ovary.

Conclusions

1. Ovulation from a larger dominant follicle occurred in cows after administration of PGF_{2α} on day 8 after parturition, whereas BCS was found to be non-significantly higher in control group.
2. Presence of regressing corpus luteum verum had no effect on follicular dynamics in post-partum dairy cows.
3. Post-partum ovarian activity/ ovulation occurred mostly on contralateral ovary to the previous gravid uterine horn.

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