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Comparison of TAI at GnRH Injection and Delayed Insemination of Non- estrus Beef Heifers

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Summary

Heifers were estrus synchronized utilizing the melengestrol acetate (MGA)-prostaglandin (PG) protocol. Heifers expressing estrus after synchronization were removed from the herd and AI. Heifers not expressing estrus were administered GnRH and either AI at GnRH injection or AI 19 hours following GnRH injection. Heifers AI from estrus detection had a higher pregnancy rate compared with heifers not expressing estrus. Pregnancy rates to AI did not differ between heifers AI immediately after GnRH compared to heifers AI 19 hours after the GnRH injection. There was no benefit to delayed AI of non-estrus beef heifers compared with traditional timed AI at GnRH injection.

Introduction

The utilization of estrus synchronization and fixed-time artificial insemination (FTAI) has improved AI efficiency, concentrating the labor and time requirement into a few d, making AI more feasible for producers (*Journal of Animal Science*, 2010, 88: E181–92). However an improvement in pregnancy rates typically attained when a FTAI protocol is used would increase the appeal of such protocols to producers. In a comparison of heifers synchronized and AI with either a standard FTAI protocol or a 19 h delayed AI following GnRH administration protocol, heifers on the delayed insemination protocol had significantly higher overall pregnancy rates (54 vs. 46%; *Journal of Animal Science*, 2014, 92: 4189–4197). Among heifers in estrus there was no difference in pregnancy rates between standard FTAI and delayed AI. However in heifers not having expressed estrus prior to GnRH injection there was a significant advantage to delayed AI compared with standard FTAI (49 vs 34%). Thus it was the objective of this study to determine the effect of a 19 h delayed AI following GnRH administration in non-estrus heifers as part of a hybrid estrus detection/FTAI protocol.

Procedure

Yearling, Angus-based, crossbred heifers (n = 453) were managed as a single herd at the Kelly Ranch (KR), Sutherland, NE, grazing dormant upland Sandhills range and offered 2.9 lb/d dried distillers grains. Alfalfa was offered to each heifer at 6.4 lb/d beginning 66 d prior to synchronization. As winter range availability decreased in the spring, alfalfa was offered ad libitum. Approximately 1 wk prior to estrus synchronization, a subset of heifers (n = 100) were transported to the West Central Research and Extension Center (WCREC), North Platte, NE. The balance of heifers remained at the KR (n = 353) through synchronization and AI. Heifers housed at the WCREC were placed in a drylot and fed 25.6 lb/d of a diet containing 10% corn, 71% prairie hay, 16% wet corn gluten feed, and 3% supplement.

At both locations, estrus was synchronized utilizing the MGA-PG protocol (Figure 1). At each location heifers received 0.50 mg/hd/d melengestrol acetate (MGA; Pfizer Animal Health, New York, NY) for 14 d. At WCREC, MGA pellets were mixed in the ration; at KR, MGA pellets were mixed with 4.6 lb/d ground hay and 3 lb/d wet distiller grain. Nineteen d later, on d 33 of the protocol, heifers received a PG (Lutalyse, Zoetis, Florham Park, NJ) i.m. injection and estrus detection aids were applied (Estrotect, Rockway Inc, Spring Valley, WI).

Heifers were considered to have expressed estrus when greater than 50% of the rub off coating was removed from the Estrotect. Heifers expressing estrus (n = 319) were assigned to the first treatment group, removed from the herd, and AI 12 h later (ESTRUS). Seventy-two hours following the PG injection heifers whose Estrotect patches were less than 50% activated were randomly assigned to 1 of 2 remaining treatment groups: administered GnRH (Fertagyl, Intervet/Schering-Plough Animal Health, Summit, NJ) and immediately AI (GNRH-I) or administered GnRH injection and AI 19 ± 1 h later (GNRH-D).

The day after TAI, WCREC heifers were returned to KR, where they were comingled on upland Sandhills range with KR heifers. Thirteen d following TAI 9 bulls were placed with heifers for a bull to heifer ratio of 1:50 for 42 d.

A minimum of 51 d after AI, BW was measured and AI pregnancies were detected via trans-rectal ultrasonography (Repro Scan XTC, Repro Scan, Beaverton, OR). Forty-five d following bull removal, pregnancy was again diagnosed to determine pregnancies sired by natural service.

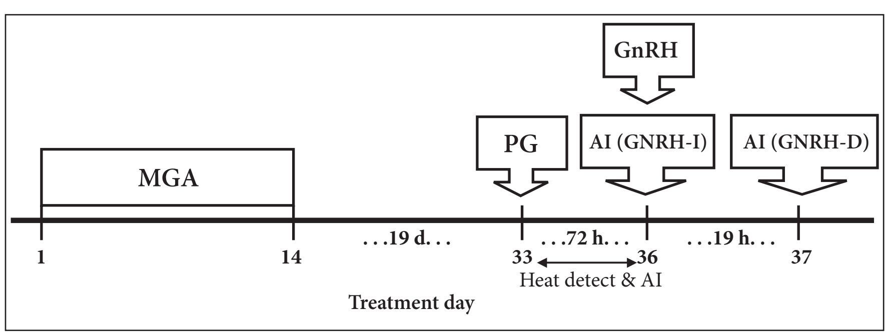

Figure 1. Modified MGA-PG estrus synchronization protocol utilized to compare AI at GnRH injection (GNRH-1) and AI 12 h following GnRH injection (GNRH-D).

Statistical Analysis

All data was analyzed using the GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.), accounting for origin, pen (KR was counted as a single pen), and AI technician as random variables. Pregnancy rate was analyzed using an odds ratio. Least squared means and SE of the proportion of pregnant heifers by treatment were obtained using the ILINK function.

Results

Heifer reproductive performance is presented in Table 1. Pre-breeding BW was similar ($P = 0.58$) among ESTRUS, GNRH-I, and GNRH-D treatments (773, 764, and 770 ± 12 lb, respectively). Furthermore, there was no difference ($P = 0.46$) in BW at pregnancy diagnosis among treatments, (829, 838, and 831 ± 13 lb; ESTRUS, GNRH-I, and GNRH-D, respectively).

Heifers in the GNRH-I group had significantly ($P < 0.01$) greater ADG from pre-breeding to pregnancy diagnosis compared with heifers in the ESTRUS group (1.20 vs. 0.89 ± 0.13 lb/d). However, there was no difference in ADG either between GNRH-I and GNRH-D (1.20 vs. 0.95 ± 0.13 lb/d, $P = 0.18$) or between ESTRUS AND GNRH-D (0.89 vs. 0.95 ± 0.13 lb/d, $P = 0.80$).

Heifers expressing estrus, as determined by an activated Estrotect, represented 70% (n = 319) of the herd. The proportion of pregnant heifers was significantly affected ($P < 0.01$) by treatment. Heifers AI on estrus, had significantly higher ($P < 0.01$) AI pregnancy rates compared with heifers in both GNRH-I and GNRH-D groups (72 vs. 56, 47 ± 6%). Pregnancy rates to AI did not differ ($P = 0.56$) between GNRH-I and GNRH-D (56 vs. 47 ± 6%). Final pregnancy rates were similar ($P = 0.54$) among ESTRUS, GNRH-I, and GNRH-D heifers (92 vs 89 vs 91 ± 4%). Heifers in all groups reached a similar ($P = 0.58$) percentage of their mature BW prior to the breeding season (63 ± 1%).

Previous research has shown a benefit to delayed AI, suggesting a 20 h delay is advantageous because of a more favorable uterine environment. Moreover, the delay should give females more time to attain estrus, increasing the number of heifers expressing estrus at AI (*Journal of Animal Science*, 2014, 92: 1747–1752). The current study, however, did not observe any advantage to delayed AI. The results of this study found no benefit to a 19 h delayed AI.

Table 1. Growth and reproductive performance of heifers AI on their estrus and non-estrus heifers assigned to GNRH-I[a] or GNRH-D[b]

	ESTRUS	Non-Estrus			
Item		GNRH-I[a]	GNRH-D[b]	SEM	*P*-value
Pre-breeding BW, lb	773	764	770	12	0.58
Pregnancy Diagnosis BW, lb	829	838	831	13	0.46
Post AI ADG,[c] lb/d	0.89[e]	1.20[f]	0.95[e,f]	0.13	0.01
AI Pregnancy Rate, %	70[e]	56[f]	47[f]	6	< 0.01
Final Pregnancy Rate, %	92	89	91	4	0.54
Percent Mature BW,[d] %	63	63	63	1	0.58

[a]Non-estrus heifers were administered GnRH 72 h following $PGF_{2\alpha}$ and immediately AI.
[b]Non-estrus heifers were administered GnRH 72 h following $PGF_{2\alpha}$ and AI 19 h following.
[c]ADG from pre-breeding to pregnancy diagnosis (57 d).
[d]Percent mature BW based on 1,218 lb mature BW.
[e,f] Means in a row with different superscripts are different ($P < 0.05$).

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