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Pregnancy per artificial insemination after presynchronizing estrous cycles with the Presynch-10 protocol or prostaglandin $F_{2\alpha}$ injection followed by gonadotropin-releasing hormone before Ovsynch-56 in 4 dairy herds of lactating dairy cows[1]

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ABSTRACT

The objective was to determine the effect of 2 presynchronization treatments on first-service pregnancy per artificial insemination (P/AI) in 4 dairy herds during warm and cool seasons of the year. Cows with ear tags ending with even digits at calving were enrolled in Presynch-10 (Presynch-10): two 25-mg injections of $PGF_{2\alpha}$ (i.e., PG-1 and PG-2) 14 d apart. Cows with ear tags ending with odd digits were enrolled in PG-3-G: one 25-mg injection of PG (Pre-PG) 3 d before injection of 100 μg of GnRH (Pre-GnRH), with the Pre-PG injection administered at the same time as PG-2 in the Presynch-10 treatment. Ten days after PG-2 or Pre-PG, all cows were enrolled in a timed AI protocol (Ovsynch-56; injection of GnRH 7 d before GnRH-1 and 56 h after GnRH-2 PG with AI 16 to 18 h after GnRH-2). Median days in milk (DIM) at scheduled timed AI were 75 d, which did not differ among herds. Cows detected in estrus before the scheduled timed AI were inseminated early (early bred, EB). Pregnancy was diagnosed at d 32 to 38 and at d 60 to 66 after timed AI by transrectal ultrasonography or transrectal palpation. Data were analyzed with herd as a random effect and with fixed effects of treatment (EB, Presynch-10, or PG-3-G), parity (primiparous vs. multiparous), season [hot (June through September) vs. cool-cold (October through May)], DIM, estrus at timed AI (0 vs. 1), and all 2-way interactions with treatment. The P/AI at d 32 to 38 for EB (n = 472), Presynch-10 (n = 1,247), and PG-3-G (n = 1,286) were 31.4, 35.0, and 41.2%, respectively; P/AI at d 60 to 66 was 29.8, 32.2, and 37.3%, respectively. Season significantly influenced P/AI at d 32 to 38 and d 60 to 66, but a treatment by season interaction was not detected. The P/AI for PG-3-G and Presynch-10 treatments did not differ during cool-cold weather (d 32 to 38: 46.8 vs. 44.3%; d 60 to 66: 41.6 vs. 41.1%, respectively), but PG-3-G and Presynch-10 produced more P/AI than EB at d 32 to 38. During the summer, P/AI in PG-3-G was greater than in Presynch-10 (d 32 to 38: 35.9 vs. 26.7% and d 60 to 66: 33.2 vs. 24.4%, respectively), and P/AI in EB cows did not differ from that of Presynch-10 cows. Although pregnancy loss did not differ for EB, Presynch-10, and PG-3-G treatments (4.0, 6.7, and 9.3%, respectively), pregnancy loss from d 32 to 38 and d 60 to 66 was 2-fold greater in thinner cows (<2.5 vs. ≥2.5; 9.0 vs. 4.4%). We concluded that presynchronizing estrous cycles with PG-3-G produced more P/AI than inseminating cows at estrus during cooler weather and was superior to Presynch-10 during the summer.
Key words: Presynch-10, prostaglandin $F_{2\alpha}$-gonadotropin-releasing hormone-Ovsynch protocol, pregnancy per artificial insemination

INTRODUCTION

Timed AI programs facilitate control of estrous cycles in lactating dairy cattle and provide viable options to AI programs solely based on detection of estrus. The most commonly used timed AI programs are variations of the original Ovsynch protocol [Pursley et al., 1998; injection of GnRH 7 d before (**GnRH-1**) and 48 h after (**GnRH-2**) $PGF_{2\alpha}$ (**PG**), with timed AI administered 16 h after GnRH-2], which is used widely in the US dairy industry (Caraviello et al., 2006; Moeller et al., 2010).

When estrous cycles of lactating dairy cows are presynchronized to d 5 through 12 of the cycle before enrolling cows in the Ovsynch protocol, pregnancy per AI (**P/AI**) is further augmented (Vasconcelos et al., 1999). Standard presynchronization programs in which 2 injections of PG administered 14 d apart (**Presynch**) with the Ovsynch protocol initiated 14 d (**Presynch-14**; Navanukraw et al., 2004), 12 d (**Presynch-12;** Moreira et al., 2001; El-Zarkouny et al.,

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2004), 11 d (**Presynch-11**; Galvão et al., 2007), or 10 d later (**Presynch-10**; Stevenson, 2011; Stevenson et al., 2012) have been tested in lactating dairy cows. The Presynch programs generally improve P/AI compared with cows randomly allocated to Ovsynch alone (Moreira et al., 2001; El-Zarkouny et al., 2004; Navanukraw et al., 2004). Moreover, Presynch programs with shorter intervals of 11 d between the second Presynch PG injection (i.e., Presynch-11) and onset of Ovsynch improved P/AI compared with programs with longer intervals (Presynch-14; Galvão et al., 2007). One reason for improved P/AI with shorter Presynch intervals is greater ovulatory response to GnRH-1 (Vasconcelos et al., 1999; Galvão et al., 2007).

Other presynchronization schemes tested by first injecting PG and then GnRH 2 d (**G-6-G**; Bello et al., 2006) or 3 d later (**PG-3-G**; Peters and Pursley, 2002; Stevenson et al., 2012), followed in 6 or 7 d, respectively, by enrollment in the Ovsynch protocol, tended to improve P/AI. In addition, use of an Ovsynch protocol to presynchronize cows (i.e., nonbreeding Ovsynch) before the timed AI Ovsynch program (**Double Ovsynch**; Souza et al., 2008) resulted in improved P/AI compared with Presynch-12 in primiparous, but not in multiparous, cows. Regardless of presynchronization scheme, improved P/AI in timed AI programs is associated with (1) greater ovulation response to GnRH-1 of Ovsynch (Vasconcelos et al., 1999; Bello et al., 2006; Chebel et al., 2006; Stevenson et al., 2012), (2) more cows with a functional corpus luteum (**CL**; Galvão and Santos, 2010; Stevenson et al., 2012) or more CL per cow at GnRH-1 (Stevenson et al., 2012), (3) greater progesterone at GnRH-1 (Stevenson et al., 2012), and (4) greater ovulatory response to GnRH-1 and GnRH-2 injections of Ovsynch (Rutigliano et al., 2008; Galvão and Santos, 2010).

Most studies reported in the literature have excluded presynchronization and timed AI treatments during the summer. Dairy cows, whose estrous cycles were presynchronized with Presynch-12 or a progesterone insert-GnRH combination before a timed AI program and exposed to heat stress [temperature-humidity index (**THI**) >72; NOAA, 1976], were 5.8 times more likely to have poorer P/AI than those not exposed to heat stress (Rutigliano et al., 2008). Furthermore, cows in that study were 7.4 times more likely to abort an established pregnancy between 28 and 56 d of gestation. Compared with cooler conditions, chronic seasonal heat stress or hyperthermia alters follicular steroidogenesis, which leads to formation of suboptimal CL and reduced progesterone (Wolfenson et al., 2000); factors that likely reduce synchronization efficiency and subsequent fertility.

We recently demonstrated that the PG-3-G presynchronization program [PG followed in 3 d by GnRH (Stevenson et al., 2012), followed by the Ovsynch protocol 7 d after GnRH] produced more cows with CL, more CL per cow, greater progesterone, and greater ovulatory response to GnRH-1 than cows whose estrous cycles were presynchronized with Presynch-10 before applying the Ovsynch program. The objectives of the current study were to determine the effect of these 2 presynchronization treatments on first service P/AI in 4 dairy herds during hot and cool-cold seasons of the year and to validate our preliminary report (Stevenson et al., 2012) that suggested the superiority of the PG-3-G treatment for achieving greater P/AI.

MATERIALS AND METHODS

Experimental Cows

Lactating dairy cows from 4 herds in northeast Kansas were enrolled in the study. Three herds comprised cows calving from September 2010 through September 2011, with cows from the remaining herd calving from September 2009 through September 2011. All herds included cows that were milked three times daily and fed diets consisting of alfalfa hay, corn silage, soybean meal, whole cottonseed, corn or milo grain, corn gluten feed, vitamins, and minerals.

Experimental Design

At calving, 3,285 dairy cows (>95% were Holsteins, with the residual representing crosses of Holstein with Jersey, Brown Swiss, or Norwegian Red) were clustered into breeding groups weekly (herds 2, 3, and 4) or every 2 wk (herd 1). Characteristics of herds used in the experiment are summarized in Table 1. Enrollment in the study began at a median 42 DIM (41 ± 0.1 d; mean ± SE). Cows with ear tags ending with even digits were enrolled in Presynch-10: two 25-mg injections of PG (i.e., **PG-1** and **PG-2**; 5 mL of Lutalyse; Pfizer Animal Health, Madison, NJ) were administered 14 d apart (Figure 1). Cows with ear tags ending with odd digits were enrolled in PG-3-G: one 25-mg injection of PG (Pre-PG; 5 mL of Lutalyse; Pfizer Animal Health) 3 d before injection of 100 μg of GnRH (Pre-GnRH; 2 mL of Fertagyl; Merck Animal Health, Whitehouse Station, NJ), with the Pre-PG injection administered at the same time as PG-2 in the Presynch-10 treatment (Figure 1). Cows subsequently were enrolled in a timed AI protocol [Ovsynch-56; Brusveen et al., 2008; injection of GnRH 7 d before (GnRH-1) and 56 h after (GnRH-2) PG with AI 16 to 18 h after GnRH-2] 10