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Effect of Interval from Timed Artificial Insemination to Initiation of Resynchronization of Ovulation on Fertility of Lactating Dairy Cows

R. A. Sterry,* M. L. Welle,† and P. M. Fricke*[1]
*Department of Dairy Science, University of Wisconsin, Madison 53706
†Miltrim Farms, Inc., Athens, WI 54411

ABSTRACT

To compare 2 strategies for systematically resynchronizing ovulation, lactating Holstein cows (n = 763) at various days in milk and prior artificial insemination services were assigned randomly at timed AI (TAI) to receive the first GnRH injection of Ovsynch 26 (D26) or 33 (D33) d after TAI to resynchronize ovulation (Resynch) in cows failing to conceive. Cows in the D26 treatment received GnRH 26 d after TAI and continued Resynch only when diagnosed not pregnant by using ultrasonography 33 d after TAI, whereas D33 cows initiated Resynch only when diagnosed not pregnant 33 d after TAI. Cows were classified based on the presence or absence of a corpus luteum (CL) at the not-pregnant diagnosis, and cows without a CL received an intravaginal progesterone-releasing insert during Resynch. When analyzed as a systematic strategy, pregnancy rate per AI (PR/AI) was greater for cows assigned to the D33 than the D26 Resynch treatment (39.4 vs. 28.6%). A treatment × parity interaction was detected for PR/AI after Resynch for nonpregnant cows having a CL in which primiparous cows had a greater PR/AI than multiparous cows when Resynch was initiated 33 d after the initial TAI, and primiparous and multiparous cows when Resynch was initiated 26 d after the initial TAI. Pregnancy loss for Resynch was 6.4% between 33 and 40 d, and 2.6% between 40 and 61 d after Resynch TAI. We concluded that delaying initiation of Resynch until 33 d after TAI increased PR/AI for primiparous cows.

Key words: dairy cow, Ovsynch, pregnancy loss, Resynch

INTRODUCTION

Because shortened duration and decreased expression of estrus in high-producing dairy cows present a challenge for detection of estrus (Lopez et al., 2004b), hormonal protocols that diminish reliance on detection have become popular tools for reproductive management. Programs such as **Ovsynch** (synchronization regimen using sequential injections of GnRH and $PGF_{2\alpha}$ to control ovulation for timed insemination; Pursley et al., 1995) or **Presynch** (post partum regimen using 2 injections of $PGF_{2\alpha}$ to synchronize estrous cycles in cows before applying Ovsynch) + Ovsynch (Moreira et al., 2001; Navanukraw et al., 2004) systematically program cows to receive their first postpartum timed AI (**TAI**) without the need for detection of estrus. Strategies that allow hormonal injections, TAI, and pregnancy diagnosis to be scheduled on the same days each week make synchronization protocols easier to manage and may facilitate protocol compliance (Fricke et al., 2003).

For maximum reproductive efficiency, cows failing to conceive to their first postpartum TAI need to be identified and aggressively resubmitted for subsequent AI service (Fricke, 2002). An optimal resynchronization program would provide an opportunity for cows diagnosed not pregnant to receive a subsequent TAI as soon as possible after diagnosis while still achieving acceptable fertility. To this end, a field trial was conducted to determine differences in fertility after initiating Ovsynch for second TAI service (**Resynch**) at 19 (D19), 26 (D26), or 33 (D33) d after first postpartum TAI for cows submitted to a Presynch + Ovsynch protocol (Fricke et al., 2003). These intervals were selected because they allowed the first GnRH injection of Resynch to be administered exactly 4, 5, or 6 wk after the first GnRH injection of Ovsynch for first postpartum TAI, thereby restricting injections to 2 d per week on the farm. Initiation of Resynch 19 d after TAI resulted in a reduced pregnancy rate per AI (**PR/AI**) compared with initiation of Resynch 26 or 33 d after TAI, and was not considered an acceptable protocol. Although PR/AI of cows in the D26 and D33 treatments was similar (34 vs. 38%, respectively), pregnancy diagnosis was conducted at 26 d after TAI for D26 cows and at 33 d after TAI for the D33 cows, thus confounding a direct comparison of PR/AI between these treatments.

Initiation of Ovsynch on d 5 to 12 of the estrous cycle resulted in a greater PR/AI compared with initiation

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[1]Corresponding author: pmfricke@wisc.edu

at other stages of the cycle (Vasconcelos et al., 1999; Moreira et al., 2000). To optimize fertility to Resynch TAI, Bartolome et al. (2005) assigned cows to protocols for resynchronization according to stage of the estrous cycle based on ultrasound and palpation 30 d after AI. An alternative approach is to time initiation of Resynch at an interval after initial TAI when a high proportion of cows would be expected to be d 5 to 12 of the estrous cycle similar to that achieved using Presynch + Ovsynch. Because PR/AI to Resynch was poor for cows without a corpus luteum (**CL**) at the first GnRH or $PGF_{2\alpha}$ injections of Resynch (Fricke et al., 2003), alternative treatments aimed at improving fertility of cows lacking a CL at initiation of Resynch may further improve an overall resynchronization strategy.

The overall objective of this study was to compare 2 strategies for systematic resynchronization of ovulation in lactating dairy cows. Our first objective was to evaluate PR/AI for cows in which the first GnRH injection of Resynch was initiated either 26 or 33 d after an initial TAI. Within each Resynch treatment, cows lacking a CL at a not-pregnant diagnosis were identified and treated with progesterone (using a controlled internal drug-releasing insert, **CIDR**) during Resynch with the intent of improving fertility to the overall Resynch strategy. A second objective was to determine rate of pregnancy loss at specific intervals after TAI for both the previous TAI and the Resynch treatment TAI to determine the timing of not-pregnant diagnosis during Resynch. Based on our previous results (Fricke et al., 2003), our hypothesis was that initiation of Resynch 33 d after the previous TAI would yield greater PR/AI to TAI compared with initiation of Resynch 26 d after the previous TAI.

MATERIALS AND METHODS

Farm Description and Data Collection

Lactating Holstein dairy cows on a commercial dairy farm comprising approximately 1,100 lactating cows located in north-central Wisconsin were enrolled in this study beginning July 15, 2004 and ending November 4, 2004. Cows were housed in freestall barns and were fed a TMR once daily with ad libitum access to feed and water. Cows were milked thrice daily at approximately 8-h intervals, and average milk production per cow was 40.0 ± 0.5 kg/d during the study period. Hormonal protocols to synchronize ovulation for first TAI service and to resynchronize ovulation for second and greater TAI services was performed using intramuscular injections of 100 μg of GnRH (2 mL of Cystorelin, Merial, Ltd., Duluth, GA), and 25 mg of $PGF_{2\alpha}$ (5 mL of Prostamate; Am Tech Group Inc., St. Joseph, MO).

Lists for scheduled injections and pregnancy examinations for individual cows were generated weekly using a commercial on-farm computer software program (Dairy Comp 305, Valley Agricultural Software, Tulare, CA). This program also was used to track and record reproductive outcomes, individual cow events, and monthly milk production records. Cows assigned to the study were identified and coded by treatment on each cow's individual electronic cow card, and the cow file chronicling events for each cow was archived at least once monthly to capture individual cow data throughout the study period. Data from archived cow files were exported into a computer spreadsheet program (Microsoft Excel 2002, Microsoft Corporation, Redmond, WA) for organization and manipulation of data before statistical analysis.

Submission of Cows for AI Service

Lactating cows (n = 763) were allocated weekly to breeding groups, each of which included cows that had calved during the same week, but had not yet been inseminated and cows that had received a previous AI, but were diagnosed not pregnant. In this way, cows were managed in groups to receive hormone injections and TAI on 2 preselected days of the week (Tuesdays and Thursdays). Protocol for insemination, lactation number, DIM, and AI number are shown in Table 1.

At the onset of the trial, any cow receiving TAI or an AI to a detected estrus on a Thursday was eligible to be enrolled into study and randomized to 1 of the 2 treatments. Cows receiving an AI breeding that were diagnosed not pregnant at the weekly herd check then continued the resynchronization schedule based on the treatment to which they were randomized. Thus, several different methods for submitting cows to the AI previous to the TAI of the Resynch treatments were possible. Cows received their first postpartum TAI at 69 ± 3 DIM after Presynch (n = 293; $PGF_{2\alpha}$ at 32 ± 3 and 46 ± 3 DIM) followed by Ovsynch (GnRH, d 0; $PGF_{2\alpha}$, d 7; GnRH + timed AI, d 9) initiated 14 d after the second Presynch injection. As part of the farm's standard reproductive management protocol for treatment of anovular cows, all cows were submitted to ultrasound at the first GnRH injection of Presynch + Ovsynch, and cows lacking a CL ≥10 mm received a modified protocol that included treatment with progesterone (Presynch + CIDR, n = 88; GnRH and CIDR inserted, d 0; $PGF_{2\alpha}$ and CIDR out, d 7; GnRH + timed AI, d 9). For second or greater TAI, cows received Resynch starting on d 26 (D26 and D26 + CIDR) or d 33 (D33 and D33 + CIDR; Figure 1). In addition, cows not examined at scheduled pregnancy diagnosis at 33 d, but subsequently diagnosed not pregnant (extended interval;