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Abstract

As in our previous studies, the GnRH + PGF2" treatment was very effective in inducing a fertile estrus and(or) ovulation. Ovulations induced in response to the first GnRH injection averaged 48% in three herds and ranged from 44 to 56%. The proportion of 536 cows that were cycling at the beginning of the breeding season averaged 48% and ranged from 35 to 59%. Conception rate was greater in Select Synch cows (those inseminated after detected estrus) than in cows in other breeding treatments. Pregnancy rates tended to be greater in Select Synch cows than in cows of other treatments. A treatment x herd interaction indicated that alternate breeding treatments performed differently in each herd. These results also emphasize the importance of early cycling activity to reproductive outcomes.

Keywords

Cattlemen's Day, 1999; Kansas Agricultural Experiment Station contribution; no. 99-339-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 831; Beef; AI; Estrus-ovulation synchronization; GnRH; PGF2; Cows

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FIXED-TIME INSEMINATION OF SUCKLED BEEF COWS. 1. SELECT SYNCH, COSYNCH, AND THEIR COMBINATION[1]

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Summary

As in our previous studies, the GnRH + $PGF_{2"}$ treatment was very effective in inducing a fertile estrus and(or) ovulation. Ovulations induced in response to the first GnRH injection averaged 48% in three herds and ranged from 44 to 56%. The proportion of 536 cows that were cycling at the beginning of the breeding season averaged 48% and ranged from 35 to 59%. Conception rate was greater in Select Synch cows (those inseminated after detected estrus) than in cows in other breeding treatments. Pregnancy rates tended to be greater in Select Synch cows than in cows of other treatments. A treatment × herd interaction indicated that alternate breeding treatments performed differently in each herd. These results also emphasize the importance of early cycling activity to reproductive outcomes.

(Key Words: AI, Estrus-Ovulation Synchronization, GnRH, $PGF_{2"}$, Cows.)

Introduction

Estrus-synchronization programs are designed to improve reproductive efficiency by reducing the duration of the breeding and calving season and to group together cows or heifers so artificial insemination (AI) can be used more efficiently. The major limitation of estrus-synchronization programs is their inability to induce a potentially fertile estrus and ovulation in noncycling cattle (i.e., prepubertal heifers and anestrous suckled cows). Because current estrus-synchronization programs were not designed for successful treatment of noncycling cattle, their use in cow-calf operations generally has not produced results that would encourage greater AI use. Currently, less than 5% of beef cows and an estimated 8 to 10% of beef heifers are AI-bred in the US. The potential for increasing AI in beef cattle is great if a system can successfully resolve the problem of the noncycling female at the beginning of the breeding season.

Our results using GnRH, norgestomet, and $PGF_{2"}$ have demonstrated a new method of inducing fertile ovulations in both cycling and noncycling cows (1996 Cattlemen's Day Report, pp 25-28; 1997 Cattlemen's Day Report, pp 91-93 and 94-96). Further, treatments involving a single injection of gonadotropin-releasing hormone (GnRH; Cystorelin®, Factrel®, or Fertagyl®) given 7 days before $PGF_{2"}$ (Lutalyse®) are successful in initiating a fertile estrus and(or) ovulation before insemination. GnRH induces secretion of LH and FSH and causes ovulation of mature follicles. The resulting corpus luteum is then responsive to the $PGF_{2"}$ given 7 days later. Our objective was to assess the best timing of insemination after GnRH + $PGF_{2"}$.

Experimental Procedures

Three herds of suckled beef cows were used in this experiment: 1) 153 crossbred Angus×Hereford cows; 2) 225 crossbred Angus×Hereford×Simmental cows; and 3)

[1]We acknowledge the cooperation and participation of Joe Thielen, Dorrance, KS; Gary Johnson, Dwight, KS; and Troy Marple and student workers at the KSU Purebred Beef Unit.

158 purebred Angus, Hereford, and Simmental cows. Estrus and ovulation in all cows were programmed for AI using one system consisting of 100 µg of Cystorelin (day -7) and 25 mg of Lutalyse (day 0) given prior to the onset of the spring breeding season (day 0).

Cows were assigned randomly to three insemination treatments in which inseminations occurred (Figure 1): 1) 8 to 14 h after detected estrus during a 144-h period after $PGF_{2"}$ (Select Synch); 2) 54 h after Lutalyse ($PGF_{2"}$), when a second 100-µg injection of Cystorelin was given immediately after the insemination (Cosynch); or 3) up to 54 h after Lutalyse, based on heat detection, then all remaining cows were inseminated and given Cystorelin at 54 h (Select Synch + Cosynch). Cows were observed for estrus at least twice daily.

Blood samples were collected on days -17, -7 (first Cystorelin injection), and 0 for subsequent analysis of progesterone by radioimmunoassay. Cows were classified as cycling or anestrus based on concentrations of progesterone in the first two blood serum samples. Body condition score (BCS; 1 = thin and 9 = fat) was assessed at the time of Lutalyse injection. Pregnancy rates were determined by a single ultrasonograph 30 to 43 days after AI.

Results and Discussion

Characteristics of the cows assigned to three breeding treatments are summarized in Table 1. Overall, only 48% of the cows had elevated blood progesterone concentrations before the beginning of the breeding season, thus, less than half of the cows were cycling before the hormonal protocol was initiated. Percentages of cows cycling varied from 35 to 59% among herds. Of those noncycling females, hormone treatment induced postpartum ovulation in 43 to 56% (average, 48%). Body condition ranged from 3.5 to 8.0 in one herd and 3.5 to 6.5 in the other two herds, with an overall average of 4.9. Days after calving at the onset of the breeding season varied from 11 to 118 days, with the three herd averages ranging from 64 to 74 days.

In the Select Synch treatment, only 70% of the cows were detected in heat during the 144 hours after Lutalyse. Only 20% of those heats occurred before 54 hours (Select Synch + Cosynch). Cows were not observed for heat in the Cosynch treatment. Conception rates (number of cows that became pregnant/number of cows inseminated) of cows inseminated after detected estrus in the Select Synch treatment were normal; 58 to 83%, with an average of 67%.

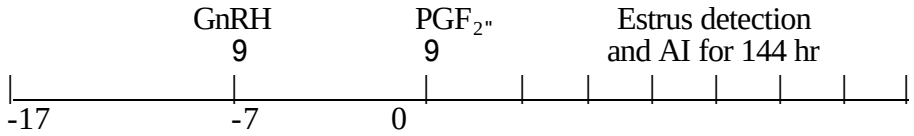
Conception and pregnancy rates (number of cows that became pregnant/number of cows treated) of all cows are summarized based on their cycling status at the beginning of the breeding season (Table 2). Overall conception rates were greater ($P<.01$) for Select Synch than the other two treatments.

For every one unit increase in BCS at the beginning of the breeding season, conception rate increased ($P=.06$) by 8.8 ± 0.05%, which emphasizes the importance of keeping cows in good body condition. To achieve early cycling activity and maximal conception rates, cows should have a BCS of at least 5 at calving time.

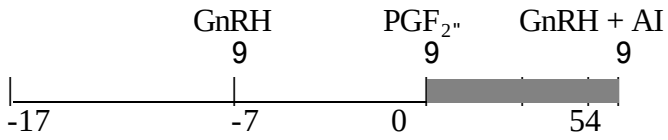
No significant differences in pregnancy rates occurred among treatments despite a large number of cows tested. However, pregnancy rates tended to follow the same trend as conception rates. For every one unit increase in BCS, pregnancy rate increased ($P=.07$) by 8.2 ± 0.04%. For every 10-day increase in days postpartum at the beginning of the breeding season (day 0), pregnancy rate increased ($P=.06$) by 2.5 ± 0.01%.

These results again emphasize the importance of early cycling activity to reproductive performance. Further, the benefit of the GnRH + $PGF_{2"}$ treatment to induce a fertile estrus and(or) ovulation cannot be overemphasized. The results also indicated that differences between herds affected the success of the insemination treatments.

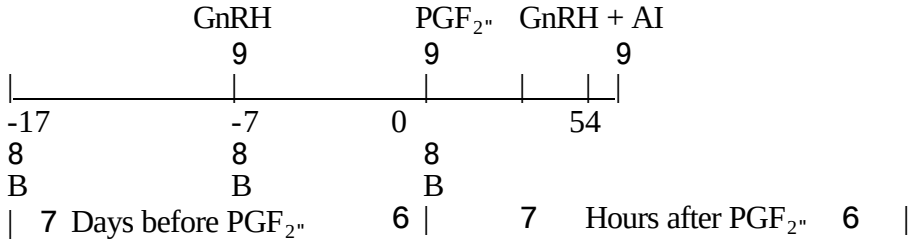
Select Synch (AI follows GnRH + $PGF_{2"}$)



Cosynch (AI follows GnRH + $PGF_{2"}$ but occurs at the same time as second GnRH injection)



Select Synch + Cosynch



Days of blood (B) collection for progesterone
Period of heat detection + AI =

Figure 1. Experimental Protocol Used to Synchronize Estrus and(or) Ovulation in Suckled Beef Cows.

Table 1. Characteristics of Cows in Three Herds Assigned to Treatments

Herd	Assessed at the Beginning of the Breeding Season			
	Cycling[a] (%)	Induced Ovulation[b] (%)	Body Condition	Days Postpartum
1	69/155 (43.8)	48/86 (55.8)	4.8 ± .4[c] (3.5-6.0)[d]	64.5 ± 12.3[c] (34-88)[d]
2	104/251 (35.1)	66/147 (44.8)	5.1 ± .4 (3.5-8.0)	74.1 ± 17.6 (43-111)
3	102/166 (59.4)	28/64 (43.7)	4.6 ± .6 (3.0-6.5)	74.1 ± 20.3 (11-118)
3	275/572 (48.1)	142/297 (47.8)	4.9 ± .5 (3.0-8.0)	71.3 ± 17.6 (11-118)

[a]At least one serum progesterone sample on either days -17, -7, or 0 was high (>1 ng/mL).
[b]Proportion of cows with two low (<1 ng/mL) concentrations of progesterone on days -17 and -7, followed by high progesterone on day 0 (evidence of GnRH-induced ovulation).
[c]Mean ± SD.
[d]Range in days.

Table 2. Conception and Pregnancy Rates of Suckled Cows by Cycling Status

Item	Treatment		
	Select Synch	Cosynch	Select Synch + Co-synch
	---------- % (no.) ----------		
Conception rate[a], %	69.6[x] (115)	33.7[y] (175)	32.8[y] (177)
Anestrus	62.8 (43)	26.9 (104)	25.8 (97)
Cycling	73.6 (72)	43.7 (71)	41.2 (80)
Pregnancy rate[b], %	43.5 (184)	33.7 (175)	32.8 (177)
Anestrus	28.4 (95)	26.9 (104)	25.8 (97)
Cycling	59.6 (89)	43.7 (71)	41.2 (80)

[a]Cycling effect (P<.01); sire within herd (P<.05); and body condition score (BCS; P=.06).
[b]Cycling effect (P<.001); treatment × herd (P=.06); body condition score (BCS; P=.07); and days postpartum (P=.06).
[x,y]Different (P<.01).