Effect of Two Estrus Synchronization Protocols on Reproductive Performance of May Calving Cows

John D. Harms
Adam F. Summers
Jacqueline A. Musgrave
Rick N. Funston[1]

Summary

The objective of this experiment was to determine the effectiveness of fixed-time AI utilizing one of two estrus synchronization protocols, CO-Synch or CO-Synch + CIDR, in May-calving cows. Cows synchronized with the CO-Synch + CIDR protocol had increased AI and overall pregnancy rates compared to cows synchronized utilizing the CO-Synch protocol. Due to increased AI pregnancy rates, CO-Synch + CIDR cows calved earlier, resulting in a greater proportion of cows calving within the first 21 days of the calving season compared to CO-Synch cows.

Introduction

In Nebraska, cow-calf producers primarily breed cows for spring calving. The breeding season for these cows coincides with high forage nutrient values. However, harvested forage inputs may be increased to support the cow maintenance demands during late gestation and early lactation. Moving the calving season to early summer could reduce harvested forage inputs, but requires cows to be bred during reduced forage nutrient quality and increased temperatures, possibly impacting reproductive performance. Estrus synchronization may allow more cows to become pregnant earlier as forage quality declines throughout the breeding season. Other benefits include a shortened calving season, increased calf uniformity, and a decrease in AI labor.

To achieve these benefits created by estrus synchronization, numerous protocols using $PGF_{2\alpha}$, GnRH, and/or a progestin have been developed that induce cyclicity and successfully syn-chronize estrus in beef cows (*Journal of Animal Science,* 1999, 77:1823-1832). Utilizing the CO-Synch protocol, 5-15% of cows will exhibit estrus before and immediately after $PGF_{2\alpha}$ administration, resulting in a recom-mendation for fixed-time AI (TAI) 48 hours after $PGF_{2\alpha}$ administration (*Journal of Animal Science*, 2010, 8:E181-E192). Previous studies have reported TAI 56+ hours after $PGF_{2\alpha}$ administration results in improved AI pregnancy rates with CO-Synch + controlled internal drug release (CIDR; *Theriogenology*, 2009, 72:1009-1016). CO-Synch and CO-Synch + CIDR protocols were compared and the addition of the CIDR increased pregnancy rates following TAI 60 hours after $PGF_{2\alpha}$ injection, which may not have been optimum timing for the CO-Synch protocol (*Journal of Animal Science*, 2006, 84:332-342). The objective of this study was to compare the effects of utilizing a CO-Synch or CO-Synch + CIDR TAI on reproductive performance of May calving cows.
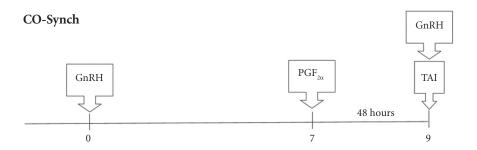
Procedure

The University of Nebraska–Lincoln Institutional Animal Care and Use Committee approved the procedures and facilities used in this experiment.

Cow Management

A two-year study utilized Red Angus × Simmental Cows (year 1 n=145; year 2 n=162) at the Gud-mundsen Sandhills Laboratory (GSL), Whitman, Neb. Cows were randomly assigned to one of two estrus synchro-nization treatments (Figure 1): GnRH (100 µg; i.m.) on day 0, $PGF_{2\alpha}$ (25 mg; i.m.) on day 7, and GnRH (100 µg; i.m.) with TAI 48 hours after $PGF_{2\alpha}$ (CO-Synch); or GnRH (100 µg; i.m.) and CIDR insertion on day 0, $PGF_{2\alpha}$ (25 mg; i.m.) and CIDR removal on day 7, and GnRH (100 µg; i.m.) with TAI 60 hours after $PGF_{2\alpha}$ (CO-Synch + CIDR). Five days after TAI, cows were placed with bulls for 45 days.
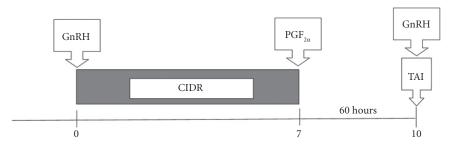
Figure 1. Estrus synchronization treatments, CIDR = controlled internal drug release; TAI = Time AI.

Final pregnancy rate was determined using transrectal ultrasonography 45 days after bull removal. Artificial insemination conception rates were determined based on calving date with days from TAI to calving calculated at 281 (± 4 days) based on average gestation lengths reported in previous literature (*Journal of Animal Science*, 2006, 84:332-342). Days to calving was calculated as days from TAI to calving for all cows that calved. Cow BW and BCS were measured at breeding, pregnancy determination, and calving.

Statistical Analysis

The study was replicated over a two-year period with cows being randomly assigned to one of two estrus synchronization protocols each year, thus animal was the experimental unit. Data were analyzed utilizing the MIXED and GLIMMIX procedures of SAS. The statistical model included synchronization protocol as the fixed effect with year and cow age as random effects. Calf sire and cow postpartum interval (calculated as calving date to TAI) were included in the original model, but were not significant sources of variation and were removed.

Results

Cow performance data are displayed in Table 1. Pregnancy by AI and final pregnancy rates were greater ($P < 0.01$) for CO-Synch + CIDR synchronized cows compared to CO-Synch synchronized cows. Previous research indicates progesterone from the CIDR increases pregnancy rates resulting in an earlier calving date (*Journal of Animal Science,* 2001, 79:2253-2259). Cow age, BW, and BCS were similar ($P \geq 0.13$) between synchronization treatments. Calving date and days to calving were greater ($P < 0.05$; Table 2) for the CO-Synch compared to the CO-Synch + CIDR protocols. However, no differences in calf birth BW, calf prebreeding BW, or

weaning BW were observed ($P \geq 0.09$; Table 2). There was a 56-day difference ($P < 0.05$) in postpartum interval between year 1 and year 2 as the cows were converted from March calving to May calving the first year of the study; however, AI and final pregnancy rates were similar ($P \geq 0.09$) between years. There was no year × treatment interaction for AI pregnancy rate, but there was for final pregnancy rate, where final pregnancy rate was similar in year 1, but greater for CO-Synch + CIDR in year 2 ($P < 0.01$). Although the CO-Synch protocol is less expensive (*Journal of Animal Science,* 2001, 79:1-4), a disadvantage of this protocol is a small percentage of beef cows exhibit estrus prior to the $PGF_{2\alpha}$ injection. Unless these cows are detected

in estrus and inseminated, they will fail to become pregnant to AI after the CO-Synch protocol. This is why the decreased time of AI (48 hours after $PGF_{2\alpha}$) has been recommended compared to the CO-Synch + CIDR (60 hours after $PGF_{2\alpha}$). The CO-Synch + CIDR protocol prevents estrus prior to CIDR removal (*Journal of Animal Science,* 2001, 79:2253-2259). In the current study, CO-Synch + CIDR resulted in greater AI and final pregnancy rates compared to CO-Synch alone.

[1]John D. Harms, Adam F. Summers, graduate students; Jacqueline A. Musgrave, research technician; Rick N. Funston, professor, West Central Research and Extension Center, North Platte, Neb.

Table 1. Effect of CO-Synch vs. CO-Synch + CIDR estrus synchronization protocol on cow reproductive performance.

Item	CO-synch[1]	CO-synch + CIDR[2]	SEM	*P*-value
Cow age, year	4.5	4.5	0.3	0.86
PPI[3], day	109	110	28	0.61
Prebreeding BW, lb	1165	1153	55	0.30
Prebreeding BCS	5.5	5.6	0.2	0.25
Pregnancy diagnosis BW, lb	1006	1003	70	0.77
Pregnancy diagnosis BCS	4.6	4.7	0.2	0.19
Precalving BW, lb	1093	1076	43	0.11
Precalving BCS	4.8	4.7	0.2	0.57
AI pregnancy rate, %	32	54	4	<0.01
Final pregnancy rate, %	86	95	5	<0.01

[1]CO-Synch = 100µg of GnRH (i.m.; day 0), 25 mg of $PGF_{2\alpha}$ (i.m.; day 7) 100µg of GnRH and TAI 48 hours after $PGF_{2\alpha}$.
[2]CO-Synch + CIDR = 100µg of GnRH and CIDR insertion (i.m.; day 0), 25 mg of $PGF_{2\alpha}$ and CIDR removal (i.m.; day 7), 100µg of GnRH and TAI 60 hours after $PGF_{2\alpha}$.
[3]Postpartum interval.

Table 2. Effect of CO-Synch vs. CO-Synch + CIDR estrus synchronization protocol on calving performance.

Item	CO-synch[1]	CO-synch + CIDR[2]	SEM	*P*-value
Calving date, Julian day	145	140	1	<0.01
Days to calving[3], day	293	288	1	<0.01
Calved first 21day, %	76	90	3	<0.01
Calf birth BW, lb	79	77	2	0.09
Prebreeding calf BW, lb	216	223	4	0.14
Weaning calf BW, lb	433	431	14	0.76

[1]CO-Synch = 100µg of GnRH (i.m.; day 0), 25 mg of $PGF_{2\alpha}$ (i.m.; day 7) 100µg of GnRH and TAI 48 hours after $PGF_{2\alpha}$.
[2]CO-Synch + CIDR = 100µg of GnRH and CIDR insertion (i.m.; day 0), 25 mg of $PGF_{2\alpha}$ and CIDR removal (i.m.; day 7), 100µg of GnRH and TAI 60 hours after $PGF_{2\alpha}$.
[3]Days to calving from TAI for all cows that calved.