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Comparison of Two Alternate Prostaglandin Products in Yearling Beef Heifers

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Summary with Implications

Yearling heifers were administered 1 of 2 alternate prostaglandin products (Lutalyse vs. Lutalyse HighCon), which differ in concentration of active ingredient and administration route. Timing of estrus, pregnancy rate to AI, and final pregnancy rate did not differ between treatments. Body weight and ADG were also not affected by prostaglandin treatment. These results indicate producers can utilize Lutalyse HighCon, administered subcutaneously (s.c.), to avoid injection site blemishes and reduce carcass discounts with no impact on estrus synchronization or pregnancy rates.

Introduction

Estrus synchronization optimizes labor and time, increases calf uniformity, decreases the length of the calving season, and improves the ease of using AI. Prostaglandin $F_{2\alpha}$ (PG), a hormone used in estrus synchronization, is typically injected intramuscularly (i.m.) to regress the corpus luteum, initiate estrus, and ultimately, cause ovulation of the dominant follicle. The Beef Quality Assurance program encourages animal pharmaceutical companies to develop s.c. administration of injectable products, decreasing the use of i.m. injections, which can cause injection site lesions. Lutalyse *HighCon* (12.5 mg/mL dinoprost tromethamine, Zoetis Animal Health, Parsippany, NJ) has recently received labeling for either s.c. or i.m. injection. It contains a higher concentration of dinoprost tromethamine than Lutalyse (5 mg/mL, Zoetis Animal Health, Parsippany, NJ) and subsequent dosage is decreased from 5 to 2 ml. The objective of the present study was to evaluate the efficacy of 2 ml s.c. Lutalyse *HighCon* compared with 5 ml i.m. Lutalyse in estrus response and pregnancy rates in a melengestrol acetate (MGA)-PG protocol.

Figure 1. Melengestrol acetate–prostaglandin $F_{2\alpha}$ (MGA-PG) protocol. Melengestrol acetate (Zoetis Animal Health, Parsippany, NJ) offered to each heifer for 14 d at a rate of 0.5 mg/d. On d 33, heifers were administered either 5 ml i.m. Lutalyse (CONTROL, 5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n = 95) or 2 ml s.c. Lutalyse *HighCon* (HiCON, 12.5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n = 95).

Procedure

Yearling, Angus-based heifers managed at 2 locations were utilized to evaluate the efficacy of 2 alternate PG (Lutalyse vs. Lutalyse *HighCon*) products. Heifers at location 1 (n = 100, 750 ± 7 lb, L1) were maintained at West Central Research and Extension Center (WCREC), North Platte, NE. Heifers were offered a ration consisting of 13 lb/hd grass hay, 5 lb/hd wet corn gluten feed, and 1 lb/hd of 1 of 2 mineral supplements, on an DM basis.

Heifers were synchronized using a MGA-PG protocol (Figure 1). Each heifer was offered 0.5 mg/d of melengestrol acetate (MGA, Zoetis Animal Health, Parsippany, NJ) pellets in their diet (d 1 to 14). On d 33, heifers were blocked by previous mineral treatment and assigned to receive 5 mL Lutalyse i.m. (CONTROL, n = 50) or 2 mL Lutalyse *HighCon* s.c. (HiCON, n =50). A heat detection patch (Estrotect, Rockway Inc., Spring Valley, WI) was applied at PG injection. Heifers were managed together to observe estrus continuously for 6 d.

Heifers were AI 12 h after estrus was observed. Heifers were considered in estrus when more than 50% of the rub-off coating was removed on the Estrotect patch. Heifers not detected in estrus (n = 16) were given a s.c. injection of Lutalyse *HighCon* 6 d after initial PG injection and placed with 2 bulls. Inseminated heifers were placed in a separate pasture for 10 d before being placed with bulls and heifers not detected in estrus for a 60 d breeding season at a bull to heifer ratio of 1:50. Pregnancy to AI was diagnosed via transrectal ultrasonography (Aloka, Hitachi Aloka Medical America Inc., Wallingford, CT) 51 d after initial PG injection and BW was recorded. Final pregnancy diagnosis occurred 78 d after initial pregnancy diagnosis via transrectal ultrasonography to determine final pregnancy rates and record BW.

A second group of yearling, Angus-based crossbred heifers were managed at the Kelly Ranch, Sutherland, NE (n = 90, 719 ± 9 lb; location 2, L2) and were offered a ration containing 1 lb/d wet distillers grains, 5 lb/d grass hay, 7 lb/d corn silage, and 0.4 lb/d balancer pellet on a DM basis. Heifers were synchronized with a similar MGA-PG protocol as L1 and assigned randomly to CONTROL (n = 45) or HiCON (n = 45) treatment groups.

Heifers were AI 12 h after detection of estrus. Heifers not expressing estrus by 96 h were AI and given 2 ml Factrel i.m. (50 μg/mL gonadorelin hydrochloride, Zoetis Animal Health, Parsippany, NJ). Ten d post AI, 2 bulls were placed with heifers for a 40 d breeding season. Pregnancy to AI was diagnosed via transrectal ultrasonography 57 d after PG injection and BW recorded. A final pregnancy diagnosis and BW measurement followed 50 d after initial pregnancy diagnosis on heifers not pregnant to AI.

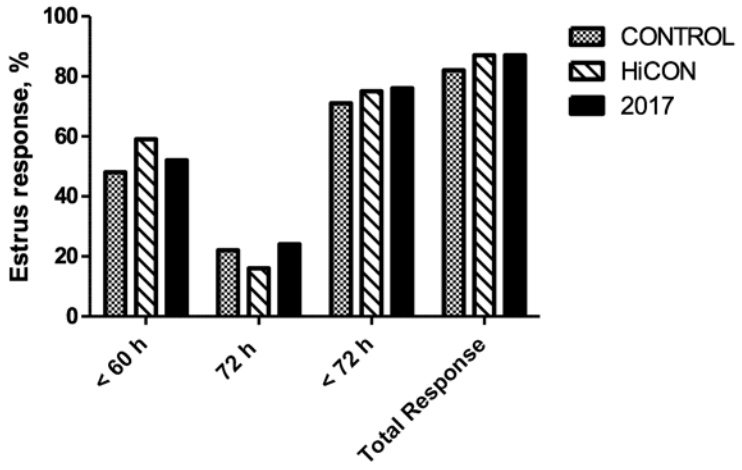

Figure 2. Heifers were offered 0.5 mg/d melengestrol acetate (MGA, Zoetis Animal Health, Parsippany, NJ) for 14 d. On d 33, heifers were injected with prostaglandin $F_{2\alpha}$ in the neck region. For 2016, heifers were randomly assigned to 1 of 2 treatments: **CONTROL**: 5 mL i.m. Lutalyse (5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n = 95) or **HiCON**: 2 mL s.c. Lutalyse *HighCon* (12.5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n = 95). In 2017, heifers (n = 98) were administered 2 mL s.c. Lutalyse *HighCon* (**2017**).

Table 1. Estrus response times for yearling heifers given 2 alternate prostaglandin $F_{2\alpha}$ injections in a MGA-PG estrus synchronization protocol

	Treatment[1]			*P*-value[2]		
Estrus response, %	CONTROL	HiCON	SEM	TRT	Location	T×L
≤ 60 h	48	59	5.2	0.15	0.07	0.81
72 h	22	16	4.3	0.27	0.69	0.72
≤ 72 h	71	75	4.7	0.51	0.08	0.96
Total Response	82	87	3.9	0.40	0.85	0.40

[1] Heifers administered 1 of 2 alternate $PGF_{2\alpha}$ injections in the neck region on d 33 as part of a MGA-PG protocol. CONTROL: 5 mL i.m. Lutalyse (5 mg/mL dinoprost tromethamine, Zoetis Animal Health, Parsippany, NJ, n = 95) or HiCON: 2 mL s.c. Lutalyse *HighCon* (12.5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n =95).
[2] TRT: $PGF_{2\alpha}$ injection treatment main effect, Location: Location main effect, T×L: $PGF_{2\alpha}$ injection treatment by location interaction.

Table 2. Pregnancy rates of yearling beef heifers given one of two alternate prostaglandin $F_{2\alpha}$ injections

	Treatment[1]			*P*-value[2]		
	CONTROL	HiCON	SEM	TRT	Location	T×L
AI pregnancy[3], %	63	60	5.3	0.62	0.06	0.03
Total pregnancy[4], %	98	93	2.7	0.11	0.96	0.85

[1] Heifers administered 1 of 2 alternate $PGF_{2\alpha}$ injections in the neck region on d 33 as part of a MGA-PG protocol. CONTROL: 5 mL i.m. Lutalyse (5 mg/mL dinoprost tromethamine, Zoetis Animal Health, Parsippany, NJ, n = 95) or HiCON: 2 mL s.c. Lutalyse *HighCon* (12.5 mg/mL dinoprost tromethamine, Zoetis Animal Health, n = 95).
[2] TRT: $PGF_{2\alpha}$ injection treatment main effect, Location: Location main effect, T×L: $PGF_{2\alpha}$ injection treatment by location interaction.
[3] Pregnancy diagnosed via transrectal ultrasonography a minimum of 51 d after $PGF_{2\alpha}$ injection.
[4] Final pregnancy diagnosis conducted via transrectal ultrasonography a minimum of 107 d after $PGF_{2\alpha}$ injection.

The following year, in 2017, additional yearling Angus-based heifers located at WCREC (2017, n = 98) were exposed to an MGA-PG protocol. Heifers were managed the same as L1, except all heifers received 2 mL s.c. Lutalyse *HighCon*. Heifers were observed for estrus activity for 4 d after PG injection and AI 12 h after detection. Those not detected (n = 13) were given a second injection of Lutalyse *HighCon* and placed with bulls for a 60 d breeding season.

Statistical Analysis

The PROC GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C) was used for statistical analyses with location and treatment in the class statement. Main effects analyzed were estrus detection time points, AI pregnancy rate, final pregnancy rate, BW and ADG. Individual heifer was considered the experimental unit. Means were declared significant for both experiments at $P \leq 0.05$ with $0.05 < P < 0.10$ considered a tendency.

Results

Initial BW was similar ($P = 0.36$) between treatments (729 vs. 739 ± 8 lb, CONTROL vs. HiCON), but differed ($P = 0.01$) between locations (750 vs. 719 ± 7 lb, L1 vs. L2). Additionally, BW at first pregnancy diagnosis was similar ($P = 0.26$) between treatments (858 vs. 871 ± 9 lb, CONTROL vs. HiCON), but also differed ($P = 0.04$) by location (851 vs. 875 ± 9 lb, L1 vs. L2). Heifers at L2 had a greater ADG ($P < 0.01$) between prebreeding and AI pregnancy diagnosis compared with heifers at L1 (2.0 vs. 2.9 ± 0.07 lb/d). At final pregnancy diagnosis, heifer BW was similar ($P = 0.71$) between locations (928 vs. 941 ± 31 lb, L1 vs. L2), and treatments ($P = 0.85$; 939 vs. 933 ± 24 lb, CONTROL vs. HiCON). The discrepancy in BW and ADG by location is caused by L2 heifers starting at a lower BW at initiation of the trial, but due to a higher energy ration fed through the treatment period, compensating to a similar final BW.

Percentage of heifers detected in estrus is summarized in Table 1, and was similar between treatments at ≤ 60 h ($P = 0.15$), ≤ 72 h ($P = 0.51$), and at 72 h ($P = 0.27$). There was a tendency ($P > 0.07$) for a location effect on estrus response timing at ≤ 60 h (60 vs. 47 ± 5%, L1 vs. L2) and at ≤ 72 h (78 vs. 67 ± 5%, L1 vs. L2). Different management practices were implemented at each location, and likely caused the tendency for location to have an effect on estrus response times.Total percentage of heifers observed in estrus throughout the detection period was similar between treatments ($P = 0.40$). Estrus response times for CONTROL, HiCON and 2017 groups is displayed in Figure 2.

There was a location × treatment interaction ($P = 0.03$) for AI pregnancy rates at AI pregnancy diagnosis between L1 (44 vs.

64 ± 7.0%, CONTROL vs. HiCON) and L2 (73 vs. 62 ± 7.2%, CONTROL vs. HiCON). This is similar to past AI pregnancy rates reported at WCREC (2016 Nebraska Beef Report, pp 5–7) and those reported at the Kelly Ranch (2017 Nebraska Beef Report, pp 11–12). Final pregnancy rates were similar between treatments ($P > 0.11$, Table 2). Results from the present study indicate s.c. administration of Lutalyse *HighCon* is a suitable alternative to an i.m. injection of Lutalyse.

Implications/Conclusions

Treatment (Lutalyse vs. Lutalyse *HighCon*) did not affect estrus timing, pregnancy to AI, final pregnancy rates, BW or ADG. These results indicate producers can utilize a s.c. injection of Lutalyse *HighCon* to avoid injection site blemishes and reduce carcass discounts without negatively impacting estrus synchronization or pregnancy rates.

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