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## Synchronized ovulation with gonadotropin-releasing hormone, prostaglandin F and fixed-time insemination

### Abstract

Summary Lactating Holstein cows and replacement heifers were treated with a novel synchronized ovulation protocol, which involves one fixedtime insemination without heat detection. One injection of GnRH (Cystorelin®) was given, followed in 7 days with an injection of PGF<sub>2</sub>α (Lutalyse®). Approximately 32 to 36 hr later, ovulation was induced with a second injection of GnRH, and one fixed-time insemination was given 18 hr later. Control cattle were given one injection of PGF and inseminated at observed 2a estrus. Pregnancy rates measured by palpation between 38 and 52 days after insemination in controls (47.1%) were slightly, but not significantly, greater than those in the synchronized ovulation treatment (35.3%). The treatment worked much better in lactating cows than in virgin heifers. This treatment may be particularly well suited to cows in which estrus is rarely observed, as well as for synchronizing first or repeat services.; Dairy Day, 1995, Kansas State University, Manhattan, KS, 1995;

### Keywords

Dairy Day, 1995; Kansas Agricultural Experiment Station contribution; no. 96-106-S; Report of progress (Kansas Agricultural Experiment Station and Cooperative Extension Service); 742; Prostaglandin; Gonadotropin-releasing hormone; Synchronized ovulation; Pregnancy rates

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**SYNCHRONIZED OVULATION WITH GONADOTROPIN-  
RELEASING HORMONE, PROSTAGLANDIN F<sub>2α</sub>,  
AND FIXED-TIME INSEMINATION**

*J. S. Stevenson and Y. Kobayashi*

**Summary**

Lactating Holstein cows and replacement heifers were treated with a novel synchronized ovulation protocol, which involves one fixed-time insemination without heat detection. One injection of GnRH (Cystorelin®) was given, followed in 7 days with an injection of PGF<sub>2α</sub> (Lutalyse®). Approximately 32 to 36 hr later, ovulation was induced with a second injection of GnRH, and one fixed-time insemination was given 18 hr later. Control cattle were given one injection of PGF<sub>2α</sub> and inseminated at observed estrus. Pregnancy rates measured by palpation between 38 and 52 days after insemination in controls (47.1%) were slightly, but not significantly, greater than those in the synchronized ovulation treatment (35.3%). The treatment worked much better in lactating cows than in virgin heifers. This treatment may be particularly well suited to cows in which estrus is rarely observed, as well as for synchronizing first or repeat services.

(Key Words: Prostaglandin, Gonadotropin-Releasing Hormone, Synchronized Ovulation, Pregnancy Rates.)

**Introduction**

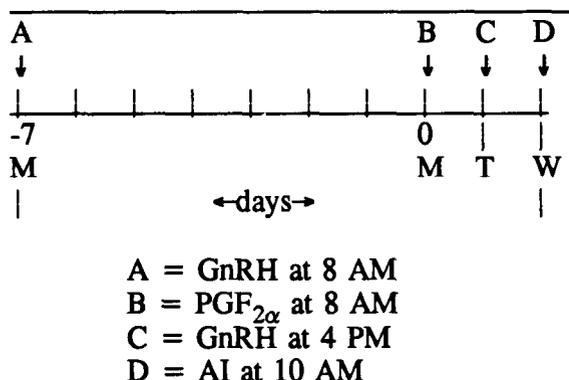
Since the discovery of the luteolytic properties of prostaglandin F<sub>2α</sub> and the introduction of Lutalyse® in 1979, programs to synchronize estrus for fixed-time inseminations have been tested. Many early attempts to use PGF<sub>2α</sub> in lactating dairy cows demonstrated its effectiveness in controlling the estrous cycle. Pregnancy rates after PGF<sub>2α</sub> usually were best when inseminations were performed based on

observed signs of heat. Our early attempts to use fixed-time inseminations at first services in lactating dairy cows demonstrated that pregnancy rates were less than desirable. Using two injections of PGF<sub>2α</sub> given 11 days apart, we found that pregnancy rates averaged 23% when one fixed-time insemination was administered at 80 hr after the second of two injections of PGF<sub>2α</sub>, whereas pregnancy rates improved slightly to about 30% when the 80-hr insemination was preceded 8 hr earlier by 100 µg of GnRH (Cystorelin®) or when two fixed-time inseminations were given at 72 and 96 hr after the second injection of PGF<sub>2α</sub>. Pregnancy rates in control cows inseminated at estrus were 51% in that study.

Recent work has demonstrated that controlling follicular growth relative to the programmed termination of the corpus luteum with PGF<sub>2α</sub> may improve pregnancy rates associated with one fixed-time insemination. An injection of GnRH during the estrous cycle in lactating cows induced either luteinization or ovulation of a large (dominant) follicle via the release of luteinizing hormone (LH). As a result of such treatment, a new group of follicles began to grow and one follicle became dominant and capable of ovulation within 6 or 7 days after the injection of GnRH. When an injection of PGF<sub>2α</sub> was administered 6 or 7 days after GnRH, this freshly developed dominant follicle was induced to ovulate with a second injection of GnRH before one fixed-time insemination was given. The objective of our study was to determine pregnancy rates in heifers and lactating cows following the use of this synchronized ovulation protocol.

## Procedures

A novel synchronized ovulation treatment was compared to a treatment using one injection of  $\text{PGF}_{2\alpha}$ . Treatments were applied to virgin heifers (minimum body weight of 800 lb and 12 mo of age) and to lactating cows (minimum of 60 days in milk) before first and repeat services.



**Figure 1.** Synchronized ovulation protocol

The synchronized ovulation treatment (Figure 1) consisted of a 100-pg injection of GnRH (Cystorelin<sup>®</sup>) on a Monday morning, followed 7 days later with one 25-mg injection of  $\text{PGF}_{2\alpha}$  (Lutalyse<sup>®</sup>). Then, 32 to 36 hr after  $\text{PGF}_{2\alpha}$ , a second 100-pg injection of GnRH was given to induce the preovulatory release of LH, which induced ovulation 24 to 32 hr later. Cows were given one fixed-time insemination 18 hr after the second injection of GnRH. The specific hours of injections are listed in Figure 1. Controls received 25 mg of  $\text{PGF}_{2\alpha}$  and were inseminated when detected in estrus. Pregnancy diagnoses

were made by palpation of the uterus and its contents between days 38 and 52 after insemination.

## Results and Discussion

Overall pregnancy rates for the two treatments are illustrated in Table 1. Pregnancy rates at first services were 47.1% (40/85) in the control and 35.3% (30/85) in the synchronized ovulation treatment. Although the control showed a slight advantage in pregnancy rates, the difference was not significant. Pregnancy rates tended to be reduced more by the synchronized ovulation treatment in replacement heifers and first-lactation cows than in older cows.

The synchronized ovulation treatment reduced pregnancy rate in lactating cows regardless of whether body condition was < 2.5 or > 2.5 at approximately 60 days in milk (Table 1). Furthermore, cumulative pregnancy and culling rates were unaffected by treatment (Table 1).

These results suggest that ovulation can be synchronized sufficiently to achieve acceptable pregnancy rates with *one* fixed-time insemination. This treatment may be particularly well suited to cows in which estrus is rarely observed, as well as for synchronizing first or repeat services (for cows found open at pregnancy checks). However, this treatment is not recommended for use in replacement heifers because of the reduced pregnancy rate. Research at other locations is finding similar successes.

**Table 1. Pregnancy Rates after Synchronized Ovulation with GnRH and PGF<sub>2α</sub>**

Item	Synchronized ovulation <sup>1</sup>		Control <sup>1</sup>	
	No./no.	%	No./no.	%
Pregnancy rate at service	30/85	35.3	40/85	47.1
Lactation number				
Heifers	7/13	53.8	10/14	71.4
Primiparous	7/16	43.7	12/24	50.0
Multiparous	16/56	28.6	18/47	38.3
Body condition <sup>2</sup>				
<2.5	14/42	33.3	16/38	42.1
>2.5	9/30	30.0	14/33	42.4
Cumulative pregnancy rate <sup>3</sup>	51/85	60.0	62/85	72.9
Culling rate <sup>3</sup>	25/85	29.4	18/85	21.2

<sup>1</sup>Synchronized ovulation protocol consisted of cattle receiving GnRH followed in 7 days by PGF<sub>2α</sub>. Thirty-two to 36 hr after PGF<sub>2α</sub>, a second dose of GnRH was given to induce ovulation of the dominant follicle, and one fixed-time insemination was given 18 hr later. Controls were given PGF<sub>2α</sub> and inseminated at estrus.

<sup>2</sup>Body condition of cows was assigned at the time of the first injection of PGF<sub>2α</sub> (1 = thin and 5 = obese) at an average of 56.7 ± 1.3 days in milk.

<sup>3</sup>Sums of pregnancy and culling rates do not equal 100% because some pregnant cows were culled for various reasons.