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ScienceDirect
Theriogenology 71 (2009) 534–542
Theriogenology
www.theriojournal.com

Strategic treatment of anovular dairy cows with GnRH

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Received 5 March 2008; received in revised form 8 August 2008; accepted 16 August 2008

Abstract

The primary objective was to evaluate fertility of anovular dairy cows given GnRH 4 d after first postpartum timed AI (TAI). Secondary objectives were to determine ovulatory response to treatment, effect of treatment on serum progesterone (P_4) concentrations, and the proportion with a short luteal phase. Lactating Holstein cows ($n = 1047$) were submitted for first postpartum TAI using a Presynch + Ovsynch protocol. Anovular cows were identified from an initial 1047 lactating Holstein cows using transrectal ultrasonography, based on the absence of a CL at the first GnRH injection of a Presynch + Ovsynch protocol, and anovular cows were randomly assigned to receive either no further treatment (Control, $n = 85$), or 100 μg of GnRH 4 d after TAI (GnRH treated; $n = 71$). For GnRH treated cows, 51% responded by ovulating a follicle in response to GnRH treatment 4 d after TAI; however, pregnancies per AI (P/AI) did not differ between GnRH treated cows that ovulated (36%) compared to GnRH treated cows that did not ovulate (21%). There was a quadratic effect of P_4 at the $PGF_{2\alpha}$ injection of Ovsynch on P/AI, and cows with $P_4 \geq 1$ ng/mL at the $PGF_{2\alpha}$ injection of Ovsynch had greater P/AI (41%) than cows with $P_4 < 1$ ng/mL (12%); however, no treatment difference was detected. Overall, P/AI did not differ between control (30.1%) and GnRH treated (29.6%) treatments for synchronized cows. Although treatment of anovular cows with GnRH 4 d after TAI failed to improve fertility, variation among cows in serum P_4 at the $PGF_{2\alpha}$ injection of Ovsynch dramatically affected fertility of anovular dairy cows.

Keywords: Anovulation; Dairy cow; GnRH; Ovsynch; Fertility

1. Introduction

The first step to establishing pregnancy among a group of postpartum lactating dairy cows is to submit all cows for AI service in a timely manner. The adoption of programs that synchronize ovulation for timed AI (TAI), such as Ovsynch (synchronization regimen using sequential injections of GnRH and $PGF_{2\alpha}$ to precisely time ovulation for TAI [1] or Presynch (postpartum regimen using two injections of $PGF_{2\alpha}$ to synchronize estrous cycles before applying Ovsynch [2,3]) + Ovsynch, allow dairy producers to submit cows for AI without estrus detection. Thus, producers are not only able to designate a voluntary waiting period but also a maximum number of d postpartum at which all cows receive TAI within a herd.

Farms aggressively using Ovsynch or Presynch + - Ovsynch to submit all cows for first postpartum TAI are able to designate all cows calving within a given calendar week to receive TAI at a desired day postpartum, within a range of ±3 d. Because this system allows all cows to be submitted for TAI (regardless of estrus detection), cyclicity status of individual cows before TAI is unknown. One concern with using Ovsynch in this manner is that noncycling

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0093-691X/$ – see front matter
doi:10.1016/j.theriogenology.2008.08.020

cows produce fewer pregnancies per AI (P/AI) and undergo more pregnancy loss than cycling herdmates [2,4,5]. The proportion of anovular cows submitted for first postpartum TAI is frequently reported to be between 20 and 30% [6–8], but ranges from 8% [9] to 55.7% [10].

A previous report showed that GnRH treatment 5 d after the GnRH + TAI of Presynch + Ovsynch tended to improve fertility [11]. Furthermore, the tendency for improved fertility was due to a treatment by cyclicity interaction, in which anovular cows treated with GnRH 5 d after TAI tended to have greater P/AI than untreated anovular cows. In that experiment, however, all anovular cows received a controlled drug releasing insert (CIDR) containing 1.38 g of progesterone (P_4) at the first GnRH injection of Presynch + Ovsynch for 7 d. Thus, it is unknown whether GnRH administration after TAI can improve P/AI in anovular cows not previously exposed to CIDR treatment, or if there is a synergistic interaction between P_4 before TAI and GnRH treatment after TAI.

The primary objective of this study was to evaluate P/AI for anovular dairy cows treated with GnRH 4 d after first postpartum TAI. Secondary objectives were to determine ovulatory response to GnRH treatment 4 d after TAI and the effect of GnRH treatment on circulating P_4, and proportion of anovular cows with a short luteal phase. Our hypothesis was that treatment of anovular cows with GnRH 4 d after first postpartum TAI would improve P/AI, possibly by reducing the proportion of cows undergoing a short luteal phase.

2. Materials and methods

2.1. Animals and reproductive management

Lactating Holstein dairy cows on a commercial dairy farm comprising approximately 1600 lactating cows located in south-central Wisconsin were enrolled into this study from 20 September 2005 to 23 May 2006. Cows were housed in free-stall barns with *ad libitum* access to water and were fed a total mixed ration consisting of corn silage and alfalfa silage with corn and soybean concentrate. Cows assigned to the study were coded by treatment, and 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, USA). This program also was used to track and record treatment groups, reproductive outcomes, individual cow events, and monthly milk production records for each cow enrolled in the experiment. Data from ''cowfile'' archives were transferred into a computer spreadsheet program (Microsoft Excel 2002, Microsoft Corporation, Redmond, WA, USA) for organization and manipulation of data before statistical analysis using SAS (SAS Institute Inc., Cary, NC, USA).

2.2. Identification of anovular cows

Cows (n = 1047) were allocated weekly to breeding groups, each of which included cows that had calved within a given calendar week, but had not yet received a first postpartum TAI (range = 15–47 cows/group). All cows received a hormonal synchronization protocol (Presynch + Ovsynch) using im injections of 100 μg of GnRH (2 mL Cystorelin; Merial Ltd., Duluth, GA, USA) and 25 mg of $PGF_{2\alpha}$ (5 mL of Lutalyse; Pfizer Animal Health, New York, NY, USA) before first postpartum TAI, as follows: $PGF_{2\alpha}$ (Days 45 $\pm$ 3 and 59 $\pm$ 3), GnRH (Day 71 $\pm$ 3), $PGF_{2\alpha}$ (Day 78 $\pm$ 3), GnRH 54 h after $PGF_{2\alpha}$, followed by TAI 16 h later (Day 81 $\pm$ 3 postpartum).

Of the 1047 cows examined at the first GnRH injection of Presynch + Ovsynch using transrectal ultrasonography, 190 (18%) were classified as anovular based on the absence of a CL, using the method of Silva et al. [6]. Briefly, all cows were presynchronized with two injections of $PGF_{2\alpha}$ given 14 d apart, with the second injection 12 d before the first GnRH injection of Ovsynch. The rationale was that cycling cows receiving Presynch treatment would be expected to have a midcycle CL at the first GnRH injection of Ovsynch. When the ultrasound method of Silva et al. [6] was compared to a previously published method using two low ($\leq$1.0 ng/mL) serum P_4 samples collected at the second $PGF_{2\alpha}$ and first GnRH injections of Presynch + Ovsynch to classify cows as anovular, the ultrasound method was found to have 85.7% sensitivity and 87.7% specificity. Only cows classified as anovular were randomized to receive: (1) no further treatment after TAI (Control); or (2) 100 μg GnRH 4 d after AI (GnRH treated). A body condition score measured on a scale of one to five, with one being emaciated and five being obese [12], was assigned to anovular cows at the time of diagnosis.

2.3. Assessment of ovarian structures, blood sampling, and pregnancy diagnosis

Ultrasound examinations, blood sampling, hormone injections, and body condition scoring were conducted while cows were restrained in feed line headlocks after the morning milking. All ovarian structures $\geq$5 mm in