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Pregnancy rates in dairy cattle after three different, timed, breeding protocols

Abstract

Synchronizing ovulation enables dairy producers to inseminate cows by appointment rather than after detected estrus. Three different, timed artificial insemination protocols using different combinations of prostaglandin F2α and gonadotropin-releasing hormone were used to synchronize ovulation in 702 lactating Holstein cows. Cyclicity, pregnancy rate, and embryonic survival rate from each treatment were compared. Our results indicate that all three treatments produced acceptable pregnancy rates in first lactation cows. However, for cows in their second or greater lactation, the treatment using prostaglandin F2α 12 days before the Ovsynch protocol improved pregnancy rates more than the other two.; Dairy Day, 1999, Kansas State University, Manhattan, KS, 1999;

Keywords

Dairy Day, 1999; Kansas Agricultural Experiment Station contribution; no. 00-136-S; Report of progress (Kansas Agricultural Experiment Station and Cooperative Extension Service); 842; Dairy; Ovsynch protocol; Pregnancy rates; Timed a.i.

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PREGNANCY RATES IN DAIRY CATTLE AFTER THREE DIFFERENT, TIMED, BREEDING PROTOCOLS[1]

J. A. Cartmill, S. Z. El-Zarkouny, G. C. Lamb, and J. S. Stevenson

Summary

Synchronizing ovulation enables dairy producers to inseminate cows by appointment rather than after detected estrus. Three different, timed artificial insemination protocols using different combinations of prostaglandin $F_{2\alpha}$ and gonadotropin-releasing hormone were used to synchronize ovulation in 702 lactating Holstein cows. Cyclicity, pregnancy rate, and embryonic survival rate from each treatment were compared. Our results indicate that all three treatments produced acceptable pregnancy rates in first lactation cows. However, for cows in their second or greater lactation, the treatment using prostaglandin $F_{2\alpha}$ 12 days before the Ovsynch protocol improved pregnancy rates more than the other two.

(Key Words: Ovsynch Protocol, Pregnancy Rates, Timed AI.)

Introduction

The objective of this experiment was to determine the merits of three protocols to synchronize ovulation prior to timed artificial insemination (TAI). A successful breeding program that allows a dairy producer to inseminate all cows by appointment after a voluntary waiting period without estrus detection potentially could decrease the number of cows remaining nonpregnant later in lactation.

The Ovsynch protocol has been adopted by dairy producers because of its acceptable conception rates. This protocol consists of two injections of gonadotropin-releasing hormone (GnRH); one given 7 days before prostaglandin $F_{2\alpha}$ (PG) and the second given 48 hrs afterwards. Cows then are inseminated 16 to 20 hrs after the second GnRH injection.

Previous research indicated that conception rates were greater in dairy cows when they began the Ovsynch protocol between days 5 and 12 of the estrous cycle (day 0 = estrus). Therefore, we formulated a treatment in which one injection of PG was given 12 days before initiating the Ovsynch protocol, so a greater percentage of cows would be between days 7 and 10 of the cycle when it began. In addition, we compared those two protocols (Ovsynch and PG + Ovsynch) to a treatment in which cows were given two injections of PG 12 days apart, followed 48 hrs later by an injection of GnRH, and TAI 16 to 20 hrs later.

Procedures

Cows on two dairy farms were grouped into 3-week breeding clusters as they calved, resulting in 17 clusters in one herd and 25 clusters in another. Cows then were assigned randomly to each of three treatments before TAI was carried out between 57 and 77 days postpartum. Inseminations were performed between July 1997 and February 1999, excluding the months of June through November 1998.

[1]Thanks to Steve Ohlde and Ohlde Dairy, Linn, KS, for their cooperation in this study and to the Kansas Dairy Association for partial funding.

Figure 1 shows the treatments: Ovsynch (OVS), Ovsynch preceded 12 days earlier by a single injection of prostaglandin $F_{2\alpha}$ (PG + OVS), and two injections of PG 12 days apart with a single injection of GnRH 48 hrs after the second PG injection (2 × PG12). All cows received TAI between 16 and 20 hrs after the second injection of GnRH. Blood samples were collected from the tail vein of each cow at the time of injection (days –22, –15, –10, –3, and –1) regardless of treatment. Concentrations of progesterone in blood serum were measured to determine whether or not the cow was cycling before the onset of treatment. Pregnancy was confirmed by transrectal ultrasonography at 28 days postinsemination and reconfirmed by palpation of the uterus at 40 to 54 days by the herd veterinary practitioner.

Cows were milked 2× daily and housed either in freestall barns bedded with sand or in a tie-stall barn. Cows were fed a total mixed ration consisting of chopped alfalfa, corn silage, whole cottonseed, and concentrate-mineral mix to meet or exceed their daily requirements for maintenance and milk production.

Results and Discussion

The proportion of cows cycling (elevated progesterone in their blood indicative of a functional corpus luteum) varied from 81 to 86% and was not different among treatments (Table 1).

Overall, pregnancy rates were greater ($P<.01$) in cows with previous cycling activity than in those with low progesterone concentrations on days 22, 15, and 10 before insemination, 39 vs 25% at 28 days and 29 vs 17% at 40 to 50 days.

Table 1. Percent of Cycling by 45 to 65 Days in Milk

	Treatments[1]		
Item	Ovsynch	PG + OVS	2 × PG12
No. of cows	230	234	241
% cycling	86	81	83

[1]See Figure 1.

Pregnancy rates are summarized by treatment and lactation number in Table 2. Overall, first lactation cows had greater ($P<.01$) pregnancy rates than older cows. A treatment by lactation interaction ($P=.07$) occurred for pregnancy rates. The PG + OVS treatment tended to increase pregnancy rates in the older (2+) lactating cows compared to the OVS and 2 × PG12 treatments, but not in first-lactation cows.

Regardless of treatment, cows in their first lactation had greater ($P<.01$) rates of embryo survival (79 vs. 66%; Table 2) than older cows. Embryonic survival was greater ($P=.05$) in the Ovsynch and PG + OVS treatments than in the 2 × PG12 treatment (Table 3).

In conclusion, using an injection of PG 12 d prior to the start of OVS improved pregnancy rates of cows in their second or greater lactation. This treatment provides dairy producers with an improved protocol that should improve pregnancy rates in older cows compared to the traditional Ovsynch protocol.

Table 2. Pregnancy Rates by Treatment and Lactation Number

Item	Lactation No.	Treatments[1] Ovsynch	PG + OVS	2 × PG12
No. of cows	1	109	104	103
	2+	121	131	137
Pregnancy rate at 28 days, %	1	40	39	44
	2+	28	41[x]	27
Pregnancy rate at 40 to 54 days, %	1	30	34	34
	2+	18	28	17

[x]Different (*P*=.07) from Ovsynch and 2 × PG12.
[1]See Figure 1.

Table 3. Embryo Survival from Day 28 to Days 40 to 54

Item	Treatments[1] Ovsynch	PG + OVS	2 × PG12
Embryo survival, %	77	95	82
	79	75	58[x]

[x]Different (*P*=.05 from Ovsynch and PG + OVS.
[1]See Figure 1.

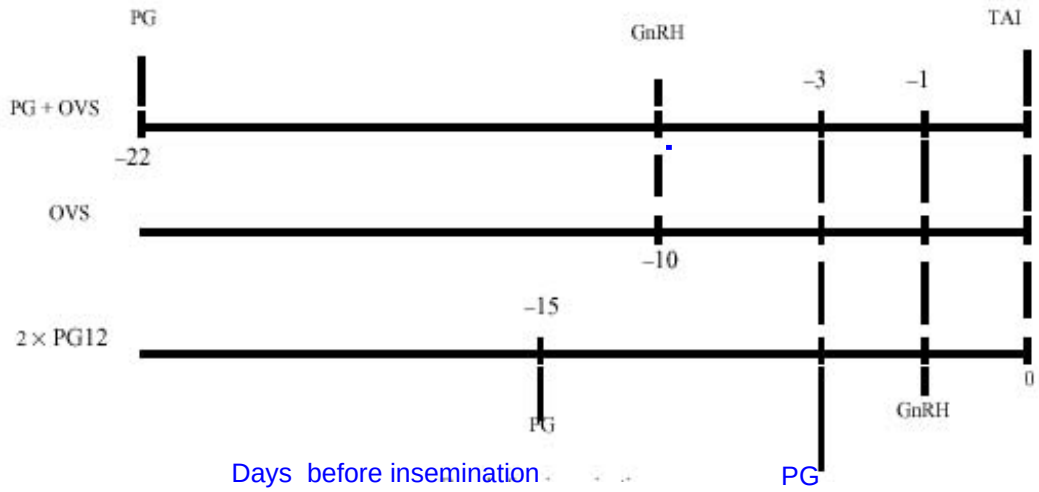

Figure 1. Treatment Protocols. GnRH = gonadotropin-releasing hormone (100 Fg of Cystorelin®, Merial, Iselin, NJ); PG = prostaglandin F_{2a} (25 mg of Lutalyse®, Pharmacia and Upjohn, Kalamazoo, MI); and TAI - timed artificial insemination.