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Influence of prebreeding progesterone plus prostaglandin F2- α on estrus and fertility in lactating dairy cows

Authors

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INFLUENCE OF PREBREEDING PROGESTERONE PLUS PROSTAGLANDIN F₂-ALPHA ON ESTRUS AND FERTILITY IN LACTATING DAIRY COWS

M.O. Mee, R.E. Stewart, J.S. Stevenson,
and E.P. Call

Summary

Progesterone administered before breeding may increase estrous expression and subsequent fertility in lactating dairy cows. Holstein cows (n=302) were assigned randomly at calving to three groups. Cows received no treatment (controls), one injection of prostaglandin F₂-alpha (PGF), or progesterone plus one injection of PGF (PRID + PGF). The average interval to estrus was 5 days shorter in PRID + PGF cows compared to cows given only PGF. In addition, more cows were observed in estrus 2 to 5 days after treatment in the PRID + PGF group compared to the PGF group. Average days from calving to conception were reduced in PRID + PGF cows by 15 to 20 days compared to control and PGF cows. We concluded that prebreeding progesterone in combination with PGF appears to enhance fertility.

Introduction

Several studies have attempted to synchronize estrus to allow for convenient breeding of dairy cows at first service at approximately 60 days postpartum. Most of these studies have used prostaglandin F₂-alpha (PGF) and a few studies have incorporated progesterone plus PGF in estrous synchronization. A previous attempt at the KSU dairy to synchronize estrus failed to show any benefit of utilizing two injections of PGF given 11 days apart. Furthermore, there is little information on the effects of progesterone in estrous synchronization. It has been demonstrated that cows with increased progesterone levels in their blood during the estrous cycle before breeding have better conception rates than herdmates with lower progesterone levels prior to breeding. This suggests that progesterone may have a prebreeding role for increasing fertility. Therefore, the objectives of this study were: (1) to determine the feasibility of using one injection of PGF to regress the corpus luteum (CL) prior to first service and (2) to examine further the prebreeding role of progesterone prior to CL regression on estrous expression and subsequent fertility.

Procedures

This study utilized 302 lactating Holstein cows in the KSU dairy herd. Cows were assigned randomly at calving to three groups. Group 1 consisted of 112 control cows that were inseminated at the first observed estrus after 42 days postpartum. Group 2 consisted of 97 PGF cows given one injection of PGF (25 mg Lutalyse®) between 56 and 62 days postpartum. Group 3 consisted of 93 PRID + PGF cows. Cows in this group had a progesterone-releasing intravaginal device or PRID inserted into the vagina at approximately 54 days postpartum. A PRID is a

silastic coil impregnated with 1.13 grams of crystalline progesterone. The PRIDs remained in place for 7 days with an injection of PGF (25 mg Lutalyse®) given 24 hr prior to PRID removal. Cows in Groups 2 and 3 were inseminated at the first observed estrus after Lutalyse®. This allowed for all treated cows to be inseminated for the first service around 60 days postpartum.

Blood was collected at 0, 24, and 48 hr after PGF injection and analyzed for concentrations of progesterone in serum. This enabled us to monitor the success of CL regression. Blood also was collected at the time of PRID insertion and removal.

Results and Discussion

As illustrated in Figure 1, more PRID + PGF cows were observed in heat 2 to 5 days after PGF injection, resulting in a more synchronous estrus compared to PGF cows. This result suggests that PRID + PGF synchronizes more heats than one injection of PGF. However, progesterone may be enhancing behavioral signs of heat. Missed heats and PGF failure may have contributed to the wide distribution of observed heats in the PGF group.

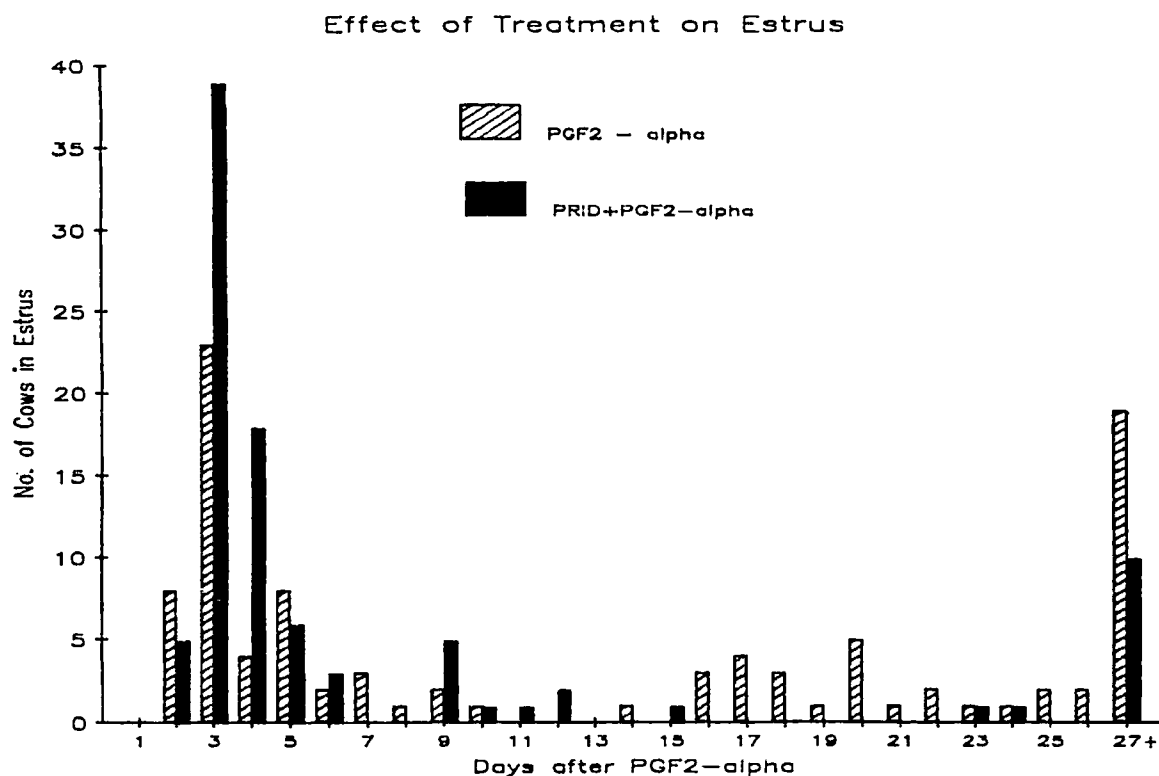


Figure 1. Distribution of heats after one injection of PGF or a 7-day progesterone-releasing intravaginal device (PRID) and PGF 1 day before PRID removal.

In addition, the average interval to estrus after PGF injection was reduced ($P < .05$) from 16 to 11 days in the PRID + PGF group compared to the PGF group.

Results of the reproductive traits examined are illustrated in Table 1. The average interval to first breeding was 10 days longer in the PGF group compared to controls. Conception rates were similar in all groups; however, in the PRID group, conception rates tended to be higher in those cows conceiving 2 to 5 days after treatment compared to those conceiving 6 or more days after PGF (53 vs 32%). The reasons for this finding are unknown, but it could be related to the stage of the estrous cycle when the PRIDs were inserted and/or the failure of CL regression after PGF administration. Interestingly, this effect was not observed in the PGF treatment group, since conception rates were similar 2 to 5 days and after 6 or more days (44 vs 46%).

The PRID + PGF group averaged 20 fewer days to conception than the PGF group and 15 days fewer than controls. In addition, fewer services per conception were required in the PRID + PGF group compared to the other groups. Fewer days between first service and conception were observed in the PRID + PGF group compared to the other groups.

Table 1. Reproductive measures of cows after treatment

Item	Control	PGF	PRID + PGF
No. cows	112	97	93
Interval to 1st service, d	65	75 ^a	69
Conception rates at 1st service, %	38	45	47
2 to 5 d, %		44	53
> 6d, %		46 ^b	32
First service to conception, d	42	39 ^b	23 ^a
Days open	107	112 ^b	92 ^a
Services per conception	2.1	2.0	1.7 ^a

^aDifferent from control ($P < .05$).

^bDifferent from PRID + PGF ($P < .05$).

The results of this study are preliminary, with further studies needed to investigate the role of progesterone. However, our data suggest that one injection of PGF results in reproductive performance similar to that of untreated controls and, therefore, provides no economical benefit. It appears that estrous synchronization and fertility can be enhanced by administering progesterone before breeding in combination with PGF.