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Comparison of responses to Ovsynch between Holstein-Friesian and Swedish Red cows

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ABSTRACT

The Ovsynch protocol was designed to synchronize ovulation, thereby allowing timed artificial insemination (TAI) of all cows without detection of estrus. However, the effectiveness of Ovsynch in different breeds of dairy cows has not been previously compared. The aim of this study was to compare the response to Ovsynch in cycling lactating Holstein-Friesian (HF) and Swedish Red (SR) dairy cows. A total of 495 cyclic cows (n = 347 HF, n = 148 SR) were housed together and treated with Ovsynch (GnRH – 7 d – $PGF_{2\alpha}$ – 56 h – GnRH – 16 to 18 h – TAI). Ovulatory responses, synchronization rate, maximal follicle size at the time of AI, and percentage of pregnant cows per AI (P/AI at 31 and 62 d after AI) were compared between breeds. Ultrasonography was performed during Ovsynch at first GnRH, $PGF_{2\alpha}$, at time of AI, and 7 d after AI. Ovulatory response and synchronization rate were similar in HF versus SR cows (60.2 vs. 62.2%; 88.4 vs. 88.5%, respectively). Cows that ovulated to the first GnRH of Ovsynch had smaller follicle size at AI (15.9 ± 0.1 vs. 16.4 ± 0.2 mm). Maximal follicle size at AI was greater for HF (16.4 ± 2.2 mm) than SR (15.5 ± 2.3 mm) cows. The P/AI was greater for SR than HF cows at the 62-d pregnancy diagnosis (56.1 vs. 46.1%). In addition, pregnancy loss between 31 and 62 d of pregnancy was greater in HF (10.1%) than SR (3.5%) cows. Fertility was less in HF cows during the hot season (57.7 in cold vs. 38.1% in the hot season), whereas such a decrease was not observed in SR (60.0 in cold vs. 53.5% in the hot season) cows. Thus, although the GnRH treatments of Ovsynch were equally effective in SR and HF cows, pregnancy outcomes (P/AI at d 62 and pregnancy survival) were greater in SR than HF cows, and P/AI in SR cows was not compromised during the hot season as was found for HF cows.

Key words: breed, dairy cow, Ovsynch, reproduction

INTRODUCTION

Timed artificial insemination (**TAI**) programs have become important tools for reproductive management on many commercial dairy farms (Pursley et al., 1997; Rabiee et al., 2005; Souza et al., 2008). Many of the TAI programs are based on the original Ovsynch protocol that can be used to synchronize time of ovulation at first and subsequent AI in lactating dairy cows (Pursley et al., 1997). Numerous research reports are available comparing Ovsynch, modifications of Ovsynch, and various other reproductive management strategies. A meta-analysis done in 2005 found 71 trials in 53 research publications with sufficient experimental details for inclusion in the analysis (Rabiee et al., 2005). Overall, no differences were detected between Ovsynch and other reproductive management strategies; however, the variation in conception rates between herds (Jemmeson, 2000) and between trials was substantial (Rabiee et al., 2005).

The response to each hormone administration during the Ovsynch protocol can dramatically alter success of the program. Substantial variation exists in the percentage of cows that ovulate in response to the first GnRH of Ovsynch depending on various factors particularly presynchronization strategy (Bello et al., 2006; Souza et al., 2008; Galvão and Santos, 2010). Generally, greater fertility is found in cows that ovulate to the first GnRH of Ovsynch compared with cows that do not ovulate to the first GnRH (Gümen et al., 2003; Bello et al., 2006; Galvão and Santos, 2010). Response to $PGF_{2\alpha}$ also is critical for Ovsynch success. Cows with greater concentrations of progesterone near AI, indicating a lack of complete luteolysis, have much lower fertility (Moreira et al., 2001; Souza et al., 2008; Galvão and Santos, 2010).

Several studies found effects of various physiological factors on fertility following Ovsynch. One of the most critical factors has been the cyclicity status of cows at

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the start of Ovsynch. Ovulatory response to first GnRH and synchronization rate to Ovsynch were greater in noncycling than cycling dairy cows (Gümen et al., 2003; Karakaya et al., 2009), although fertility was lower in the cows that were noncycling before Ovsynch (Gümen et al., 2003). Other cow factors that alter success with Ovsynch include stage of the estrous cycle at the start of Ovsynch, DIM, parity, and service number (Bello et al., 2006; Souza et al., 2008; Galvão and Santos, 2010). For example, primiparous cows generally have enhanced fertility compared with multiparous cows following Ovsynch (Gümen et al., 2003; Tenhagen et al., 2003; Souza et al., 2008). In addition, synchronization rate to Ovsynch and percentage pregnant per AI (**P/AI**) were greater when cycling cows began Ovsynch on d 5 to 12 of the cycle compared with earlier or later times (Vasconcelos et al., 1999; Moreira et al., 2001; Bello et al., 2006). Several presynchronization programs have been developed to optimize the cycle stage at the start of Ovsynch (Moreira et al., 2001; Bello et al., 2006; Souza et al., 2008).

It seems likely that dairy cow breed could have substantial effects on responses to Ovsynch, although we have been unable to locate any studies that directly compared the response of different dairy breeds to the Ovsynch protocol. Previous studies evaluated Ovsynch in various breeds of beef cattle (Geary et al., 2001; Lamb et al., 2010), in dairy cattle under grazing conditions (Cordoba and Fricke, 2001; Cavestany et al., 2007) and with different breeds of sires (Pegorer et al., 2007), and in buffalo (de Araujo Berber et al., 2002). Because of the lack of direct comparisons between breeds, this study was undertaken to compare the response to Ovsynch in Holstein-Friesian and Swedish Red dairy cattle. To eliminate the effect of cyclicity status, only cows that were cycling were used in this study.

MATERIALS AND METHODS

Cows, Housing, and Management

This experiment was conducted on a commercial dairy herd in the South Marmara region, Bursa, Turkey. The dairy herd consisted of approximately 1,000 lactating cows comprising purebred Holstein-Friesian (**HF**; approximately 65% of herd; original Holstein-Friesian cows imported from Sweden in May 2005) and purebred Swedish Red (**SR**; approximately 35% of herd; originally imported from Sweden in May 2005) cows. All breedings were by AI using commercial semen from HF (>10 sires) and SR (4 sires) sires, used on the same breed of dairy cows. Both breeds of cows were housed together in the same freestall barns, and all pens had fans and sprinklers that were activated during the hotter months of the year. All cows were milked 3 times daily. Mean milk production of the herd was 9,880 ± 69.7 kg (305 d) per cow. Cows were fed a TMR formulated based on NRC recommendations (NRC, 2001). Daily milk yield, reproductive, health, and management records for each cow were collected on the Alpro 2000 system (DeLaval, Tumba, Sweden). Average milk production for each cow was recorded during the 7 d before and 7 d after AI (14 d average).

To determine the effects of season on fertility, daily average temperature was determined throughout the experiment using temperature records from the Turkish State Meteorological Services (2009). The average temperature during each month was determined and based on these data; the hot season was designated as May to September and the cold season was designated from October to April. The mean daily temperature for the hot and cold periods was 21.8 ± 3.8°C and 9.4 ± 2.7°C, respectively. All protocols involving cows used in this research were approved by the Lalahan Livestock Central Research Institute Animal Care Committee.

Examinations

A total of 495 cycling lactating dairy cows was included (n = 347 HF and n = 148 SR) in the study. Before including cows, ultrasound evaluation of their ovaries was performed to determine the cyclic status of each cow. The ultrasonographic examinations were performed with a Honda HS 2000 equipped with a 7.5-MHz transducer (Honda, Tokyo, Japan). The ovaries were evaluated and the presence of a corpus luteum was used as evidence of cyclicity. The ovaries were evaluated again 7 d later, and any cow without a corpus luteum at either of these examinations was designated as anovular and was not used. In addition, any cows with evidence of uterine or vaginal infection were not used.

Healthy, nonpregnant, cycling cows that were more than 60 DIM were selected for the study and treated with the Ovsynch protocol. A total of 213 cows had AI at first service. Any cows that were not pregnant at pregnancy diagnosis and had a corpus luteum were used in the study. A total of 282 cows had AI at second or later services during the experiment. During the experimental period, any cows that were not pregnant at the pregnancy diagnosis and were cycling were included. The first GnRH (Buserelin acetate, i.m., 10 μg, Receptal, Intervet, Istanbul, Turkey) of Ovsynch was administrated on the day the cows were selected without regard to stage of the estrous cycle. Seven days after GnRH, $PGF_{2\alpha}$ (Cloprostenol, 500 μg, i.m., Estrumate, CEVA-DIF, Istanbul, Turkey) was administered. A second GnRH treatment (Buserelin acetate, 10 μg,