Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 128

2007

Altered insemination timing improves pregnancy rates after a CO-Synch + CIDR protocol

C. A. Dobbins

D. E. Tenhouse

D. R. Eborn

See next page for additional authors

Recommended Citation

Dobbins, C. A.; Tenhouse, D. E.; Eborn, D. R.; Johnson, Sandra K.; Harmoney, Keith R.; and Stevenson, Jeffrey S. (2007) "Altered insemination timing improves pregnancy rates after a CO-Synch + CIDR protocol," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. https://doi.org/10.4148/2378-5977.1531

Altered insemination timing improves pregnancy rates after a CO-Synch + CIDR protocol

Authors

C. A. Dobbins, D. E. Tenhouse, D. R. Eborn, Sandra K. Johnson, Keith R. Harmoney, and Jeffrey S. Stevenson

ALTERED INSEMINATION TIMING IMPROVES PREGNANCY RATES AFTER A CO-SYNCH + CIDR PROTOCOL

C. A. Dobbins, D. E. Tenhouse, D. R. Eborn, S. K. Johnson, K. R. Harmoney, and J. S. Stevenson

Summary

Our objective was to determine the optimal time to inseminate lactating beef cows after applying the CO-Synch + CIDR protocol [injection of GnRH given seven days before and 48 to 72 hr after an injection of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) concurrent with AI, with a controlled internal drug release (CIDR) insert containing progesterone placed intravaginally for seven days between the first GnRH injection and $PGF_{2\alpha}$.]. Using 605 beef cows located at three Kansas locations, the CO-Synch + CIDR protocol was administered as follows: an injection of GnRH was given concurrent with a vaginally placed, progesterone-releasing CIDR insert, seven days later the insert was removed, and $PGF_{2\alpha}$ was injected. Blood samples were collected 10 days before initiating the protocol and at the time of GnRH injection and CIDR insertion to determine concentrations of progesterone. Cows in each herd were inseminated at four different times after the $PGF_{2\alpha}$ injection: 48, 56, 64, or 72 hours. At insemination, each cow received a GnRH injection to induce ovulation. Pregnancy was diagnosed at 32 days after insemination and again at 63 days after insemination to confirm pregnancy survival. Pregnancy rates were greatest for those cows inseminated at 56 or 64 hours.

Introduction

Ability to synchronize estrus, ovulation, or both presents many options to cattle producers who desire to use artificial insemination. Programs are available that use fixed-time insemination and produce acceptable pregnancy rates. Applying synchronization programs to facilitate use of artificial insemination allows greater opportunity to increase genetic progress and selection of desirable, economic traits. Results from well managed Kansas herds indicate 40 to 60% of cows may be cycling at the beginning of the breeding season. When winter conditions are harsh, forage availability limited, or winter supplementation insufficient, a majority of cows may not be cycling at the onset of the breeding season. Thus, synchronization protocols that induce ovulation in both anestrous as well as cycling cows are essential.

When no detection of estrus is possible or desirable, the best protocol must include GnRH to stimulate ovulation (manage follicle populations) in noncycling and cycling cows, a source of progestin to alter uterine function and tighten ovulation synchrony, and $PGF_{2\alpha}$ to control corpus luteum function. The CO-Synch + CIDR protocol seems to provide these desirable benefits that are needed in a timed insemination program. Optimal timing of artificial insemination, however, in the CO-Synch + CIDR protocol has not been determined. The objective of the current study was to determine the optimal timing of insemination when applying a CO-Synch + CIDR protocol.

Experimental Procedures

In spring 2005, lactating beef cows from three Kansas herds were utilized. The three herds consisted of purebred Angus, Hereford, and Simmental cows (n = 144) from the Kansas State University Purebred Beef Unit (PBU), Angus-Hereford crossbred cows (n = 249) from the Kansas State University Cow Calf Unit (CCU), and crossbred Angus cows (n = 212) from the Agriculture Research Center in Hays (ARCH). No 2-year-old cows were treated at the ARCH location.

The CO-Synch + CIDR protocol was administered to each cow as follows: an 100-µg injection of GnRH (2 mL of OvaCyst™, IVX Animal Health, St. Joseph, MO) was given concurrent with vaginal placement of a progesterone-releasing CIDR insert (Eazi-Breed CIDR® insert, Pfizer Animal Health, New York, NY); seven days later the insert was removed, and 25 mg of $PGF_{2\alpha}$ (5 mL of Lutalyse, Pfizer Animal Health, New York, NY) was injected (Figure 1). Cows within herds were sorted by calving date, age, and breed, and then assigned randomly to be inseminated at four different times after the $PGF_{2\alpha}$ injection: 48, 56, 64, or 72 hours. At insemination, each cow received another GnRH injection to induce ovulation.

Blood samples were collected 10 days before and at the time of GnRH injection and CIDR insertion to determine concentrations of progesterone. Cows having progesterone concentrations of at lease 1 ng/mL in either of the two blood samples were defined to be cycling. When both samples contained less than 1 ng/mL, the cows were considered to be anestrous or not cycling.

Pregnancy status was determined via transrectal ultrsonography on day 32 (range of 27 to 35) after insemination and pregnancy status was reconfirmed on day 63 (range of 60 to 68).

Results and Discussion

Before the CO-Synch + CIDR protocol was initiated, 60% of the 605 cows across all three herds had initiated estrous cycles. The rate of cyclicity was 40% in the PBU cows, 65% in the CCU cows, and 68% in the ARCH cows. As expected, cyclicity rates were less ($P<0.001$) in 2-year old cows (30%) compared with 3-year old cows (55%) and older cows (73%). In the current study, fewer 2-year-old cows were cycling, despite calving, on average, 23 and 20 days earlier ($P<0.001$) than the 3-year-old and older cows, respectively.

Pregnancy rates of cows by treatment, cycling status, herd, age, and days postpartum are summarized in Table 1. Insemination at 56 hours improved ($P<0.01$) pregnancy rates compared with inseminations made at 48 and 72 hours, and tended ($P = 0.06$) to improve pregnancy rates at 56 hours compared with 64 hours. The pregnancy response fit ($P<0.001$) a quadratic curve, indicating the pregnancy rates peaked between 56 and 64 hours. The pregnancy rate response was uniformly similar between cows that were cycling and not cycling before the initiation of the CO-Synch protocol (Figure 2). Noncycling cows had greater ($P<0.05$) pregnancy rates than cycling cows (55.8 vs. 51.2%, respectively). No differences in pregnancy rates, however, were detected among herds, age groups, or days postpartum categories.

At the two locations in which cows of all ages were treated, a treatment × age group interaction ($P = 0.05$) was detected. This was interpreted to mean that the optimal insemination timing may differ according to age of the cow. Figure 3 illustrates these results. In 2-year-old cows, the 56-hour timing was clearly best. In contrast, in 3-year-old cows, 56 or 64 hours was superior to other insemination times. Among older cows, however, inseminations made between 56 and 72 hours seemed to be best.

Actual calving rates of cows in the 48-, 56-, 64-, and 72-hour treatments were 71.3, 77.7, 80.6, and 76.8%, respectively. Because calving rates did not differ among treatments, conception rates of cows in the 48- and 72-hour treatments in response to natural mating (clean-up bulls) was normal. Actual calving intervals were 369, 359, 363, and 365 days for the 48-, 56-, 64-, and 72-hour treatments.

Implications

The window for timed inseminations for younger cows may be smaller than for mature cows, but more information is needed before specific age recommendations might be made for beef cows. Our results indicate that those wishing to use fixed-time insemination with a CO-Synch + CIDR protocol may have a broader window of insemination times from 56 to 64 hours after $PGF_{2\alpha}$. This larger window may facilitate application of the CO-Synch + CIDR protocol in a wider range of production settings.

Table 1. Overall Pregnancy Rates According to Time of Insemination (treatment), Cycling Status, Herd, Age, and Days Postpartum at the Beginning of the Breeding Season

Item	Number of Cows	Pregnancy Rates, %
Treatment, hours after $PGF_{2\alpha}$		
48	136	42.6 [a]
56	157	62.4 [b,*]
64	170	54.1 [a,b]
72	142	51.4 [a]
Cycling status before treatment		
Cycling	363	51.2 [a]
Not cycling	242	55.8 [b]
Herd		
Agriculture Research Center-Hays	212	51.8
Cow-Calf Unit	249	56.2
Purebred Beef Unit	144	49.3
Age (years)		
2	114	52.4
3	162	49.6
4+	329	57.0
Days postpartum at $PGF_{2\alpha}$		
< 60	235	51.1
60 to 75	164	52.1
> 75	206	55.5

[a,b]Means having different superscript letters differ (P<0.01).

*Tended (P = 0.07) to differ from 64 hours.

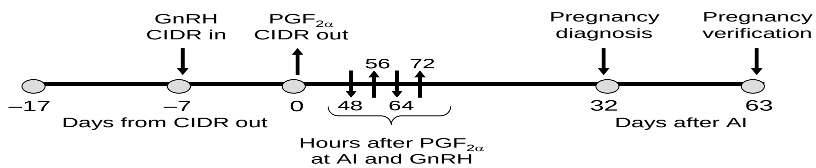

Figure 1. Experimental Protocol. Blood samples were collected at days –17 and –7 for later determination of concentrations of progesterone.

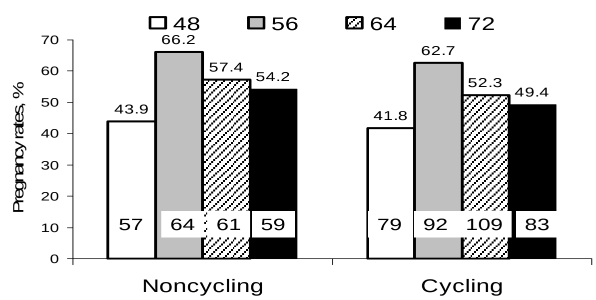

Figure 2. Pregnancy Rates of Lactating Beef Cows According to Time of Insemination (48, 56, 64, or 72 hours) and Whether They had Initiated Estrous Cycles (cycling versus non-cycling) Before the Onset of the CO-Synch + CIDR Protocol. Numbers of cows represented per bar are listed across the bottom of each bar.

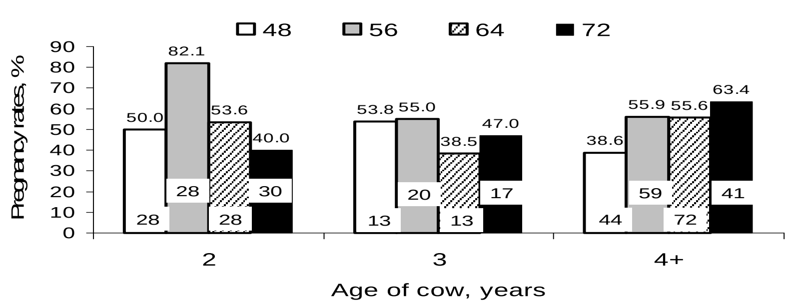

Figure 3. Pregnancy Rates of Lactating Beef Cows at the Purebred Beef Unit and Cow-Calf Unit Locations According to Time of Insemination (48, 56, 64, or 72 hours) in Each Age Group. Numbers of cows represented per bar are listed across the bottom of each bar.