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Subluteal dose of natural prostaglandin $F_2\alpha$ (Lutalyse) administration during artificial insemination improves conception rate in buffaloes

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Abstract
The study was conducted in postpartum buffaloes which were brought for artificial insemination unit during natural estrum. A total of 50 calved buffaloes were used in this study. 500 µg of natural prostaglandin $F_2\alpha$ (subluteal dose) was injected through ear vein at the time of artificial insemination (AI). The control animals were inseminated without any treatment. Transrectal ultrasonographic study of the ovary was done to study follicular status before inseminating the buffaloes. Ovulatory response in treatment and control groups were monitored by ultrasonography on day 10 post AI. The pregnancy was confirmed 30 days after insemination in both the groups by ultrasonographic examination. Follicular size at the time of the AI was similar (12.62 ± 0. 27 mm and 12.47 ± 0.07 mm) between experimental and control groups and the time of ovulation between experimental and control group was 17.04 ± 0.20 and 22.78 ± 0.46 hrs, respectively. Conception rate was 52.50% in experimental and 40.00% in control groups.

Keywords: Prostaglandin $F_2\alpha$, sub luteal dose, Transrectal, ovulation, Luteolysis

Introduction
Low pregnancy rate is widely recognized as one of the major problem facing the dairy industry, Lucy MC (2001) [4] and Waish *et al.,* 2011) [12]. The luteolytic effects of prostaglandin F2α (PGF2α) and its analogues during the dioestrus period of the oestrous cycle are well documented, and PGF2α has been used widely in the synchronisation protocol Chenault *et al.,* (2014) [2]. Prostaglandins are 20 carbon atom molecules which are involved in LH-induced progesterone synthesis and have a role in luteolysis. Further various research works in animals indicated that they may be closely linked with ovulation itself. Recommended luteolytic dose of 500 microgram of synthetic analog PGF2α, given at AI, increased conception rate by 15.2% in cattle, Gallo *et al.,* (1992) [3]. Furthermore, iv administration of 500microgram cloproestenol at AI increased pregnancy rate. Inhibition of prostaglandin synthesis by the systemic or local administration of indomethacin or aspirin has been shown to block ovulation in the rabbit and the rat Tsafriri *et al.,* (1972) [11] and Armstrong *et al.,* (1972) [1]. Since this block could not be overcome by LH, but could be reversed by administration of exogenous prostaglandins, the prostaglandin involvement appeared to be at the ovarian level. Prostaglandins of the F (PGF) and E (PGE) series both increased in ovulated follicles, but not in follicles which failed to ovulate. With the above background information, the present study was conducted with the objective of identifying the role of subluteal dose of prostaglandin $F_2\alpha$ ($PGF_2\alpha$) through ear vein at AI on the day of estrus increases conception rate in buffaloes.

Material and Methods
The study was conducted in the post partum buffaloes which are brought to the artificial insemination unit of Veterinary Clinical Complex (VCC), Namakkal. Tamil Nadu. A total of 50 buffaloes were used for this study. In treatment groups (40 buffaloes) 500 µg of prostaglandin $F_2\alpha$ (subluteal dose) was injected through ear vein at the time of artificial insemination (AI). The control animals (10 cows) were inseminated at oestrum without any treatment. Transrectal ultrasonographic study of the ovary was done to study follicular status before inseminating the buffaloes. Ovulatory response in treatment and control were monitored ultasonographically on day 10 post AI. The pregnancy was confirmed 30 days after insemination in both the groups. The collected data was analyzed statistically, Snedecor, G.W. and Cochran, W.G (1994) [8].

Results and Discussion

In this study the size of the follicle, time of ovulation, size of corpus luteum and conception rate are presented in Table 1.

Size of the follicle

The mean±SE dominant follicle size at the time of artificial insemination was 12.62 ± 0.27 and 12.47 ± 0.07 mm in the pregnant buffaloes and 12.21 ± 0.66 and 11.62 ± 0.12 mm in the non-pregnant buffaloes of experimental and control groups, respectively. In general, the size of the dominant follicle at the time of artificial insemination was larger in pregnant buffaloes than the non pregnant animals. There was no significant (P≥0.05) difference was observed between these groups and also between pregnant and non-pregnant buffaloes in the follicular size at the time of insemination. The result of the present study was concurred with the results of Tasdemir, *et al.* (2011) [9] and Pfeifer *et al.,* (2012) [6]. Ovulatory follicle size of 12.80±1.60 and 13.20±1.80 mm in two different groups of cows Tasdemir, *et al.,* (2011) [9]. Whereas the follicular size of 13.00±1.80 mm in cows was reported Rantala et al., (2009) [7]. Cattle with ovulatory follicular size of 13-15 mm had higher pregnancy rate than other categories of follicle, Pfeifer *et al.,* (2012) [6].

Time of ovulation

The mean±SE time interval between subluteal $PGF_2\alpha$ injection (and insemination) and ovulation was 17.04±0.20 and 18.50 ±0.64 hrs in the pregnant and non-pregnant cows of experimental group and the interval between insemination and ovulation was 22.78±0.46 and 24.66 ±0.49 hours in the pregnant and non-pregnant cows of control group. There was a significant (*P*≤ 0.05) difference was observed between experimental and control group in the ovulation time in both pregnant and non-pregnant cows. During the pre-ovulatory period there was an increase in the follicular prostaglandin level and it could increase up to 60 fold as the ovulation approaches, William *et al.,* (1973) [13]. As the prostaglandin level increases the cascade of proteolytic enzymes including plasminogen activator, plasmin and matrix mettallo proteinases which bring about degradation of follicular matrix and decomposition of the meshwork of collagen fibers of follicular wall Tsafriri, *et al.,* (1995) [10]. Along with these, the follicular wall contraction caused by prostaglandins led to ovulation, Chenault *et al.,* (1993) [2]. In the present study it was observed that ovulation occurred earlier in the experimental group than the control group which clearly indicates that the prostaglandin has a definite role in the process of ovulation, Neglia *et al.,* (2008) [5].

Size of corpus luteum

The mean±SE diameter of the corpus luteum after 10 days of artificial insemination was studied using ultrasonography in both the groups. The size of the corpus luteum was 22.40±0.28 and 22.23±0.43 in the pregnant and 19.45±0.27 and 19.49±0.50 in the non-pregnant animals of experimental and control group, respectively. Even though the size of the corpus luteum size had showed no significant (P≥0.05) difference between the two groups and also between pregnant and non-pregnant buffaloes, the overall size was slightly larger in the pregnant buffaloes than the non-pregnant buffaloes, Neglia *et al.,* (2008) [5].

Conception rate

The overall conception rate was higher in the experimental (52.50 per cent) group than the control (40 per cent) group which showed highly significant difference between the two groups, Neglia *et al.,* (2008) [5]. The luteal progesterone after artificial insemination was essential for the appropriate establishment and maintenance of pregnancy and the size of the follicle determines the size of the corpus luteum but at the same time larger the size of the ovulatory follicle (above 15 mm) led to reduced pregnancy rate, Pfeifer *et al.,* (2012) [6].

Table 1: Mean (±SE) follicular size, ovulation time, size of corpus luteum and conception rate in the experimental and control buffaloes

S. No	Parameters		Experimental group (n=40)	Control group (n=10)
1.	Size of the follicle (mm)	Pregnant	12.62± 0.27	12.47±0.07
		Non pregnant	12.21±0.66	11.62±0.12
2.	Ovulation time (hrs)	Pregnant	17.04±0.20^a	22.78±0.64^a
		Non pregnant	18.50±0.46^b	24.66±0.49^b
3.	Size of corpus luteum (mm)	Pregnant	22.40±0.28	22.23±0.43
		Non pregnant	19.45±0.27	19.49±0.47
4.	Conception rate (%)		52.50^a	40.00^a

Conclusions

In conclusion, the results of the present study seem to confirm the beneficial effect of subluteal dose of natural $PGF_2\alpha$ injection on the day of AI at estrus in buffaloes. In this research we conclude that higher pregnancy rate obtained in experimental group might be due to the optimum size of the ovulatory follicle, earlier ovulation, size of CL and more viable spermatozoa at the time of ovulation.

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