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Effects of Ralgro^{1,2} Implants on Growth, Sexual Development, Carcass Characteristics, and Eating Quality of Bulls Implanted From Birth to Slaughter

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Summary

Growth, performance, sexual development, carcass characteristics, and eating quality were evaluated on 40 fall-born Angus bulls. Twenty of the bulls were implanted five times with Ralgro at an average interval of 106 days, beginning near birth. The other 20 bulls served as nonimplanted controls. Bull calves remained with their dams on native southeast Kansas pasture for an average of 320 days; they were then allotted to drylot pens (feedlot beginning) and placed on a 75% concentrate ration. Bulls from each treatment were fed to target weights of 1000 and 1100 pounds, and then slaughtered.

Ralgro implanting increased average daily gain 6.6% over that of the controls from birth to the feedlot beginning, and 9.4% from the feedlot beginning to the first slaughter endpoint (196 days on feed). Feed efficiency was improved 8.2%, with implanting when the first group of implanted and control bulls were slaughtered (196 and 231 days on feed, respectively).

Implanting reduced semen quality, reduced the number of bulls producing semen, and depressed the development of reproductive organs. Sex drive was unaffected by implanting.

Implanting resulted in fatter carcasses and tended to increase yield grades, but did not affect final quality grades. Lean from control carcasses tended to be firmer and have a finer texture, but color was not affected by implanting. Loineye steaks from implanted bulls were significantly more tender, as judged by taste panel ratings and by Warner-Bratzler shear forces.

Introduction

Consumer demand for leaner beef and cattlemen's desire to increase efficiency have emphasized the need to study bulls as meat animals.

Previous research has shown that implanting bulls with Ralgro has improved their growth, performance, and carcass traits, but these advantages appear to depend on animal age and weight, and on implanting frequency.

¹Ralgro is a product of International Minerals & Chemical Corporation.

²Mention of products and companies is made with the understanding that no discrimination is intended and no endorsement implied.

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A trial at K.S.U. (Cattlemen's Day, 1979) showed that implanting bulls every 100 days from birth to slaughter improved average daily gain, impaired sexual development, and reduced mounting activity. That trial also indicated that implanting may improve carcass traits and the eating quality of bull meat.

Our trial was conducted to evaluate the effects of implanting bulls with Ralgro on: 1) growth and performance; 2) sexual development; and 3) carcass and palatability (eating quality) characteristics.

Experimental Procedure

Twenty of 40 Angus bull calves were implanted with 36 mg of Ralgro within 3 days after birth, then were reimplanted at an average of 123, 198, 324, and 425 days of age. The remaining 20 bulls served as nonimplanted controls.

All bulls were born in September and October and remained with their dams on native southeast Kansas pasture for an average of 320 days. The bulls were then assigned to drylot pens (feedlot beginning) and placed on adjustment rations, before being finished on a 75% concentrate ration.

Bulls from each treatment were slaughtered at two target weights (1000 and 1100 pounds). Each bull was weighed at the beginning of the finishing period and thereafter at regular intervals until slaughter; feed intake was monitored.

Maximum circumference of the scrotum (scrotal circumference) of each bull was measured at an average of 331 days and again at 517 days of age. At an average of 374 days and again at 501 days, groups of four bulls were penned with three restrained heifers in heat. The number of mounts, services, and other sexual activities were recorded on each bull for 10 minutes. Bulls were scored on a scale from 1 to 10 for libido (sex drive), with 1 being no interest and 10 being two services followed by mounts, mounting attempts, or further services. At an average age of 515 days, semen collection by electro-ejaculation was attempted on each bull. Collection continued until sperm were found in the ejaculate or until three attempts had been made. At slaughter the testicles, penis, seminal vesicles, and pituitary gland were removed and weighed, and testicle volume and penis length were recorded.

Carcass quality grade, yield grade, lean color, lean firmness, and lean texture were evaluated after a 48-hour chill. Loin steaks were removed from the shortloin of each carcass. The longissimus dorsi muscle (loineye) of one steak was evaluated by a trained taste panel for tenderness, juiciness, and flavor. Six 0.5-inch diameter cores were removed from another loineye steak and sheared with a Warner-Bratzler shear to mechanically measure tenderness.

Results and Discussion

Growth and performance: Average daily gain (ADG) and feed efficiency data are shown in Table 19.1. Implanting improved ADG 6.6% ($P < .05$) from

birth to the feedlot beginning (320 days, average age). From the feedlot beginning until the first group of bulls was slaughtered (196 days), implanted bulls gained 9.4% faster ($P < .01$), with a 7.9% advantage ($P < .10$) in feed efficiency, than did controls. Compared within slaughter weight endpoints, implanting increased ADG 9.1% ($P < .01$). Feed efficiency for all implanted bulls up to the first slaughter (196 days) was 7.13 lbs of feed/lb of gain. Control bulls required 35 more days to reach the same target weight, and their feed efficiency was 7.71 lbs of feed/lb of gain -- an 8.2% advantage ($P < .10$) for implanted bulls.

Sexual development: Table 19.2 shows that testicular development was depressed ($P < .05$) by implanting. Sperm were successfully collected from all control bulls but from only 45% of the implanted bulls, and percent motility was lower ($P < .05$) for implanted bulls. Sex drive (libido) was not affected in this trial, which is in disagreement with an earlier trial at Kansas State (Cattlemen's Day, 1979) where bulls implanted with Ralgro had lower libido scores.

Because repeated implanting with Ralgro suppresses sexual development in bulls, implanted bulls should not be used for breeding purposes.

Carcass and palatability characteristics: Slaughter weight, average age at slaughter, hot carcass weight, and dressing percent are shown in Table 19.3. We cannot explain the inconsistency in dressing percentages for bulls within slaughter weight groups.

Table 19.4 shows that implanted bulls had more ($P < .05$) external fat (adjusted fat thickness) and more ($P < .10$) kidney, pelvic, and heart fat than did the controls. Yield grades tended ($P < .10$) to be lower for control bulls, with no difference in loin-eye areas. Quality grades were similar between treatments, and no differences were found in lean color, but control bulls tended ($P < .10$) to have more desirable lean texture and firmness ratings. Even though implanted bulls were slaughtered at an earlier chronological age, they tended ($P < .10$) to have higher carcass maturity scores.

A trained taste panel rated steaks from implanted bulls as being significantly more tender for myofibrillar tenderness, connective tissue amount, and overall tenderness. Warner-Bratzler shear forces confirmed the taste panel tenderness ratings. Flavor intensity and juiciness ratings were similar between treatments.

Table 19.1. Effects of Ralgro on bull growth and performance

	Control	Implant	% advantage of implanted over control
No. bulls	20	20	-
Avg. daily gain, lbs from birth to feedlot beginning	1.37 ^a	1.46 ^b	6.6%
Avg. daily gain, lbs from feedlot beginning to slaughter	2.35 ^c	2.57 ^d	9.4%
Avg. daily gain, lbs from feedlot beginning to actual slaughter endpoints	2.31 ^c	2.52 ^d	9.1%
Feed/lb of gain from feedlot beginning to slaughter	7.69 ^f	7.13 ^e	7.9%

^{a,b}Means in same row with different superscripts are different ($P < .05$).

^{c,d}Means in same row with different superscripts are different ($P < .01$).

^{e,f}Means in same row with different superscripts are different ($P < .10$).

Table 19.2. Effects of Ralgro on sexual development of bulls

	Control	Implant
No. bulls	20	20
<u>Scrotal circumference, cm</u>		
Average age -331 days	28.3 ^a	21.2 ^b
Average age - 517 days	32.4 ^a	29.7 ^b
<u>Libido test (avg. age - 374 days)</u>		
Libido score ^x	3.8	4.9
Number of mounts per bull	2.7	4.7
Number of services per bull	0.15	0.00
% bulls mounting	50.0 ^a	80.0 ^b
<u>Libido test (avg. age - 501 days)</u>		
Libido score ^x	4.7	4.8
Number of mounts per bull	2.5	3.0
Number of services per bull	0.25	0.05
% bulls mounting	70.0	70.0
<u>Semen collection by electro-ejaculation (avg. age - 515 days)</u>		
% with penis extension	100.0	90.0
% with erection	79.0	90.0 ^b
% with sperm in ejaculate	100.0 ^a	45.0 ^b
% motility	27.8 ^a	2.0 ^b
<u>Reproductive organs at slaughter</u>		
Paired testicle weight, g	499.6 ^a	261.0 ^b
Paired testicle volume, ml	469.8 ^a	250.6 ^b
Testicle density, g/ml	1.07 ^a	1.04 ^b
Penis weight, g	364.0 ^a	282.5 ^b
Penis length, cm	75.7 ^a	72.4 ^b
Seminal vesicles weight, g	73.6 ^a	62.1 ^b
Pituitary weight, g	1.6	1.5

^{a,b}Means in same row with different superscripts are different (P<.05).

^xA score of 10 = two services followed by mounts, mounting attempts, or further services; a score of 1 = no interest.

Table 194. Effects of Ralgro on bull carcass characteristics and palatability ratings

	Control	Implant
<u>Carcass characteristics</u>		
48-hour quality grade	Good 73	Good 78
Marbling	Slight 81	Slight 93
Maturity	A 70 ^a	A 80 ^b
Lean color ^s	2.1	2.2 ^b
Lean texture ^s	2.9 ^a	3.1 ^b
Firmness of lean ^s	1.9 ^a	2.3 ^b
Yield grade	2.79 ^a	3.09 ^b
Adjusted fat thickness, in.	0.45 ^c	0.56 ^d
Loineye area, in. ²	11.71	11.73
% Kidney, pelvic, and heart fat	2.0 ^a	2.2 ^b
<u>Palatability ratings (loineye steaks)</u>		
<u>Taste panel analysis scores</u>		
Flavor intensity ^x	6.15	6.22
Juiciness ^x	6.24	6.01 ^f
Myofibrillar tenderness ^x	5.65 ^e	6.47 ^d
Connective tissue amount ^y	6.41 ^c	6.81 ^f
Overall tenderness ^x	5.80 ^e	6.54 ^f
Warner-Bratzler shear forces ^z	7.07 ^f	5.12 ^e

^{a,b}Means in same row with different superscripts are different (P<.10).

^{c,d}Means in same row with different superscripts are different (P<.05).

^{e,f}Means in same row with different superscripts are different (P<.01).

^sA score of 4 = moderately dark red color, slightly fine texture, or slightly soft firmness; 1 = very light cherry red color, very fine texture or very firm firmness.

^xA score of 8 = extremely intense flavor, extremely juicy, or extremely tender myofibrillar or overall tenderness; 1 = extremely bland, extremely dry, or extremely tough myofibrillar or overall tenderness.

^yA score of 8 = no connective tissue; 1 = abundant connective tissue.

^zPounds of force required to shear through a 0.5-in. core of cooked steak.

Table 19.3. Slaughter information for Ralgro implanted bulls

	Light control	Heavy control	Light implant	heavy implant
Slaughter weight, lbs	1000	1134	997	1104
Avg. age at slaughter, days	581	552	538	522
Hot carcass weight, lbs	614	719	639	681
Dressing %	61.4	63.4	64.1	61.7