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Presynchronization with GnRH 7 days prior to resynchronization with CO-Synch did not improve pregnancy rate in lactating dairy cows

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Abstract

The objective was to determine the effect of presynchronization with GnRH 7 d prior to the initiation of resynchronization with CO-Synch on pregnancy/AI (P/AI) of resynchronization in lactating dairy cows, and the effect of GnRH on P/AI from previous breeding. All parity Holstein cows (n = 3287) from four dairy farms were enrolled. Cows not detected in estrus by 28 ± 3 d (Day -7) after a previous breeding were assigned to receive either GnRH (100 μg, im; n = 1636) or no GnRH (Control; n = 1651). Cows not detected in estrus during the 7 d after GnRH underwent pregnancy diagnosis (35 ± 3 d after previous breeding, Day 0); non-pregnant cows (n = 1232) in the Control (n = 645) and GnRH (n = 587) groups were resynchronized with a CO-Synch protocol. Briefly, cows received 100 μg GnRH on Day 0, 25 mg $PGF_{2\alpha}$ on Day 7, and 72 h later (Day 10) were given 100 μg GnRH and concurrently inseminated. Serum progesterone concentrations (n = 55 cows) were elevated in 47.3, 70.9, and 74.5% of cows on Days -7, 0, and 7, respectively. The proportion of cows with high progesterone concentrations on Day -7 and Day 0 were 44.1% and 88.2% ($P < 0.003$), and 55.2% and 33.2% ($P > 0.1$), for GnRH and Control groups, respectively. Accounting for significant variables such as locations ($P < 0.0001$) and parity categories ($P < 0.05$), the P/AI (35 ± 3 d after AI) for resynchronization was not different between GnRH and Control groups [26.7% (95% CI: 23.2, 30.5; (157/587) vs 28.4% (95% CI: 25.0, 31.9; (183/645); $P > 0.1$]. There were no significant location by treatment or parity by treatment interactions. Accounting for significant variables such as location ($P < 0.0001$) and parity categories ($P < 0.001$), the P/AI was not different between GnRH and Control groups for the previous service [60.2%; 95% CI: 57.9, 62.6; (986/1636) vs 59.1%; 95% CI: 56.7, 61.5; (976/1651); $P > 0.1$)]. There were no significant location by treatment or parity by treatment interactions. In conclusion, more cows presynchronized with GnRH 7 d prior to resynchronization with CO-Synch had elevated progesterone concentrations at initiation of resynchronization than those not presynchronized. The GnRH treatment 7 d prior to resynchronization with CO-Synch, when given 28 ± 3 d after a previous breeding, did not improve P/AI in lactating dairy cows; furthermore, compared to the control, it did not significantly affect pregnancy rate from the previous breeding.

Keywords: Dairy cows; GnRH; Presynchronization; Resynchronization; Pregnancy

1. Introduction

Reduced submission rate of non-pregnant cows is one of several factors responsible for reproductive inefficiency in a dairy farm. Failure to inseminate non-pregnant cows in a timely manner prolongs intervals between inseminations and delays re-establishment of pregnancy. Therefore, an efficient protocol for resynchronization and subsequent AI of non-pregnant cows is essential. Synchronization of ovulation for resynchronized breeding can be initiated before, at, or after

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pregnancy diagnosis. This can be achieved with an Ovsynch® or CO-Synch protocol. Ovsynch® includes administration of GnRH, followed by $PGF_{2\alpha}$ injection 7 d later, a second GnRH injection 2 d later, and timed AI 12 to 16 h after the second GnRH [1]. The CO-Synch protocol includes administration of GnRH, followed by $PGF_{2\alpha}$ 7 d later, and a second GnRH treatment, and AI 72 h later. The advantage of the CO-Synch protocol is that both administration of GnRH and insemination are done concurrently, which favors compliance. The pregnancy/AI (P/AI) rate following these protocols may decrease when synchronization is initiated at random stages of the estrous cycle, since up to 30% of cows lack synchronized ovulations [2]. Alternatively, cows given the first GnRH treatment of these protocols between Days 5 and 9 of the estrous cycle are more likely to ovulate, form a new CL, and develop a new follicular wave, resulting in synchronized ovulation of a newly formed dominant follicle at the end of the synchronization protocol [2,3]. Increased ovulation to the first GnRH injection can be achieved by presynchronizing the estrous cycle with $PGF_{2\alpha}$ before the start of the ovulation synchronization protocols [4–6]. However, without the knowledge of pregnancy status, cows cannot be treated with $PGF_{2\alpha}$ as a means of presynchronization. Presynchronizing the estrous cycle with GnRH before the start of a synchronization protocol has been studied previously [7]. The advantage of using GnRH as presynchronization treatment is that it did not cause any untoward threat to pregnancy maintenance [8]. In addition, presynchronization with GnRH 6 d before the start of a synchronization protocol resulted in more dairy heifers ovulating to the first GnRH injection of the synchronization protocol [7]. Therefore, the objective of the present study was to determine the effect of presynchronization with GnRH 7 d prior to the initiation of resynchronization with CO-Synch on P/AI to resynchronization in lactating dairy cows, and the effect of GnRH treatment on P/AI from previous AI.

2. Materials and methods

2.1. Animal enrollment and data collection

All parity lactating Holstein cows (n = 3287) from four dairy farms (three from Idaho and one from Washington) were enrolled. Cows were housed in free-stall barns; primiparous and multiparous cows were housed separately and milked thrice daily at 8 h intervals. Cows were fed a TMR, twice daily, to meet or exceed the dietary requirements for lactating Holstein cows weighing 544 to 635 kg and producing 27 to 36 kg of 3.5% FCM [9]. Lists of all eligible cows including injection schedules, reproductive events, pregnancy examinations, health events, and milk yield data on the test date closest to the date of reinsemination were generated, tracked, and recorded using a commercial on-farm computer software programs (DairyComp 305, Valley Agricultural Software, Tulare, CA, USA; or DHI Plus, DHI Computing Service, Provo, UT, USA).

2.2. Resynchronization treatment

One week before enrollment, data from all eligible cows (at least one previous breeding) were extracted from the on-farm software and entered into a computer spreadsheet (Excel 2003, Microsoft Corp., Redmond, WA, USA). Cows not detected in estrus by 28 ± 3 d (Day -7) after a previous breeding were assigned by odd and even ear tag identification number, to receive either no GnRH (Control; n = 1651) or GnRH (n = 1636; 100 μg of gonadorelin diacetate tetrahydrate sterile solution, im; Merial Ltd. Duluth, GA, USA) treatment. Cows not detected in estrus in the next 7 d were presented for pregnancy diagnosis (35 ± 3 d after previous breeding; Day 0); non-pregnant cows in the Control (n = 645) and GnRH (n = 587) groups were submitted for resynchronization with a CO-Synch protocol. Briefly, cows received 100 μg GnRH, im, on Day 0 (35 ± 3), 25 mg $PGF_{2\alpha}$ (25 mg of dinoprost tromethamine sterile solution, Pfizer Animal Health, New York, NY, USA) on Day 7 (42 ± 3), and 100 μg GnRH, im, and AI 72 h later on Day 10 (45 ± 3; Fig.1).

Blood samples were collected on Days -7, 0, and 7 from a small subset of cows (n = 55) to determine serum progesterone concentrations. Cows were examined for pregnancy 35 ± 3 d after AI. Pregnant cows were re-examined at 63 ± 3 d to determine pregnancy loss. In the WA farm, non-pregnant cows were re-enrolled in the study or subjected to other reproductive protocols used on the farm. For the previous breeding, cows were bred on observed estrus (spontaneous or induced with 25 mg $PGF_{2\alpha}$) or synchronized with an Ovsynch protocol. The P/AI was calculated as the number of cows pregnant divided by the number of cows inseminated.

2.3. Progesterone assay

Blood samples were collected via coccygeal venipuncture into commercial blood collection tubes (Vacutainer, 10 mL, Becton Dickinson, Franklin Lakes, NJ, USA), placed immediately on ice, and centrifuged at 3,000 × *g* for 30 min for serum collection. Harvested serum was stored frozen at −20