ESTRUS SYNCHRONIZATION OF REPLACEMENT BEEF HEIFERS BY USING GnRH, PROSTAGLANDIN $F_{2\alpha}$ (PGF), AND PROGESTERONE (CIDR): A MULTI-LOCATION STUDY[1]

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Summary

Our objectives were to determine whether a fixed-timed artificial insemination (TAI) protocol could yield similar fertility rates to a protocol requiring detection of estrus and whether an injection of gonadotropin hormone-releasing hormone (GnRH) at CIDR (vaginal insert containing progesterone) insertion enhances pregnancy rates. Replacement beef heifers (n=2,077) from 12 locations were assigned randomly to each of four estrus-synchronization protocols. All heifers received a CIDR for 7 days, and an injection of prostaglandin $F_{2\alpha}$ (PGF) on the day of CIDR removal. For treatment EAI, heifers were observed for estrus for 84 hours after PGF administration and were inseminated 6 to 12 hours after observed estrus. Any heifer not detected in estrus was injected with GnRH, followed by TAI. For treatment GnRH+EAI, heifers were treated as those for EAI, but also received GnRH at the time of CIDR insertion. For treatment TAI, heifers received a single TAI at 60 hours after PGF administration. For treatment GnRH+TAI, heifers were treated as those for TAI, but also received GnRH at CIDR insertion. The percentage of heifers cycling at the initiation of estrus-synchronization was 91%; the percentage of cycling heifers among locations ranged from 78 to 100%. Overall pregnancy rates among locations ranged from 38 to 74%. Pregnancy rates were 57.3, 54.5, 53.1, and 49.1% for GnRH+EAI, EAI, GnRH+TAI, and TAI, respectively. Although no statistically significant differences in pregnancy rates among treatments were observed, the GnRH+EAI treatment achieved the numerically greatest pregnancy rates. In addition, the GnRH+TAI protocol provides an alternative that allows producers to synchronize heifers without detection of estrus.

Introduction

Synchronization of estrus shortens the calving season, increases calf uniformity, and enhances the possibilities for using artificial

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[1]Sincere appreciation is expressed to Whisper Alexander, Chad Bailey, Sue Bellows, Matt Bartlett, Brian Gray, Tony Krizek, Keith Harmoney, Dan Brown, John Hall, George Perry, and Rud Wasson for their support in data collection and technical service. We acknowledge Losey Land and Cattle Co. for their participation in this study.
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insemination (AI). The EAZI-BREED CIDR® (CIDR; Pharmacia Animal Health, Kalamazoo, MI) was recently approved by the U.S. Food and Drug Administration for synchronizing estrus in replacement beef heifers. The CIDR is a vaginal insert that contains 1.38 g of progesterone, which is gradually released over a period of days. Until the approval of the CIDR, the orally administered melengestrol acetate (MGA) was the primary progestin used for synchronizing estrus in beef heifers. Although excellent pregnancy rates can be achieved by using a protocol with MGA and prostaglandin $F_{2\alpha}$ (PGF), the time from initiating the protocol until insemination is more than 33 days, and this can be a drawback. In addition, no reliable TAI protocol exists for synchronizing estrus in beef heifers. Therefore, the objectives of this study were to determine whether: 1) a TAI protocol could yield fertility similar to a protocol requiring detection of estrus; and 2) an injection of GnRH at CIDR insertion enhances pregnancy rates.

Materials and Methods

Estrus in 2,077 replacement beef heifers from 12 locations was synchronized, and artificial insemination occurred after four treatments (Figure 1): 1) heifers received a CIDR insert for 7 days, with 25 mg of PGF on the day of CIDR removal, followed by detection of estrus and AI during 84 hours. Any heifer not detected in estrus by 84 hours received 100 μg of GnRH and was inseminated (**EAI**; n=517); 2) heifers were treated and inseminated as EAI heifers, but also received 100 μg of GnRH at the time of CIDR insertion (**GnRH+EAI**; n=504); 3) heifers received a CIDR insert for 7 days, with 25 mg of PGF on the day of CIDR removal, followed in 60 hours by a second injection of GnRH and one TAI (**TAI**; n=531); and 4) heifers were treated and inseminated as TAI heifers but also received 100 μg of GnRH at the time of CIDR insertion (**GnRH+TAI**; n=525).

Pregnancy was diagnosed by transrectal ultrasonography between 30 and 35 days after AI. Clean-up bulls were not introduced until a minimum of 10 days after treatment inseminations.

Blood samples were collected on days –17 and –7 relative to the injection of PGF. Blood sera were analyzed for progesterone concentration to determine cycling status. Body condition scores were assessed on day –17. The statistical model to evaluate pregnancy rates included treatment, location, and cycling status, with body condition score as a regression variable.

Results and Discussion

Percentage of heifers cycling at the initiation of estrus-synchronization was 91.0% (1,350 of 1,518 heifers). Percentages of cycling heifers among locations ranged from 78 to 100%. Overall pregnancy rates at days 30 to 35 after AI ranged from 38 to 74% among locations (Figure 2).

Pregnancy rates were 57.3, 54.5, 53.1, and 49.1% for GnRH+EAI, EAI, GnRH+TAI, and TAI, respectively (Figure 3). Although no differences in pregnancy rates were detected among treatments, heifers that were inseminated in the estrus-detection treatments (EAI and GnRH+EAI; 56%) had greater ($P<0.05$) pregnancy rates than heifers in the TAI treatments (TAI and GnRH+TAI; 51%). However, the GnRH+TAI treatment provides a reliable TAI estrus-synchronization protocol for beef producers.

For the two estrus-detection protocols (EAI and GnRH+EAI), pregnancy rates for heifers detected in estrus before 84 hours were 44.6 and 45.0%, respectively. The clean-up TAI at 84 hours enhanced pregnancy rates by 9.9 and 12.3 percentage points for EAI and GnRH+EAI treatments, respectively. These results indicate that clean-up TAI after a period of estrus detection enhances the potential for improving pregnancy rates to exceed those of estrus detection alone.

The time from PGF injection to detection of estrus, and to AI for those heifers exhibiting estrus, was similar between EAI (49.9 and 61.7 hours, respectively) and GnRH+EAI (49.8 and 61.3 hours, respectively).

Our results demonstrate that estrus in heifers can be synchronized effectively with GnRH, PGF, and a CIDR. The GnRH+EAI treatment most frequently produced the greatest pregnancy rates and provided a reliable alternative to a protocol based on MGA and PGF.

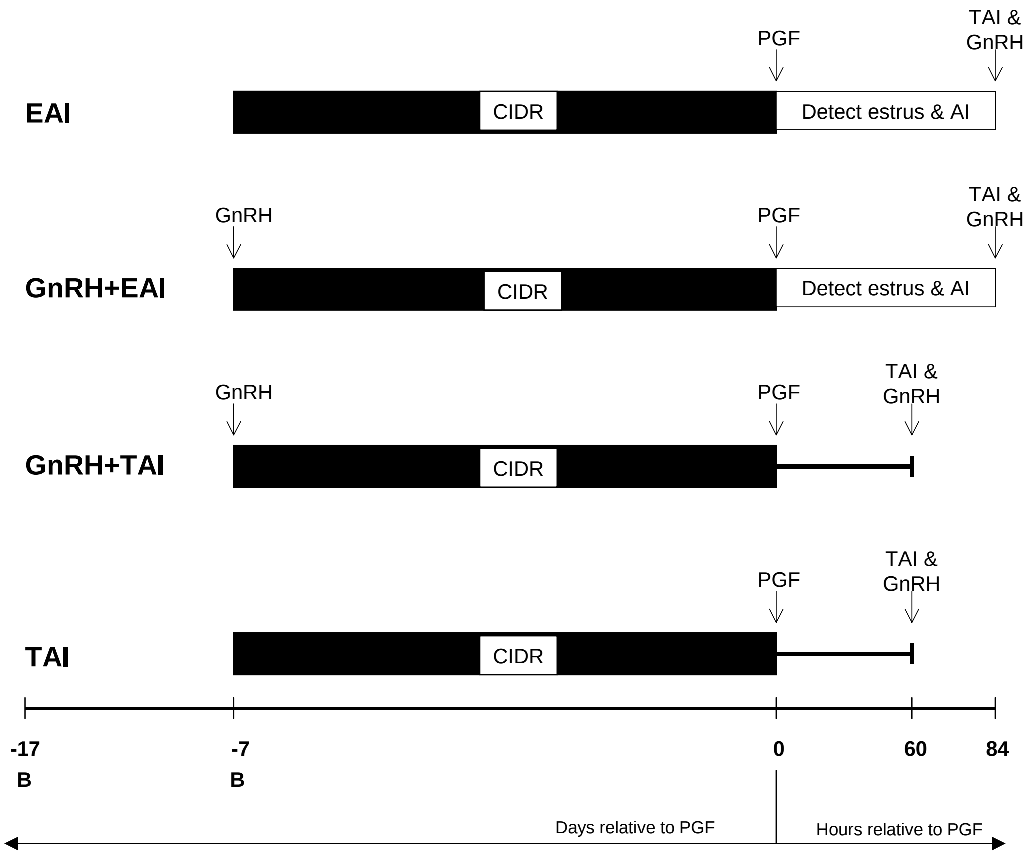

Figure 1. Schematic of Experimental Protocols for Replacement Beef Heifers Treated with GnRH, PGF, and a CIDR.

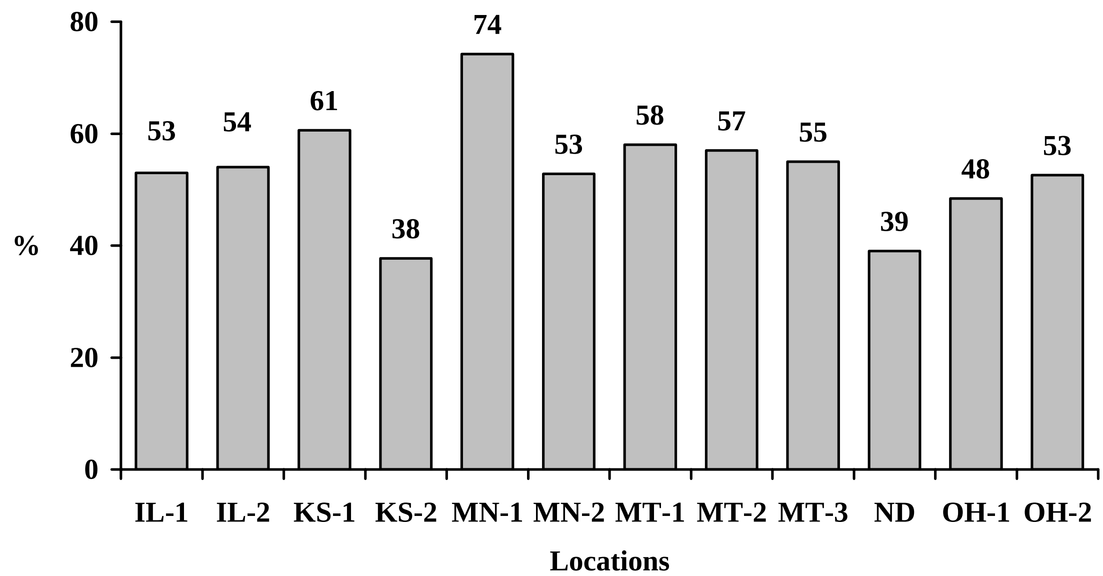

Figure 2. Distribution in Overall Pregnancy Rates Among Locations for Replacement Beef Heifers Treated with GnRH, PGF, and a CIDR.

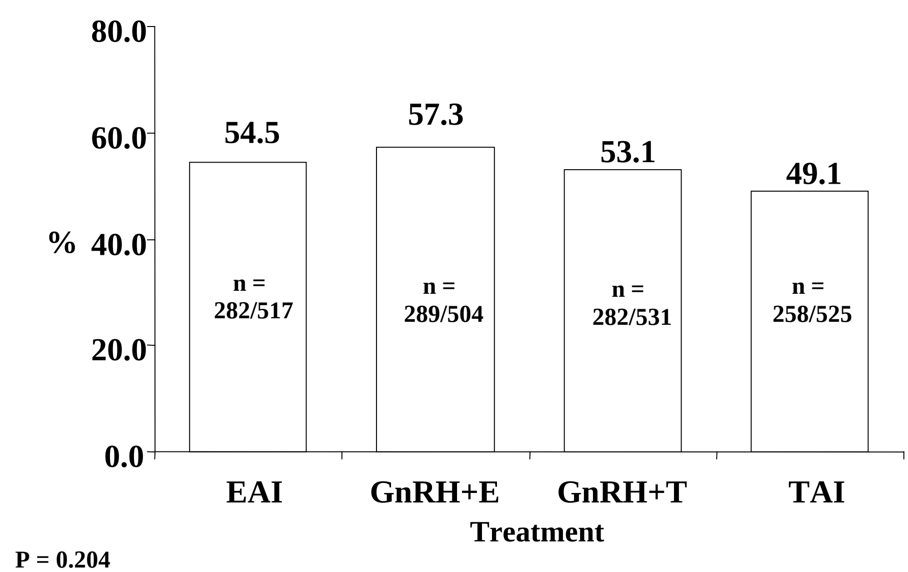

Figure 3. Pregnancy Rates (%) for Replacement Beef Heifers Treated with GnRH, PGF, and CIDR.