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Effect of Estrus Synchronization with a Single Injection of Prostaglandin During Natural Service Mating

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Summary

Records from unsynchronized cows ($n = 2073$; 60-day breeding season) were compared with records from synchronized cows ($n = 517$; 45-day breeding season) collected between 2000 and 2006. A single injection of prostaglandin $F_{2\alpha}$ was administered approximately 108 hours after bull turn-in to synchronize estrus in spring calving mature beef cows. Estrus synchronization increased the percentage of cows calving in the first 21 days without affecting pregnancy rates. However, weaning BW of calves was not significantly different. Estrus synchronization improves synchrony of calving in a shorter breeding season with similar overall pregnancy rates.

Introduction

Estrus synchronization is primarily utilized in conjunction with artificial insemination. However, estrus synchronization is potentially beneficial to cattle producers using natural mating. A primary obstacle to increased usage of estrus synchronization is the labor associated with applying a synchronization protocol. Thus, a successful system will be easy to implement as well as cost effective. Prostaglandin $F_{2\alpha}$ (PGF) causes lysis of the corpus luteum when administered at least 96 hours after ovulation; however, the corpus luteum is not responsive to PGF prior to this time. Standing estrus will occur between 48 and 96 hours after PGF in cyclic females. Whittier et al. (1991, *Journal of Animal Science*, 69:4670-4677) found a single injection of PGF administered 96 hours after bull turn-in increased the percentage of cows calving in the first 50 days of the calving season.

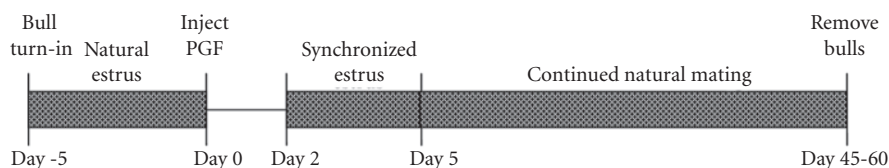


Figure 1. Breeding season protocol.

However, they did not detect a difference in the percentage calving in the first 21 days, nor did they measure weaning BW of the resulting calf crop. Data from our group (Larson et al., 2008 *Proceedings of the Western Section of the American Society of Animal Science*, abstract no. 74) indicate more heifers given PGF 96 hours after bull turn-in calved in the first 21 days of the breeding season. Further research is needed to evaluate the effect of this system in mature, lactating cows.

Procedure

All procedures were approved by the University of Nebraska Institutional Animal Care and Use Committee.

Breeding, calving and weaning data were collected from the research herd at the Gudmundsen Sandhills Laboratory (GSL) near Whitman, Neb. The data for the spring calving herd, collected between 2000 and 2008, were used for the purposes of this analysis. The breeding season begins on approximately June 15 for the spring calving herd. Natural service mating was used for all cows greater than or equal to three years of age. Bulls remained with the cows for 60 days in years where no estrus synchronization was used and for 45 days in years where estrus synchronization was used. The exception was a subset of cows used in a current nutritional experiment, which were exposed to bulls for 60 days during the synchronized spring breeding season in 2007 (118 cows). The bull-to-cow ratio was at least 1:25 in all years. Pregnancy was diagnosed via rectal palpa-

tion approximately 45 days following bull removal. As varying nutritional and breeding treatments are applied to the yearling heifers during breeding, two-year-old cows were removed from this analysis to avoid confounding the results.

Estrus was synchronized using a single injection of PGF administered 108 hours after fertile bulls were turned in with each respective cowherd (Figure 1). Estrus was synchronized during the 2006 and 2007 breeding seasons (517 individual records), resulting in synchronized calving seasons in 2007 and 2008. These results were compared to the data collected between the 2000 and 2006 calving seasons resulting from unsynchronized breeding between 1999 and 2005 (2073 individual records). Weaning data also were analyzed for the 2007 weaned calves (208 individual records) and compared to those weaned between 2000 and 2006 (1790 individual records). The continuous data were analyzed using the MIXED procedure of SAS and binomial data with the GLIMMIX procedure of SAS. The model included the fixed effect of synchronization, the random effects of year and any treatments imposed on each particular herd within each year.

Results

The data for the spring calving herd are displayed in Table 1. The synchronized subset of data was generated for the 2007 and 2008 calving seasons and the unsynchronized

(Continued on next page)

subset was generated for the years between 2000 and 2006.

Calf birth date was similar ($P = 0.60$) for synchronized and unsynchronized cows, as was calf birth weight ($P = 0.48$). Average calving difficulty score was defined, where 1 = no assistance and 3 = difficult assist. Calving difficulty score was similar ($P = 0.16$) for unsynchronized and synchronized cows. The percentage of male calves was unaffected ($P = 0.93$) by synchronization scheme. Perhaps most interesting, synchronization increased the percentage calving in the first 21 days ($P = 0.002$) by 11% (74.9% vs. 63.2%, synchronized vs. unsynchronized, respectively). The mechanism underlying this synchronization system relies on the observation that the corpus luteum (CL) is unresponsive to PGF within 96 hours after ovulation. Thus, bulls are allowed to inseminate cows at natural estrus for approximately five days; cows inseminated during this period will not respond to PGF. On day 5, PGF is administered to all cows and the bulls inseminate cows at synchronized estrus following PGF, as described in Figure 1. It is imperative to administer PGF at the correct interval to avoid destroying the CL in cows inseminated on the day of bull turn-in. These data agree with previously published research on both mature cows and replacement heifers. However, calf birth date was unaf-

Table 1. Effect of estrus synchronization using PGF in a spring calving herd.

	Non-synchronized	Synchronized	SEM	P-value
n	2073	518		
Calf birth date, julian day	86	85	2	0.60
Calf birth weight, lb	83	82	2	0.48
Calving ease score ¹	1.1	1.0	0.1	0.16
Calved in the first 21 days, %	63	75	3	0.002
Sex, % male	52	52	2	0.93
Pregnant, %	95	94	2	0.72
n	1597	414		
Weaning weight, lb	488	506	30	0.58
Cow weight at weaning, lb	1116	1113	31	0.92
Cow BCS at weaning	5.2	5.2	0.1	0.78

¹1 = No assistance, 2 = easy assist, 3 = difficult assist.

affected, which may seem counterintuitive. Most likely, those cows failing to conceive at synchronized estrus were inseminated 21 days later; thus, average calving date was unaffected. Still, more calves were born early in the season with estrus synchronization. As more calves are born earlier in the season, one may expect weaning weight to be increased. However, while there was a numerical increase in calf weaning weight, the difference was not significant ($P = 0.58$). Finally, pregnancy rate of the dam was unaffected ($P = 0.72$) by previous synchronization scheme.

Estrus synchronization increased the percentage of cows calving in the first 21 days of the season (Table 1). This indicates more cows were mated by natural service early in the

breeding season. In addition, the breeding season was shortened from 60 to 45 days for unsynchronized and synchronized seasons, respectively. The average calving date was unaffected by estrus synchronization, as were pregnancy rates. These data indicate that the majority of cows failing to conceive became pregnant at the subsequent mating. In summary, estrus synchronization using a single injection of prostaglandin improves synchrony of calving without sacrificing pregnancy rate in a 45-day breeding season.

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