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Introduction

The use of growth-promoting technologies has become a common practice in the beef cattle industry as producers strive for efficient growth and greater lean deposition. Two common technologies include exogenous hormonal implants and beta-adrenergic agonists (β-AA). Combination implants containing estrogen and testosterone increase muscle mass by elevating protein synthesis and/or reducing protein degradation. The increase in protein synthesis allows the animal to produce more lean muscle tissue. Optaflexx (Elanco Animal Health, Greenfield, IN) is a popular β-AA that works as a repartitioning agent to redirect nutrients toward muscle deposition and away from adipose tissue production. The two technologies utilize separate pathways for muscle growth and can have additive results on efficiency and ultimate carcass characteristics. Feedlot heifer responses to growth-promoting technologies have been inconsistent and not as potent as those observed in steers. The objective of this study was to determine the effects of two growth-promoting programs on feedlot heifer performance and carcass composition.

Experimental Procedures

Two groups of crossbred feedlot heifers were blocked by body weight (n = 33, initial body weight 946 ± 15 lb; n = 32, initial body weight 1,025 ± 15 lb) and assigned to one of three treatments: (1) no implant or Optaflexx (control); (2) Component TE-200 implant (Elanco Animal Health) and no Optaflexx (implant); or (3) Component TE-200 implant and 400 mg per head of Optaflexx fed during the final 28 days for group 1 and 29 days for group 2 (Optaflexx/implant). Animals were housed indoors in individual pens, and feed was delivered once daily to provide *ad libitum* access to feed. Diets (Table 1) were formulated to meet all nutrient requirements and were similar between the two groups. Bunks were managed to leave a minimum amount of unconsumed feed daily, and excess feed was collected daily for the calculation of dry matter feed intake. Body weights were recorded prior to treatment and before harvest. After the finishing period, animals were weighed and shipped to Creekstone Farms in Arkansas City, KS, for harvest. At time of harvest, hot carcass weight was measured and carcasses were tagged for animal identification. Following a 48-hour chill period, carcass measurements were recorded, including ribeye area, 12th-rib backfat thickness, and yield grade.

Marbling score and quality grade were determined by a USDA-certified grader. Boneless strip loins were then transported to the Kansas State University Meat Laboratory, where they were weighed and further processed for meat quality research.

Results and Discussion

Growth-promoting technologies have been well documented to improve feedlot efficiency and carcass yields. For this study, initial and final body weights did not differ across treatment groups (Table 2). Average daily gain and dry matter intake also did not differ. Feed:gain exhibited a tendency to differ ($P = 0.08$) across treatments. After animal harvest, hot carcass weight was measured and tended to differ across treatments ($P = 0.09$). The control group tended to have lighter carcasses compared with the other two growth-promoting groups. Dressing percentage and yield grade were unaffected by treatment. Ribeye area was affected ($P < 0.01$) by treatment. The implant only and Optaflexx group did not differ ($P < 0.01$) from each other but were 7 and 9% greater ($P < 0.01$) than the control group, respectively. Marbling score and backfat thickness did not differ across treatments. Boneless strip loin weights differed across treatments ($P < 0.01$). Compared with control loins, implant only and Optaflexx carcasses had 10 and 8% greater ($P < 0.01$) initial strip loin weights, respectively. These results demonstrate the effects of growth-promoting technologies on the promotion of lean muscle. Although feedlot performance was not improved, an increase in strip loin weight provides producers an incentive to use these strategies to improve the profitability of beef carcasses.

Implications

Animals subjected to growth-promoting technologies utilized similar amounts of feed but produced greater amounts of lean muscle tissue, as shown through improvements in strip loin weights and ribeye area.

Table 1. Diet percentages (dry matter basis) for crossbred heifers[1] subjected to three exogenous growth-promoting programs

	Treatment					
	Group 1			Group 2		
Ingredient	Control	Implant	Optaflexx/ implant	Control	Implant	Optaflexx/ implant
Steam-flaked corn	57.91	57.91	57.12	57.79	57.79	57.28
Corn gluten feed	30.00	30.00	31.08	30.00	30.00	30.86
Ground alfalfa hay	8.00	8.00	7.76	8.00	8.00	7.82
Feed additive premix[2]	2.16	2.16	-	2.27	2.27	-
Vitamin/mineral supplement[3]	1.93	1.93	1.90	1.93	1.93	1.85
Ractopamine supplement[4]	-	-	2.14	-	-	2.18

[1] Crossbred heifers (group 1, n = 33; group 2, n = 32) were raised during two different time periods and were subjected to one of three treatments: (1) no implant and no Optaflexx (Elanco Animal Health, Greenfield, IN) supplementation (control); (2) implanted with Component TE-200 (Elanco Animal Health) on day 0 of feeding, no Optaflexx supplementation (implant); and (3) implanted with Component TE-200 on day 0 of feeding, and supplemented with 400 mg/heifer/day Optaflexx for 28 days for group 1 or 29 days for group 2 (Optaflexx/implant).

[2] Formulated to provide 0.7% calcium, 0.7% potassium, 0.3% salt, 0.1 ppm cobalt, 10 ppm copper, 60 ppm manganese, 0.3 ppm selenium, 60 ppm zinc, 2,200 KIU/kg vitamin A, and 22 IU/kg vitamin E on a dry matter basis.

[3] Formulated to provide 300 mg/day monensin and 90 mg/day tylosin (Elanco Animal Health, Greenfield, IN) per animal in a ground corn carrier.

[4] Formulated to provide 400 mg/day per heifer of ractopamine hydrochloride (Elanco Animal Health), 0.7% calcium, 0.7% potassium, 0.3% salt, 0.1 ppm cobalt, 10 ppm copper, 60 ppm manganese, 0.3 ppm selenium, 60 ppm zinc, 2,200 KIU/kg vitamin A, and 22 IU/kg vitamin E on a dry matter basis.

Table 2. Feedlot performance and carcass characteristics for heifers[1] subjected to exogenous growth-promoting technologies

Item	Control	Implant	Optaflexx/ implant	SEM[2]	*P*-value
Feedlot performance					
Initial body weight, lb	1039.4	1069.4	1063.0	16.4	0.39
Final body weight, lb	1128.3	1166.4	1168.6	15.9	0.14
Average daily gain, lb	3.26	3.56	3.87	0.23	0.18
Dry matter intake, lb	20.4	20.2	19.8	0.7	0.83
Feed:gain	7.2	6.6	5.5	0.5	0.08
Carcass characteristics					
Hot carcass weight, lb	719.7	749.4	752.2	11.4	0.09
Dressing percentage, %	63.59	63.84	64.28	0.37	0.41
Yield grade	2.78	2.33	2.38	0.17	0.12
Ribeye area, sq. in.	13.05[a]	14.13[b]	14.35[b]	0.25	<0.01
Strip loin weight, lb	12.35[a]	13.71[b]	13.44[b]	0.22	<0.01
Back fat, in.	0.50	0.43	0.47	0.04	0.44
Marbling score[3]	519	503	519	20	0.80

[a,b] Means within a row with a different superscript are different ($P < 0.05$).

[1] Crossbred heifers (group 1, n = 33; group 2, n = 32) were raised during two different time periods and were subjected to one of three treatments: (1) no implant and no Optaflexx (Elanco Animal Health, Greenfield, IN) supplementation (control); (2) implanted with Component TE-200 (Elanco Animal Health) on d 0 of feeding, no Optaflexx supplementation (implant); and (3) implanted with Component TE-200 on d 0 of feeding, and supplemented with 400 mg/day per heifer Optaflexx for 28 days for group 1 or 29 days for group 2 (Optaflexx/implant).

[2] SEM = standard error of the mean.

[3] Marbling scores were determined by a USDA grader; slight = 400–499, small = 500–599, modest = 600–699.