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Addition of estradiol cypionate and (or) calf removal to a modified MGA + CO-Synch protocol for fixed-time artificial insemination of beef cows (2004)

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ADDITION OF ESTRADIOL CYPIONATE AND(OR) CALF REMOVAL TO A MODIFIED MGA + CO-SYNCH PROTOCOL FOR FIXED-TIME ARTIFICAL INSEMINATION OF BEEF COWS[1]

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Summary

A study was conducted in 735 suckled beef cows to determine if synchronization of ovulation could be improved with estradiol cypionate (ECP) and(or) 48-hour calf removal in a modified MGA + CO-Synch protocol. All cows were fed melengestrol acetate (MGA) (0.5 mg/cow) daily for 14 days (days -32 to -19 of the experiment) and received an injection of gonadotropin-releasing hormone (GnRH) on d -7, an injection of prostaglandin $F_{2\alpha}$ (PGF) on day 0, and received a fixed–time artificial insemination (AI) at 72 hours after PGF. Treatments were applied in a 2 x 2 factorial arrangement. Calves either remained with cows (suckled) or were removed for 48 hours, beginning 24 hours after PGF and continuing until after the fixed-time AI (calf removal). Cows received either ECP at 24 hours after PGF or received GnRH concurrent with the fixed-time AI. AI pregnancy rates were similar for cows receiving ECP (48%) or GnRH (45%). Cycling status influenced the response to calf removal. Noncycling cows whose calves were removed had greater AI pregnancy rates than suckled cows, 37% vs. 27%, respectively. When calves were not removed, GnRH given at fixed-timed AI resulted in pregnancy rates similar to ECP and did not require additional handling of the cows. In the herd of mature cows with body condition scores near 5 and that had calved 75 to 80 days before the time of AI, the MGA + CO-Synch system used in this study produced AI pregnancy rates of 50% or better without heat detection.

Introduction

Early estrus-synchronization protocols were designed to shorten the artificial insemination (AI) period, but today's protocols are designed to synchronize ovulation. This may seem like an insignificant difference, but in reality it is a big improvement. The estrogen that produces behavioral estrus is also responsible for inducing the luteinizing-hormone (LH) surge that causes ovulation. Reducing or eliminating the time variability between the onset of estrus and the timing of the LH surge should facilitate fixed-time inseminations.

Tools available to synchronize ovulation include administration of estrogen and removing the suckling stimulus. An injection of estrogen synchronizes the onset of the LH surge by giving each cow the appropriate signal at the same time, regardless of current concentrations of endogenous estrogen. Short-term calf removal has been shown to induce ovulation in non-cycling cows. Removal of the suckling

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stimulus may also tighten the synchrony of estrus and ovulation in cycling cows. Calf removal can provide several logistical benefits to a synchronization program, particularly in a large-pasture setting. When calves are locked up, cows will remain close to working pens, so when cows express estrus early, they are more easily detected and gathered for AI. At fixed-time AI, less effort is required to gather cows and calves that are already sorted.

The objective of this study was to determine if synchronization of ovulation in a modified MGA + CO-Synch system is improved with the addition of estradiol cypionate (ECP) and(or) calf removal.

Experimental Procedures

Purebred suckled Angus, Simmental, and Hereford cows and crossbred suckled cows (n=735) from three university herds were used (Agriculture Research Center-Hays, Cow-Calf Unit, and Purebred Unit) over two years. All cows were fed melengestrol acetate (MGA; 0.5 mg/cow) daily for 14 days (days -32 to -19 of the experiment) and received an injection of gonadotropin-releasing hormone (GnRH; (Factrel; 2 cc) on d -7, an injection of prostaglandin $F_{2\alpha}$ (PGF; Lutalyse; 5 cc) on d 0, and a fixed-time AI at 72 hours after PGF. The MGA was incorporated into 4 lb of a cubed supplement and fed on the ground at ARC-Hays and fed as part of a grain mix at other locations

Within herd, treatments were assigned by breed and age of cow and by calving date. Treatments were applied in a 2 x 2 factorial arrangement (Figure 1). Calves either remained with cows (suckled) or were removed for 48 hours, beginning 24 hours after PGF and continuing until after the fixed-time AI (calf removal). Cows received either ECP (0.5 mg; i.m.) at 24 hours after PGF or received GnRH (Factrel; 2 cc) concurrent with the fixed-time AI.

During the 48 hours of calf removal, calves were offered good quality oat or alfalfa hay and had access to water.

Blood samples were collected on days -17, -7, 0, and at fixed-time AI for later analysis of serum concentrations of progesterone. Cows with low concentrations of progesterone (<1 ng/ml) on day -17 and -7 were classified as noncycling, whereas those with high concentrations (>1 ng/ml) on either or both days were classified as cycling. Body condition scores (1 = thin and 9 = fat) were assessed on day 0.

Cows observed in estrus within 36 hours after PGF were inseminated 6 to 12 hours after observed estrus, but were classified nonpregnant for purposes of calculating AI pregnancy rates among treatments. Detection of estrus and AI continued, for at least 10 days after treatment inseminations lapsed, before clean-up bulls were turned out with cows. Pregnancy rate to AI was determined by transrectal ultrasonography 33 to 36 days after timed AI.

Results and Discussion

Number of cows, body condition score, average days postpartum at time of AI, proportion cycling, and AI pregnancy rates are summarized in Table 1. Cows in these herds were close to, or fell within, the recommended average days postcalving at the start of a long-term MGA treatment of 40 to 45 days or 75 to 80 days at the time of AI. When body condition was lower and the interval since calving shorter, overall AI pregnancy rate was less.

AI pregnancy rate was similar for cows receiving ECP (48%) or GnRH (45%). Cycling status influenced the response to calf removal (Table 2). Noncycling cows whose calves were removed had a greater ($P<0.05$) AI pregnancy rate than suckled noncycling cows. For cows classified as cycling, AI pregnancy rates were similar between calf-removal and suckled cows. Age of cow (first calf vs.

mature) did not influence pregnancy rates. No interactions of calf removal or hormone treatment with body condition score or calving date were detected.

Of cows classified as noncycling, 89 of 183 (48.6%) had high progesterone (>1 ng/ml) at the time of PGF, indicating that GnRH given 1 week before PGF had induced ovulation, or in a few instances, that spontaneous ovulations had occurred. Pregnancy rates in these cows were 23% (42 of 183), which contributed 5.7% of the entire group AI pregnancy rate. Because the proportion of cows cycling in this study was fairly large (75%), the benefit of GnRH given 1 week before PGF might be even greater in herds with more noncycling cows.

The most concentrated effort to detect estrus before fixed-timed AI was made at the ARC-Hays in 2002, where 15.1% were inseminated 24 hours or more before fixed-time AI. At this location, cows whose calves were removed remained fairly close to the working pens, facilitating detection of estrus, despite the cows being in a pasture of about 720 acres. AI pregnancy rate was increased 9% when pregnancies from these early heats were included with those cows that received the fixed-timed AI. No attempt was made to detect early heats at the Cow-Calf Unit. Across all locations, 32 cows were detected in estrus early, and 66% were diagnosed pregnant.

Immediately after AI at the ARC-Hays, pairs were sorted and relocated to new pastures. This decision resulted in some calves crossing fences during the next few days, but that was not considered a major problem. Herds that left pairs in the same pastures before and after AI did not experience problems with calves mothering up after calf removal.

Calf removal did not influence final weaning weights of 548 lb for suckled calves and 546 lb for calves that experienced the 48-hour calf removal before fixed-time AI.

Table 1. Description of Herds

				Days Between Calving and AI		%	AI Pregnancy
Herd[a]	Age	No.	BCS[b]	Average	Range	Cycling	Rates[c]
2002							
ARC-Hays	First Calf	18	5.3	108	73 - 130	83	67
	Mature	88	5.2	74	39 - 98	84	53
CCU	First Calf	53	5.0	90	56 - 112	34	28
	Mature	63	4.6	74	55 - 96	54	37
PBU	First Calf	46	5.4	91	39 - 110	74	46
	Mature	100	5.0	67	33 - 89	82	55
2003							
ARC-Hays	First Calf	53	5.5	112	75 - 132	94	60
	Mature	162	5.4	70	25 - 94	77	48
PBU	First Calf	34	4.9	90	65 - 105	57	46
	Mature	117	5.3	69	30 - 94	86	38
TOTAL		735	5.2	78	25 - 132	75	47

[a]CCU=Cow-Calf Unit, PBU=Purebred Unit.
[b]Body Condition Score.
[c]Percentage of pregnant to single fixed-time AI of all cows treated.

Table 2. Response of Cycling and Noncycling Cows to Calf Removal

	Cycling		Noncycling	
Item	Calf Removal	Suckled	Calf Removal	Suckled
Total number	281	271	94	89
Number pregnant	135	150	35	24
AI pregnancy rate, %	48.0	55.4	37.2[a]	27.0[b]

[ab]Means differ for noncycling cows (P<0.05).

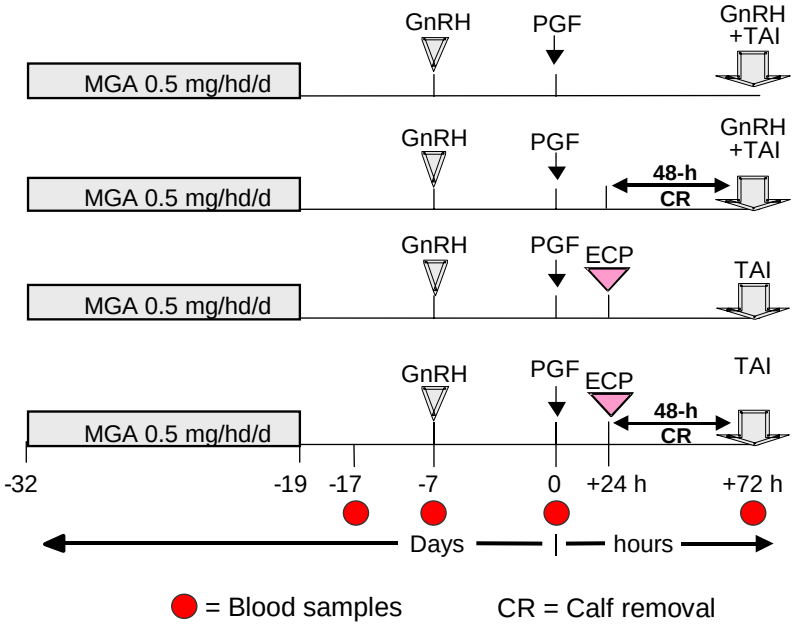

Figure 1. Experimental Design of Synchronization Protocol.