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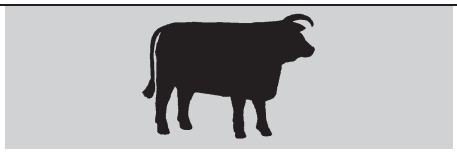

Evaluating heat detector patch response to determine gonadotropin-releasing hormone use at timed artificial insemination on pregnancy rates in beef cattle

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ABSTRACT

This study evaluated pregnancy rates in response to heat detector patch activation and the fate of gonadotropin-releasing hormone (GnRH) at timed AI (TAI) in a 7-d Co-Synch-plus-controlled intravaginal drug release (CIDR) protocol in beef cattle. Nulliparous heifers (n = 75) and lactating cows (n = 371) from 3 locations (n = 35, 139, and 198) were stratified by age, BW, BCS, and postpartum interval to a control (CON) or treatment (TREAT) group. All females received GnRH plus a CIDR insert on d 0, prostaglandin $F_{2\alpha}$, CIDR removal, and an Estrotect heat-detector patch on d 7. Beginning 54 h (heifers) and 72 h (cows) post-CIDR removal, a patch score (PS) was given (1 = unremoved; 2 = 35 to 65% removed; 3 = >65% removed or missing). All heifers and cows in the CON, regardless of PS, and TREAT with a PS 1 received GnRH at TAI; all TREAT heifers and cows with a PS 2 and 3 received no GnRH at TAI. No treatment by location interaction (P > 0.10) existed for TAI pregnancy rates; thus, data was pooled across location. Timed AI pregnancy rates were similar (P > 0.05) between the CON and TREAT groups for heifers (43.2 and 50.0%) and cows (62.7 and 59.7%). Pregnancy rates were similar (P = 0.22) among cows with a PS of 2 and 3 in both groups. Using a heat-detector patch to determine if GnRH is needed at TAI may be an option to reduce CIDR-based TAI protocol cost.

Key words: artificial insemination, beef cattle, gonadotropin-releasing hormone, heat-detector patch

INTRODUCTION

Less than 8% of all US beef cow or calf producers use estrous synchronization or AI according to the 2008 National Animal Health Monitoring System (NAHMS, 2008). The major factors contributing to this low use are (1) cost, (2) lack of facilities, (3) protocols were too complicated, (4) does not work, and (5) time and labor, with the latter being the primary reason. Strategies have been developed to decrease these limitations while enhancing pregnancy rates through synchronized ovulation (Twagiramungu et al., 1995a; Thompson et al., 1999; Lamb et al., 2001), heat detection aids (Perry, 2005), and the ability to inseminate all females at a predetermined time (Lamb et al., 2001; Larson et al., 2006). Foster et al. (2001) reduced the dosage of gonadotropin-releasing hormone (**GnRH**) 7-d before prostaglandin $F_{2\alpha}$ (**$PGF_{2\alpha}$**) administration and at 48-h timed AI (**TAI**) and reported similar pregnancy rates to those females receiving the recommended 100-μg dose of GnRH.

Controlled intravaginal drug release insert (**CIDR**)-based protocols that use GnRH and TAI are much more

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costly to producers. In an effort to minimize cost, Walker et al. (2005a) reported similar pregnancy rates from replacement heifers not receiving GnRH at TAI in a 7-d Co-Synch-plus-CIDR-based protocol; although 1 of 3 locations did report a 14% increase in TAI pregnancy rates with GnRH administered at TAI. Heat mount detectors, such as the Estrotect patch, have provided producers with the ability to identify females in standing estrus with 97% accuracy (Perry, 2005), but have not been evaluated in studies in conjunction with estrous synchronization protocols to alleviate some of the cost.

Currently, no research exists using these heat detection aids to determine if GnRH is warranted at TAI, following the 7-d Co-Synch-plus-CIDR protocol. Recent studies have reported that the mean interval to standing estrus for heifers in a GnRH and CIDR-based protocol is 48 to 54 h (Lamb et al., 2006), and for cows in a 7-d Select Synch and CIDR-based protocol is 65 h following $PGF_{2\alpha}$ (Wilson et al., 2010). If a heat-detector patch was used to identify the majority of females that exhibit estrus within this window following $PGF_{2\alpha}$, timing of insemination at 54 h for heifers and 66 or 72 h for lactating cows should maximize TAI pregnancy rates, regardless of whether GnRH is given at TAI.

We hypothesized that females responding to a 7-d Co-Synch-plus-CIDR estrous synchronization protocol by exhibiting a standing estrus should not require GnRH at TAI. Thus, the objective was to determine if no GnRH administered at TAI, based on an activated heat patch, affects TAI pregnancy rates in lactating beef cows and replacement heifers as compared with a 7-d Co-Synch-plus-CIDR protocol where GnRH is administered at TAI.

MATERIALS AND METHODS

This study was conducted during the spring and summer of 2013 at the Dean Lee (Alexandria, LA), Hill Farm (Homer, LA), and Red River (Bossier City, LA) Research Stations, units of the Louisiana State University Agricultural Experiment Station. Use of all animals in this experiment was approved by the LSU AgCenter Animal Care and Use Committee, protocol #A2012–03.

Animals and Management

Nulliparous Angus crossbred beef heifers from the Hill Farm Research Station (n = 75, BW = 361.6 ± 24.8 kg, BCS = 6.4 ± 0.31), multiparous lactating three-fourths Angus × one-fourth Brahman crossbred beef cows from the Dean Lee [n = 139, BW = 575 ± 63.7 kg, BCS = 5.6 ± 0.66, postpartum interval (**PPI**) = 58.2 ± 12.8], and Angus crossbred beef cows from the Hill Farm (n = 198, BW = 563 ± 55.5 kg, BCS = 5.5 ± 0.06, PPI = 67.4 ± 13.3 d) and Red River (n = 35, BW = 571 ± 49.8 kg, BCS = 6.0 ± 0.69, PPI = 65.0 ± 9.2 d) research stations were synchronized with the 7-d Co-Synch-plus-Eazi Breed CIDR (1.38 g of progesterone; Zoetis, Florham Park, NJ) protocol. Heifers and cows were stratified by age, BW, BCS, and PPI (cows only) to a control (**CON**) or treatment (**TREAT**) group. On d 0, all females were weighed, assigned a BCS (scale of 1 to 9 where 1 = emaciated and 9 = obese; Whitman, 1975) by 1 or 2 beef herd managers (depending on location), and received 100 μg (i.m.) of GnRH (Cystorelin, Merial, Athens, GA) plus a CIDR insert. On d 7, a 25-mg (i.m.) injection of $PGF_{2\alpha}$ (Zoetis) was followed by CIDR removal and an Estrotect Heat Detector (Rockway Inc., Spring Valley, WI) patch was placed on the backline between the hip bones and the tail head of each animal. Beginning at 54 (for heifers) and 72 h (for cows) post-CIDR removal, heat patches were scored and recorded. Estrotect patch scores (**PS**) were assigned based on activation of the patch film at TAI: 1 = unremoved (range of 0 to 35%), 2 = approximately 50% (range of 35 to 65%) of patch film was removed, and 3 = all or almost all (range of 65 to 100%) of patch film was removed or patch was completely removed from backline. All females in the CON group received a 100-μg (i.m.) injection of GnRH at TAI, regardless of PS. Females in the TREAT group either received a 100-μg (i.m.) injection of GnRH at TAI if a PS of 1 was given or no injection of GnRH at TAI if a PS of 2 or 3 was given. Heifers and cows at the Hill Farm and Red River Research Station were inseminated by the same AI technician and cows at the Dean Lee Research Station were inseminated by a different AI technician. Conventional semen from a single sire was used to inseminate all females at each location. All females were pasture exposed to bulls for 50 d beginning 14 d following TAI at each location. Timed AI and final pregnancy rates were determined at approximately 43 and 120 to 180 d following TAI using transrectal ultrasonography (5-MHz intrarectal transducer, Aloka 500V, Corometrics, Wallingford, CT).

Determination of Corpus Luteum Presence

No visual estrous detection was conducted in the current study. Ovarian ultrasonography was used for a portion of the heifers and cows at all locations to evaluate differences in TAI pregnancy rates with or without GnRH at TAI in response to corpus luteum (**CL**) presence or absence at CIDR insertion. Due to the time available to scan on certain days at CIDR insert, scanning of ovaries occurred on 70% of heifers, 78% of the cows at Hill Farm, 48% of the cows at Dean Lee, and 100% of the cows at Red River Research Station using transrectal ultrasonography with a 5-MHz intrarectal transducer.

Statistical Analysis

Treatment effects on the proportion of heifers and cows pregnant to TAI or overall pregnancy rates were tested using Proc GENMOD procedure (SAS Institute, Cary, NC) for binomial data. Fixed effects included treatment, location, CL presence