

K**S****U**

Effect of Ralgro¹ and COMPUDOSE^{2,4} on Grazing Steer Performance

Lyle W. Lomas³

Summary

COMPUDOSE (an estradiol removable implant) increased steer gains during 202 days of grazing by 11.4%. Ralgro implants (once at the beginning of the study) increased gain 8.5%. Steer performance on the two implants was statistically similar.

Introduction

Growth-promoting implants usually result in an 8 to 15% faster gain in growing and finishing cattle. Synovex and Ralgro, the only implants currently approved for beef cattle, cannot be used within 60 and 65 days, respectively, of slaughter. Because both implants have an effective life of about 100 days, reimplanting is necessary for maximum benefits.

COMPUDOSE is a silicone rubber implant that releases estradiol-17 β (a naturally occurring hormone) at a controlled rate. Although not currently cleared for use by the Food and Drug Administration, approval is anticipated in early 1982. Because it does contain a naturally occurring hormone, COMPUDOSE is expected to be approved for use without a required withdrawal period.

Procedure

On April 2, 1980, eighty-one Charolais steers averaging 539 lb were allotted thus: 1) control (no implant); 2) 36 mg of Ralgro; 3) COMPUDOSE (a removable, 4.76 mm x 3.0 cm silicone rubber implant containing estradiol-17 β). Implants were placed subcutaneously in the median surface of the ear at the beginning of the trial and at no other time was any additional anabolic treatment given. Each COMPUDOSE-implanted steer was checked every 28 days to determine implant losses and was reimplanted if necessary. Steers were observed daily for abnormal behavior, such as "buller" steers. Cattle were grazed in three brome grass pastures; all treatments were represented equally in each. Supplemental feed was provided equally when forage became short. Initial and final weights were the average of nonshrunk individual weights taken on consecutive days. The study was terminated October 22, 1980.

¹Ralgro is the trademark name for zeranol implants produced by International Minerals and Chemical Corp., Terre Haute, IN 47808. Implants provided by IMC.

²COMPUDOSE is the trademark name for the estradiol implant produced by Elanco Products Co., Division of Eli Lilly Co., Indianapolis, IN 42606. Implants and partial financial assistance provided by Eli Lilly Co.

³Southeast Kansas Branch Experiment Station, Parsons, KS 67357.

⁴COMPUDOSE is not currently cleared by the FDA for use in cattle.

Results

During the 202-day grazing study, steers implanted with COMPUDOSE gained 11.4% more ($P < .01$) than controls did. Ralgro-implanted steers gained 8.5% more ($P < .05$) (Table 18.1). The gain difference between the two implants was not significant ($P > .20$). Average calculated estradiol- 17β release from the COMPUDOSE implants was $49\mu\text{g}$ per day. The incidence of "buller" steers or other mounting activity was similar among treatments.

Early in the study, several cattle lost their COMPUDOSE implants. Most implants retained for the first 28 days, however, remained for the entire 202 days. At the end of the test, 74% of the original COMPUDOSE implants remained in place.

Table 18.1. Effect of Implants on Steer Performance (202 days)

Item	Implant treatment		
	Control	Ralgro	COMPUDOSE
No. of steers	27	27	26
Initial wt., lb	539	536	540
Final wt., lb	894	922	937
Total gain, lb	355 ^{a,c}	386 ^{b,c,d}	397 ^{b,d}
Average daily gain, lb	1.76 ^{a,c}	1.91 ^{b,c,d}	1.96 ^{b,d}

^{a,b} Values in the same row with different superscripts differ significantly ($P < .05$).

^{c,d} Values in the same row with different superscripts differ significantly ($P < .01$).

Table 19.2. Effects of Ralgro on sexual development of bulls

	Control	Implant
No. bulls	20	20
Scrotal circumference, cm		
Average age - 331 days	28.3 ^a	21.2 ^b
Average age - 517 days	32.4 ^a	29.7 ^b
Libido test (avg. age - 374 days)		
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
Libido test (avg. age - 501 days)		
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
Semen collection by electro-ejaculation (avg. age - 515 days)		
% with penis extension	100.0	90.0
% with erection	79.0	90.0
% with sperm in ejaculate	100.0 ^a	45.0 ^b
% motility	27.8 ^a	2.0 ^b
Reproductive organs at slaughter		
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 19.4. Effects of Ralgro on bull carcass characteristics and palatability ratings

	Control	Implant
Carcass characteristics		
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
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
Palatability ratings (loineye steaks)		
Taste panel analysis scores		
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

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 1	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 1	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
Scrotal circumference, cm		
Average age - 331 days	28.3 ^a	21.2 ^b
Average age - 517 days	32.4 ^a	29.7 ^b
Libido test (avg. age - 374 days)		
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
Libido test (avg. age - 501 days)		
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
Semen collection by electro-ejaculation (avg. age - 515 days)		
% 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
Reproductive organs at slaughter		
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 19.4. Effects of Ralgro on bull carcass characteristics and palatability ratings

	Control	Implant
Carcass characteristics		
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
Palatability ratings (loineye steaks)		
Taste panel analysis scores		
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