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Early postpartum luteal function after treatment with progestin and(or) gonadotropin-releasing hormone in dairy cattle

Abstract

Progestin (Norgestomet®) and(or) repeated low-dose infusions of GnRH (Cystorelin®) influenced the lifespan of the first corpus luteum after an induced ovulation. Holstein cows (n=32) were assigned at calving to four groups. Cows were treated with blank ear implants (days 2 to 9 after calving) and saline infusion (48 hr on days 10 and 11), progestin ear implants and saline infusion, blank implants and GnRH infusion, or progestin implants and GnRH infusion prior to a GnRH-induced ovulation (day 12). Four primiparous and four multiparous cows were assigned to each treatment. Fewer cows treated with progestin/GnRH ovulated in response to the GnRH challenge. However, short cycles (<17 days in duration) were prevented in all cows (n= 16) treated with progestin. In addition, all multiparous cows treated with blank implants and GnRH infusion had normal cycles. Results of this study suggested that progestin and GnRH may have altered follicular development, thereby preventing the short-lived corpus luteum and inducing a normal estrous cycle as cows overcame anestrus early postpartum.; Dairy Day, 1988, Kansas State University, Manhattan, KS, 1988;

Keywords

Kansas Agricultural Experiment Station contribution; no. 89-107-S; Dairy; Luteal function; Progestin; Gonadotropin-releasing hormone

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**EARLY POSTPARTUM LUTEAL FUNCTION
AFTER TREATMENT WITH PROGESTIN AND(OR)
GONADOTROPIN-RELEASING HORMONE IN
DAIRY CATTLE**

M.O. Mee and J.S. Stevenson

Summary

Progestin (Norgestomet®) and(or) repeated low-dose infusions of GnRH (Cystorelin®) influenced the lifespan of the first corpus luteum after an induced ovulation. Holstein cows (n=32) were assigned at calving to four groups. Cows were treated with blank ear implants (days 2 to 9 after calving) and saline infusion (48 hr on days 10 and 11), progestin ear implants and saline infusion, blank implants and GnRH infusion, or progestin implants and GnRH infusion prior to a GnRH-induced ovulation (day 12). Four primiparous and four multiparous cows were assigned to each treatment. Fewer cows treated with progestin/GnRH ovulated in response to the GnRH challenge. However, short cycles (<17 days in duration) were prevented in all cows (n=16) treated with progestin. In addition, all multiparous cows treated with blank implants and GnRH infusion had normal cycles. Results of this study suggested that progestin and GnRH may have altered follicular development, thereby preventing the short-lived corpus luteum and inducing a normal estrous cycle as cows overcame anestrus early postpartum.

Introduction

The early postpartum period in cattle is characterized by ovarian inactivity. Dairy cows begin to cycle within 14 to 28 days after calving, but are not observed in heat until 35 to 42 days postpartum because only 50% of cows express heat before the first postpartum estrous cycle. The first corpus luteum formed after calving is frequently short-lived, resulting in ovarian cycles much less than 21 days in length. Studies with beef cows have demonstrated that treatment with progestin for 9 days beginning at weaning or before a gonadotropin-induced ovulation reduced the incidence of short cycles. Likewise, early postpartum dairy cows treated with low-dose injections of gonadotropin-releasing hormone (GnRH) every 2 hr for 72 hr had normal cycles after an induced ovulation. These studies suggested that treatment with progestin or regular synchronous injections of GnRH appear to be necessary for ovarian cycles of normal duration (18 to 24 days). Therefore, the objectives of this study were: 1) to determine the effect of progestin and(or) low-dose infusions of GnRH on the duration of the first ovarian cycle and 2) to further examine the role of progestin and pulsatile GnRH on maintenance of the corpus luteum.

Procedures

Thirty-two lactating Holstein cows in the KSU dairy were assigned at calving to four treatments (Table 1). Cows were implanted in the ear with either 0 (blank) or 6 mg norgestomet for 6 days. Twenty-four hours after implant removal, cows were infused with either saline or 2 µg GnRH every 2 hr for 48 hr. Following the infusion period, all cows were injected i.v. with 50 µg GnRH to induce the first ovulation.

Table 1. Assignment of Cows to Treatments

Treatment	No. cows ^a
Blank/Saline	8
Progestin/Saline ^b	8
Blank/GnRH ^c	8
Progestin/GnRH ^{b,c}	8

^aFour primiparous and four multiparous cows were in each treatment.

^bNorgestomet (6 mg) implant in the ear for 6 days beginning 2 days after calving.

^cGnRH (2 μ g) every 2 hr for 48 hr beginning 24 hr after implant removal.

Blood was collected daily from the day of implant until 30 days after calving, then thrice weekly until 60 days postpartum, and analyzed for concentrations of progesterone in serum. This enabled us to determine the duration of the first cycle and the number of cows ovulating in response to the 50- μ g dose of GnRH.

Results and Discussion

Results of this study are summarized in Table 2. Only 2 of 8 progestin/GnRH-treated cows ovulated in response to the ovulatory dose of GnRH, resulting in fewer ($P<.05$) progestin/GnRH-treated cows ovulating in response to GnRH compared with the blank/saline treatment (2 vs 6 cows). This result suggested that the progestin/GnRH treatment may have had a negative effect on growing follicles by preventing adequate follicular development.

Short cycles were prevented in all cows ($n=16$) treated with norgestomet. In fact, 7 of 8 (88%) of the progestin/saline-treated cows had a normal cycle duration (18 to 24 days), which was more ($P=.07$) than any other treatment. This is the first reported incidence of progestin preventing short cycles in early postpartum dairy cows.

Furthermore, all multiparous cows ($n=4$) given blank implants and GnRH infusion had ovarian cycles of normal duration (Table 2). These results suggested that progestin and GnRH may alter ovarian follicular growth, thereby preventing the short-lived corpus luteum and resulting in an ovarian cycle of normal duration.

Further research is necessary to investigate the role of progestin and GnRH in preventing the short cycle. It is still unknown whether the effect of progestin or GnRH in preventing the short-lived corpus luteum is altered by preovulatory secretion of gonadotropins or is a direct effect of treatments on the preovulatory follicle.

Table 2. Characteristics of Ovarian Function after an Ovulatory Dose of GnRH.

Characteristics	Treatment			
	Blank/ Saline	Progestin/ Saline	Blank/ GnRH	Progestin/ GnRH
No. of cows ovulating after the 50- μ g GnRH challenge				
GnRH-induced (%)	6(75)	5(62)	5(62)	2(25) ^a
Delayed (%)	2(25)	3(38)	3(38)	6(75)
No. of cows with first cycles				
<17 days (%)	2(25)	0(0)	3(38)	0(0) ^d
18-24 days (%)	4(50)	7(88) ^b	4(50) ^c	3(38)
>24 days (%)	2(25)	1(12)	1(12)	3(38)

^aDifferent from Blank/Saline ($P < .05$).

^bDifferent from other treatments ($P = .07$).

^cAll multiparous cows had normal cycles.

^dTwo cows failed to ovulate during the study.

