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Efficacy of the 5 Day CO-Synch Estrous Synchronization Protocol with or without the Inclusion of a Controlled Internal Drug Release Device in Beef Cows

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Summary and Implications

To increase utilization of artificial insemination by beef producers, estrous and ovulation synchronization protocols must be re-evaluated in an attempt to reduce labor, cost, number of handlings, or a combination thereof without negatively impacting pregnancy rates. One potential way to reduce cost in these systems is through the strategic removal of hormones, such as the controlled internal drug release device (CIDR), from the protocol. While this concept has been tested in a 7 day synchronization protocol, it has not been evaluated in the newer 5 day synchronization protocols. The objective of this study was to compare TAI and overall breeding season pregnancy rates in primiparous and multiparous cows synchronized with the 5 d CO-Synch protocol with or without the inclusion of a CIDR. We hypothesized that use of a CIDR would improve timed-artificial insemination (TAI) and overall breeding season pregnancy rates. Results from this study indicate that while overall breeding season pregnancy rates are not impacted by removal of a CIDR in a 5 d CO-Synch protocol (90.3%; P = 0.94), TAI conception rates are improved when a CIDR insert is utilized (62.3 vs. 50.7%; $P < 0.001$). Based on these data, use of a CIDR in the 5 d CO-Synch program is still recommended to optimize pregnancy success in an AI management system.

Introduction

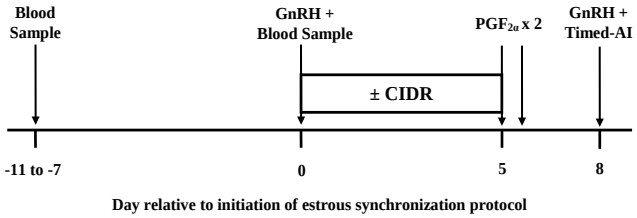
The 5 d CO-Synch + CIDR estrous synchronization protocol has been demonstrated to be an effective TAI protocol, and furthermore has resulted in greater TAI pregnancy rates than the 7 d CO-Synch + CIDR protocol in some studies. However, the additional recommended dose of $PGF_{2\alpha}$ (PGF) at CIDR insert removal as well as the cost associated with the use of CIDR inserts may limit adoption of 5 d program by producers.

Previous research has demonstrated that when using the 7 d CO-Synch protocol, inclusion of a CIDR increases TAI pregnancy rates by preventing the premature expression of estrus before PGF delivery and TAI. However, given the 2 d shorter duration between GnRH and PGF in the 5 versus the 7 d CO-Synch protocols, the incidence of premature estrus expression before TAI in the 5 d CO-Synch protocol may be less than previously observed with the 7 d CO-Synch protocol. However, failing to provide an exogenous progestin source to stimulate the resumption of estrous cycles in some females may result in reduced TAI pregnancy rates in primiparous, thin, or short postpartum cows that are more likely to be anestrus at the initiation of synchronization. Thus, the objective of this study was to compare TAI and overall breeding season pregnancy rates in primiparous and multiparous cows synchronized with the 5 d CO-Synch protocol with or without the inclusion of a CIDR. We hypothesized that use of a CIDR would improve timed-artificial insemination (TAI) and overall breeding season pregnancy rates.

Materials and Methods

The experiment was conducted in 879 cows over 2 years, and at 3 locations with a total of 5 replications. Cows were blocked by breed and parity (primiparous or multiparous) and stratified by days postpartum within block. Cows were then randomly assigned within strata to either the CIDR (n = 445) or NoCIDR (n = 438) treatment. Blood samples were collected to determine estrous cyclicity status at 11 (reps 4 and 5) or 7 (reps 1-3) days prior to, and at ovulation synchronization initiation. Cows were determined to be cyclic if either or both blood samples contained circulating progesterone concentrations > 1 ng/mL.

Figure 1. Experimental Design



The experimental design is illustrated in Figure 1. Specifically, on d 0 all cows received GnRH (100 µg; Cystorelin®, Merial, Duluth, GA) and cows in the CIDR treatment received a CIDR (CIDR®, Pfizer Animal Health, New York, NY). On d 5, CIDR inserts were removed from the CIDR treatment and all cows received 2 separate doses of $PGF_{2\alpha}$ (25 mg/dose; Lutalyse®, Zoetis Animal Health, New York, NY) between 2 and 10 h apart. Cows were TAI

72 h after CIDR removal (d 8), concurrent with GnRH (100 µg; Cystorelin®).

Timed-AI and breeding season pregnancy rates were determined via ultrasonography 32 to 38 d after TAI and end of the breeding season, respectively. Data were analyzed with the GLIMMIX procedure of SAS for binomial distribution.

Results and Discussion

Timed-AI (TAI) pregnancy rate was greater in the CIDR treatment ($P = 0.0001$; Table 1) and a similar pattern was noted across all replications (Figure 2). However, there was no effect of days postpartum on TAI pregnancy rates, and there was no interaction between postpartum interval and treatment relative to TAI pregnancy rates ($P = 0.55$). This may be due to the high proportion of cyclic cows enrolled in the study (87.1%, data not shown).

Although CIDR improved pregnancy rate to TAI in both primi- and multiparous cows, a treatment * parity interaction was observed ($P = 0.08$; Figure 3). The magnitude of improvement due to CIDR treatment was greater in primiparous than multiparous females. It was assumed initially that this interaction may be the result of more anestrous cows in the primiparous group, however, 88.9% of primiparous females were cycling at the onset of estrous synchronization. Also unexpectedly, there was no treatment by reproductive status effect on TAI pregnancy rates ($P = 0.14$; Figure 4), which again is likely due to the limited number of anestrous cows in the study.

Although breeding season pregnancy rate did not differ due to treatment ($P = 0.94$), a greater proportion of multiparous females became pregnant during the breeding season than primiparous females ($P = 0.04$); however, the cause of this is not clear.

In conclusion, these data indicate that TAI conception rates are improved when a CIDR insert is utilized in the 5 d CO-Synch protocol.

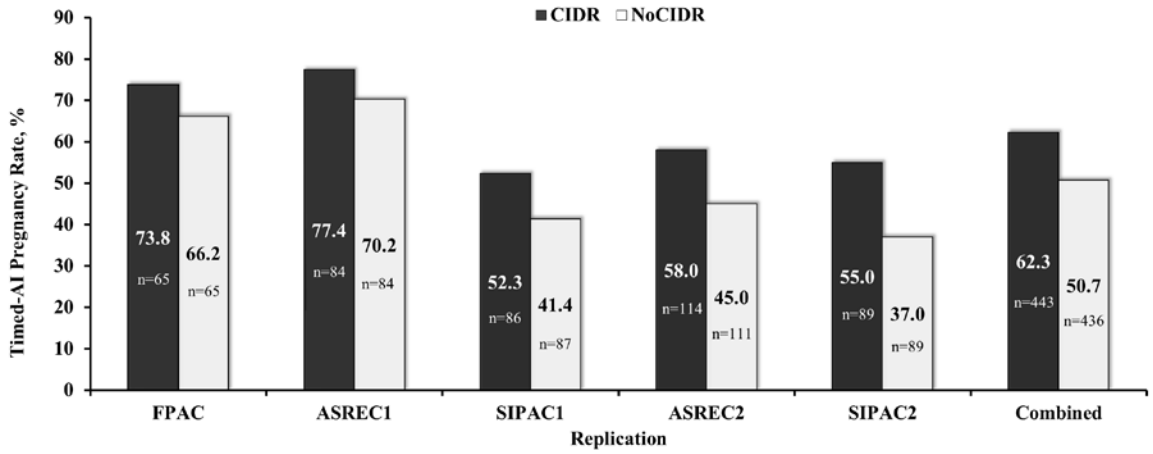


Figure 2. Effect of the 5 day CO-Synch + CIDR (C) or 5 day CO-Synch (NC) protocols on timed-AI pregnancy rates in suckled beef cows ($P < 0.001$).

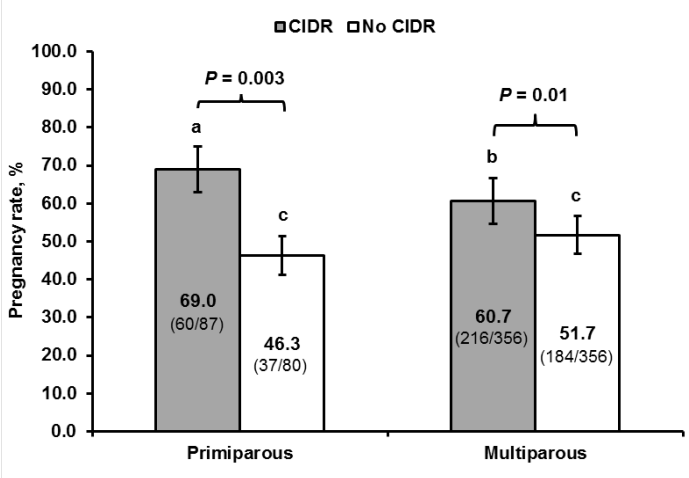


Figure 3. Treatment × parity interaction ($P = 0.08$) for timed artificial insemination pregnancy rates in beef cows that had ovulation synchronized using the 5 day CO-Synch + CIDR (C) or 5 day CO-Synch (NC) protocols. Across parity, bars lacking a common superscript differ ($P \leq 0.05$).

Table 1. Timed artificial insemination, overall breeding season pregnancy rates and resorption rates in beef cows synchronized for ovulation with a 5 day CO-Synch protocol with or without the inclusion of a CIDR.

	Treatment[1]			
Item	CIDR	NoCIDR	Combined	*P*-Value[2]
	% (no./no.)[3]			
Timed-AI pregnancy rate				
Treatment	62.3 (276/443)[a]	50.7 (221/436)[b]	56.5 (497/879)	0.0001
Parity[4]				0.37
Primiparous	69.0 (60/87)[a]	46.3 (37/80)[b]	58.1 (97/157)	
Multiparous	60.7 (216/356)[a]	51.7 (184/356)[b]	56.2 (400/712)	
Reproductive status[5]				0.76
Cyclic	63.5 (241/380)[a]	49.7 (187/377)[b]	56.5 (428/757)	
Anestrous	55.4 (31/56)	57.4 (32/56)	56.3 (63/112)	
Breeding season pregnancy rate				
Treatment	90.5 (402/444)	89.9 (393/437)	90.2 (795/881)	0.94
Parity				0.004
Primiparous	83.9 (73/87)	83.8 (67/80)	83.8 (140/167)[y]	
Multiparous	92.2 (329/357)	91.3 (326/357)	91.7 (655/714)[z]	
Reproductive status				0.14
Cyclic	91.0 (345/379)	90.5 (341/377)	90.7 (686/756)	
Anestrous	85.7 (48/56)	89.1 (49/55)	87.4 (97/111)	
Resorption rate[6]				
Treatment	2.5 (7/276)	3.2 (7/221)	2.8 (14/497)	0.68
Parity				0.79
Primiparous	3.3 (2/60)	2.7 (1/37)	3.1 (3/97)	
Multiparous	2.3 (5/216)	3.3 (6/184)	2.8 (11/400)	
Reproductive status				0.52
Cyclic	2.9 (7/241)	3.2 (6/187)	3.0 (13/428)	
Anestrous	0 (0/31)	3.2 (1/31)	1.6 (1/62)	

[1] 5 d CO-Synch ovulation synchronization protocol with (CIDR) or without (NoCIDR) inclusion of a CIDR.
[2] Main effects of treatment, parity, reproductive status.
[3] Results are presented as the proportion of cows pregnant within treatment and classification. The number of cows pregnant divided by the number of cows in which pregnancy status was determined is presented in parentheses.
[4] A treatment × parity interaction was observed ($P = 0.08$; Figure 2).
[5] There was no treatment × reproductive status interaction ($P = 0.14$).
[6] Of cows diagnosed at pregnant to timed-AI at initial pregnancy detection, the proportion of cows that were diagnosed as open or not pregnant to timed-AI at final pregnancy detection.
[a,b] Within row, means lacking a common superscript differ due to treatment ($P \leq 0.05$).
[y,z] Within column, means lacking a common superscript differ ($P \leq 0.05$).