

EFFICACY OF COMMERCIALY AVAILABLE LUTEOLYTIC AGENTS IN HOLSTEIN-FRIESIAN COWS

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ABSTRACT

Peripheral plasma progesterone concentrations and time interval from treatment to oestrus in 12 Holstein-Friesian cows after treatment with three luteolytic agents (Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol) at day-10 of the oestrus cycle were studied. The plasma progesterone concentrations at the time of treatment were 7.33 ± 0.75 , 7.77 ± 0.85 , 7.97 ± 0.32 and 8.07 ± 0.27 ng/ml in Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol treated and untreated control cows, respectively, the difference was non-significant. In the morning of day-11 of the oestrus cycle, significantly ($P < 0.05$) lower plasma progesterone concentrations were recorded in the Dinoprost Tromethamine and Cloprostenol Sodium treated cows as compared to control cows but the difference of dextro-rotatory D-Cloprostenol treated cows with that of control cows was non-significant. On the other hand, all the treated groups showed significantly ($P < 0.05$) lower plasma progesterone concentrations as compared to that of control cows starting from the evening of day-11 till the morning of day-13 of the oestrus cycle. The plasma progesterone concentrations decreased to 0.80 ± 0.10 , 0.85 ± 0.05 and 0.70 ± 0.10 ng/ml at the onset of oestrus in Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol treated cows within 68.00 ± 4.00 , 64.00 ± 8.00 and 88.00 ± 8.00 hours after the treatment, respectively.

Key words: Luteolytic agents, cows, progesterone concentrations.

INTRODUCTION

Prostaglandins are highly modified 20-carbon fatty acids, produced by many tissues and have a multitude of forms and functions. Prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) is of primary concern to reproduction, as it plays a major role in luteolysis, ovulation, parturition and gamete transport both in the male and the female (Carruthers, 1986).

The efficacy of $PGF_{2\alpha}$ to induce luteolysis has been extensively exploited as a tool for manipulating the oestrus cycle of domestic animals. The administration of exogenous $PGF_{2\alpha}$ (or its synthetic analogues) during dioestrus results in luteolysis, followed by the normal sequence of endocrinological and physiological events that precede oestrus. It has been observed that there is no adverse effect on the fertility of a cow following a prostaglandin-shortened dioestrus (Wenkoff, 1986).

At present there are different natural or synthetic prostaglandins available in the market, e.g., Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol. Dinoprost Tromethamine is a natural prostaglandin, while Cloprostenol Sodium and

dextro-rotatory D-Cloprostenol are synthetic analogues of prostaglandin structurally related to $PGF_{2\alpha}$.

The information regarding their comparative efficacy as luteolytic agents in Holstein-Friesian cows kept under Pakistani conditions is lacking. The present study was, therefore, designed to compare the efficacy of commercially available luteolytic agents in Holstein-Friesian cows kept at the Livestock Experiment Station, Bhunikey (Pattoki), Distt. Kasur.

MATERIALS AND METHODS

Experimental animals

Twelve healthy and normal cycling Holstein-Friesian cows (*Bos taurus*) of approximately the same age groups were randomly selected from the herd maintained at Livestock Experiment Station, Bhunikey (Pattoki), Distt. Kasur (Pakistan). The cows were randomly divided into four groups A, B, C and D with three animals in each group. Feeding pattern and milking time were same for all the animals. The experimental animals were housed in a separate barn till the end of the experiment. The cows were observed twice daily (morning and evening) for oestrus. The day of oestrus was considered as day-1. Rectal palpation

was made to confirm the oestrus. The cows were not bred at this oestrus. The cows in each of the three treatment groups were injected with respective drug at day-10 of the oestrus cycle (Stevens *et al.*, 1993). Animals of groups A, B and C were given intramuscularly Dinoprost Tromethamine (5 ml), Cloprostenol Sodium (2 ml) and dextro-rotatory D-Cloprostenol (2 ml), respectively. Cows of group D served as control and were injected with sterile normal saline solution @ 2 ml intramuscularly per cow on the same day. The presence of active corpora lutea was confirmed by rectal palpation before the time of administration of luteolytic agent. After treatment, the cows were closely monitored for the onset of oestrus.

Blood sampling

Ten ml of blood was collected from each cow through jugular venipuncture in heparinized, clean and sterile glass test tubes. First sample was collected at the time of administration of luteolytic agent. Subsequent blood sampling was done at 12 hour interval till the onset of oestrus in all groups, except control in which the sampling was done till 96 hour after the injection of normal saline. The plasma was separated by centrifugation at 2500 rpm for 5 minutes and stored at -20°C till its analysis.

The plasma progesterone was estimated using Progesterone ELISA Kits (DRG International, Inc. USA, Cat. No. EIA-1561) for the quantitative determination of progesterone (ng/ml). The ELISA microplates were read by using ELISA microplate reader (model 3550-UV, BIORAD USA).

Statistical analysis

The means (\pm standard error) of plasma progesterone concentrations at each time interval for each group were calculated. Further analysis was done using analysis of variance technique and significant results were subjected to Duncan's multiple range test (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

The concentrations of plasma progesterone (ng/ml) and interval to oestrus (hours) after administration of luteolytic agents in Holstein-Friesian cows of four groups are given in Table I.

The plasma progesterone concentrations at the time of treatment were 7.33 ± 0.75 , 7.77 ± 0.85 , 7.97 ± 0.32 and 8.07 ± 0.27 ng/ml in Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol treated and control cows, respectively, the

Table 1: Concentrations of plasma progesterone and interval to oestrus (mean \pm SE) after administration of luteolytic agents in cows

Groups	Plasma Progesterone (ng/ml) at the following days of oestrus cycle									Interval from treatment to oestrus (hours)
	10		11		12		13		14	
	M	E	M	E	M	E	M	E	M	
Dinoprost Tromethamine Treated (Group-A)	7.33 ± 0.75^a	5.50 ± 1.03^a	3.77 ± 0.98^b	2.77 ± 0.70^b	2.03 ± 0.52^b	0.93 ± 0.23^c	0.80 ± 0.10^b	---	---	68.00 ± 4.00^a
Cloprostenol Sodium Treated (Group-B)	7.77 ± 0.85^a	5.63 ± 1.32^a	4.63 ± 1.27^b	3.23 ± 1.05^b	2.13 ± 0.82^b	1.50 ± 0.10^{bc}	0.85 ± 0.05^b	---	---	64.00 ± 8.00^a
dextro-rotatory D-Cloprostenol Treated (Group-C)	7.97 ± 0.32^a	6.50 ± 0.29^a	5.47 ± 0.19^{ab}	4.33 ± 0.15^b	3.53 ± 0.32^b	2.57 ± 0.48^b	1.40 ± 0.35^b	1.10 ± 0.10^b	0.70 ± 0.10^b	88.00 ± 8.00^a
Control Untreated (Group-D)	8.07 ± 0.27^a	8.07 ± 0.03^a	7.83 ± 0.23^a	8.33 ± 0.23^a	8.00 ± 0.10^a	7.80 ± 0.15^a	7.67 ± 0.18^a	8.20 ± 0.15^a	8.77 ± 0.22^a	---

Values with different superscripts in the same column differ significantly ($P < 0.05$) and values sharing at least one superscript in a same column differ non-significantly ($P > 0.05$). M = Morning E = Evening

Progesterone assay

difference was non-significant. In the morning of day-

11 of the oestrus cycle, significantly ($P < 0.05$) lower plasma progesterone concentrations were recorded in Dinoprost Tromethamine and Cloprostenol Sodium treated cows as compared to control cows but the difference of dextro-rotatory D-Cloprostenol treated cows with that of control cows was non-significant. On the other hand, all the treated groups showed significantly ($P < 0.05$) lower plasma progesterone concentrations as compared to control cows starting from the evening of day-11 till the morning of day-13 of the oestrus cycle. The plasma progesterone concentrations decreased to 0.80 ± 0.10 , 0.85 ± 0.05 and 0.70 ± 0.10 ng/ml at the onset of oestrus in Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol treated cows within 68.00 ± 4.00 , 64.00 ± 8.00 and 88.00 ± 8.00 hours after the treatment, respectively.

Berardinelli and Adair (1989) and Stevens *et al.* (1993) reported below 1 ng/ml concentration of plasma progesterone after intramuscular treatment of cows with 25 mg $\text{PGF}_{2\alpha}$ at day 10-14 of the oestrus cycle in shorter interval (24-32 hours) from treatment to oestrus as compared to the present study. On the other hand, Alvarez *et al.* (1988) and Dedov and Chomaev (1988) reported 0.9 ng/ml blood progesterone concentration at oestrus after intramuscular treatment with 500 μg of Cloprostenol, in almost similar interval (72-120 hours) from treatment to oestrus as observed in the present study. In another study, Aiumlamai (1991) reported that 23 out of 28 treatments resulted into oestrus within 120 hours after treatment with Prostaglandin analogue at day 8-12 day of the oestrus cycle.

The results of the present study indicate that Dinoprost Tromethamine, Cloprostenol Sodium and dextro-rotatory D-Cloprostenol are almost similar in efficacy. However, number of cows included in each group is too small to draw any conclusion. Trials with sufficient number of cows in each group are recommended for future study.

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