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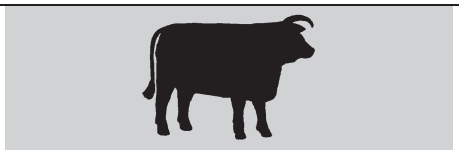

Sequential use of estrous-detection patches as a reproductive-management tool

A. J. Davis, T. D. Lester, E. A. Backes, and R. W. Rorie[1]
Department of Animal Science, University of Arkansas, Fayetteville 72701

ABSTRACT

This study investigated whether Estrotect estrous-detection patches could be used as a simple, cost-effective reproductive-management tool to identify cyclic animals before breeding, to distinguish between cows or heifers conceiving to AI versus natural service, and to determine seasonal pregnancy rate after bull removal. A secondary objective was to determine whether altering the timing of gonadorelin (GnRH) treatment in a 14-d progesterone-Select Synch synchronization protocol could reduce labor costs without reducing protocol effectiveness. Compared with cyclic status determined via ultrasonography, Chi-square analysis indicated that estrous-detection patches monitored for a 4-wk period were able to correctly identify 79% of cyclic and 86% of noncyclic heifers ($P < 0.01$). Estrous-detection patches were 96 and 98% accurate in identifying heifers and cows pregnant by AI, respectively. When compared with pregnancy data obtained via ultrasonography, estrous-detection patches were 76% accurate in identifying pregnant heifers and 87% accurate in identifying pregnant cows at the end of the breeding season ($P < 0.01$). Data indicated that accuracy of estrous-detection patches in predicting pregnancy depends upon cyclic status of the herd. Estrus was synchronized in lactating cows using a 14-d CIDR-Select Synch protocol where timing of GnRH administration occurred at time of CIDR removal (d 14) or 24 h later (d 15). In both treatments, prostaglandin $F_{2\alpha}$ was given 7 d after GnRH. Estrous response and AI pregnancy rates were similar ($P > 0.10$), regardless of timing of GnRH treatment. Treatment with GnRH at CIDR removal reduced labor costs and animal handling.

Key words: bovine, estrous-detection patch, estrous synchronization, reproductive management

INTRODUCTION

Reproductive management is the single-most-important factor contributing to the economic success of beef producers, with benefits including improved economic sustainability, quality of product, genetics, disease control, and convenience (Dziuk and Bellows, 1983). Unfortunately, many small, family-owned beef operations underuse basic reproductive-management practices because these practices are perceived as either too time or labor intensive, costly, or difficult to use (USDA NAHMS, 1994). Beef producers would be more likely to use reproductive-management practices if their application were more practical, inexpensive, and easy to use. Basic reproductive management might be achieved through the serial use of estrous-detection patches for (1) identification of cyclic animals before the breeding season, (2) detection of estrus before insemination, (3) distinguishing between cows or heifers conceiving to AI versus natural service, and (4) determining the seasonal pregnancy rate after bull removal.

Estrous synchronization can be used as a reproductive-management tool to facilitate AI and ensure more cows are cyclic at the start of the breeding season. Good estrous response (>80%) and AI pregnancy rates (>75%) have been achieved in lactating beef cows synchronized using a 14-d progesterone controlled internal drug-release insert (**CIDR**) treatment, followed by administration of gonadorelin (**GnRH**) on d 16 and prostaglandin $F_{2\alpha}$ (**PGF**) on d 23 (Powell et al., 2011). This estrous-synchronization protocol might be simplified, and associated labor costs reduced, if GnRH treatment could be given at the time of CIDR removal, without a loss in treatment effectiveness. Therefore, the objectives of this study were (1) evaluation of a simple, cost-effective reproductive-management tool, based on estrous-detection patches, and (2) evaluation of effects of timing of GnRH administration in a modified progesterone-Select Synch protocol on estrous response and AI pregnancy rates of beef cows.

[1] Corresponding author: rrorie@uark.edu

Table 1. Criteria for heifer reproductive-tract score (RTS)[1]

		Ovary			
RTS	**Uterine horn**	**Length, mm**	**Height, mm**	**Width, mm**	**Ovarian structures**
1	Immature, <20 mm in diameter, no tone	15	10	8	No palpable structures
2	20 to 25 mm in diameter, no tone	18	12	10	8-mm follicles
3	25 to 30 mm in diameter, slight tone	22	15	10	8- to 10-mm follicles
4	30 mm in diameter, good tone	30	16	12	>10-mm follicles, corpus luteum possible
5	>30 mm in diameter, good tone, erect	>32	20	15	>10-mm follicles, corpus luteum present

[1]Table adapted from Anderson et al. (1991). Heifers with an RTS of 4 or 5 were identified as cyclic.

MATERIALS AND METHODS

Angus-based cows (n = 149) and heifers (n = 81) from the University of Arkansas Savoy Beef Research Station were used in this study. At the start of the study, cows had a mean BW of 494.8 ± 64.3 kg, had a BCS of 5.5 ± 0.9, and were 57 ± 12.8 d postpartum. Heifers averaged 405.1 ± 12.7 d of age, with a mean BW of 282.1 ± 2.7 kg and BCS of 5.4 ± 0.5. Body condition was scored using a scale from 1 to 9, with a score of 1 being emaciated and 9 being extremely fat (Richards et al., 1986). All animal procedures were approved by the University of Arkansas Animal Care and Use Committee (IACUC protocol # 100014).

Evaluation of Pubertal Status of Heifers Before Breeding

Thirty days before the start of the estrous synchronization, each heifer received an Estrotect estrous-detection patch (Estrotect; Rockway Inc., Spring Valley, WI), which was adhered to the animal for a 4-wk period. In the area where the patch was to be placed, hair was clipped and skin was sprayed with a multipurpose spray adhesive (3M Super 77 Spray Adhesive, 3M Corp., St. Paul, MN) and allowed 30 to 45 s for the adhesive to get tacky. Patches were then placed on the rump, with the front edge of the patch in line with the hipbones. After the 4-wk patch-evaluation period, reproductive-tract scores (**RTS**) were assigned to all heifers based on transrectal ultrasonography (Ibex Pro, E.I. Medical Imaging, Loveland, CO) using the L6.2 transducer (8-5 MHz 66-mm linear array). Criteria for determining RTS are listed in Table 1 (Anderson et al., 1991). Heifers with RTS of 1 through 3 were considered as noncyclic, whereas heifers with RTS of 4 and 5 were considered as cyclic (Rosenkrans and Hardin, 2003). Accuracy of estrous-detection-patch data was compared with known cyclic status, as determined by RTS performed via ultrasonography.

Patches were evaluated using 2 separate scoring methods: a patch score (**PS**) of 1 to 4 or Yes or No designation based on subjective evaluation of the patch. The PS scoring method used the following scale: 1 = 25% or less of the patch had been activated, including minor scratches; 2 = up to 50% of the patch had been activated; 3 = up to 75% of the patch has been activated; and 4 = fully activated patch. With the Yes or No designation, an estrous-detection patch was considered activated when a minimum of 50% of the center portion of the patch was completely clean. Patches with minor wear due to scratching or environmental conditions were considered nonactivated. Any estrous-detection patches missing or torn loose were noted and considered a prediction failure in the analysis. For consistency, the same trained technician evaluated the patch of each individual animal weekly from a vehicle while heifers grazed.

Estrous Synchronization and Insemination of Heifers and Cows

Estrous cycles of heifers were synchronized, using a 14-d CIDR progesterone treatment (EAZI-Breed CIDR; 1.38 g of progesterone, Zoetis, Florham Park, NJ), followed by GnRH (100 μg i.m., Factrel, Zoetis) at CIDR removal on d 14, and prostaglandin $F_{2\alpha}$ (**PGF**; 25 mg i.m., Lutalyse, Zoetis) 7 d later on d 21. Cows were stratified across estrous-synchronization treatments based on ovarian ultrasonography (cows identified as having a corpus luteum, follicle >10 mm in diameter, or both were considered cyclic), BCS, postpartum interval, and weight. Cows were synchronized using the same protocol as heifers, except GnRH was administered either at CIDR removal (d 14; **GnRH$^+$0**) or 1 d after CIDR removal (d 15; **GnRH$^+$1**). At the time of GnRH administration to cows, ultrasonography was used to record the diameter (mm) of the largest follicle present on either ovary. Cows then received PGF 7 d after GnRH treatment. All heifers and cows received an Estrotect estrous-detection patch at the time of PGF treatment and were visually monitored by a trained observer for onset of estrus for a minimum of 30 min every 2 h from 0800 until 2000 h, then at 2400 and 0400 h, over a 72-h period. All animals observed in estrus were inseminated with conventional, frozen–thawed semen approximately 12 h after detected estrus. Any cows