January 2004

Influence of Implant Regimen on Performance and Carcass Characteristics in Feedlot Steers

Heather L. Haugen
University of Nebraska-Lincoln

Galen E. Erickson
University of Nebraska-Lincoln, gerickson4@unl.edu

Court G. Campbell
Fort Dodge Animal Health, Grand Island, NE

Casey G. Macken
University of Nebraska-Lincoln

Influence of Implant Regimen on Performance and Carcass Characteristics in Feedlot Steers

Heather L. Haugen
Galen E. Erickson
Court G. Campbell
Casey N. Macken[1]

Summary

A feedlot experiment was conducted to evaluate initial and terminal implant combinations in finishing steers. Implant strategies including Synovex Choice increased average daily gain and rib eye area when compared to strategies including Revalor-IS. Steers implanted initially and terminally with Synovex Choice also had increased performance compared to steers implanted initially and terminally with Revalor-IS; however, performance was not different when comparing Synovex Choice verses Revelor-IS as an initial implant (Revalor-S terminal implant). Marbling was similar across implant strategies, indicating the observed increase in performance with Synovex Choice was achieved without negatively influencing carcass quality.

Introduction

Anabolic implants have been extensively used in the cattle industry to increase gain and protein deposition and to improve feed conversion. Combinations of initial and terminal implants and their effects on animal performance and carcass quality are important to consider when selecting an implant strategy. Ralgro is an estrogenic implant which contains 36 mg zeranol. Revalor-S (24 mg estradiol 17β + 120 mg TBA) and Synovex Plus (28 mg estradiol benzoate + 200 mg TBA) are combination implants. Revalor-IS (16 mg estradiol 17β + 80 mg TBA) and Synovex Choice (14 mg estradiol benzoate and 100 mg TBA) are new combination implants. In this trial six implant strategies were selected to: 1) evaluate the influence of implant strategies in calf-feds during the finishing phase on performance and carcass characteristics and 2) determine the impact of implant strategies on carcass quality changes with additional days on feed.

Procedure

Four hundred eighty crossbred steers (619 lb) were stratified by weight and assigned randomly to one of six treatments in a feedlot trial at the University of Nebraska Agricultural Research and Development Center (Ithaca, NE). Treatments were assigned randomly to pens (4 pens/treatment) with 20 steers/pen. Initial weights were taken on two consecutive days at the beginning of the trial, and initial implants were administered at the initiation of the trial. A series of step-up diets containing 35%, 25%, 15%, and 5% alfalfa hay (DM basis) were fed for 3, 4, 7, and 7 days, respectively with high moisture corn replacing alfalfa. All treatments received the same finishing diet consisting of 10% corn silage, 43.5% high moisture corn, 40% wet corn gluten feed, 3.5% tallow, and 3% supplement, formulated to contain 14.5% CP. Rumensin and Tylan were included in the diet at 30 g/ton and 11 g/ton (DM basis), respectively.

Steers implanted originally with Ralgro were reimplanted on day 63 with their respective terminal implant. Steers implanted with Synovex Choice or Revalor-IS initially were reimplanted with their terminal implants on day 83. Steers were serially slaughtered so 10 steers from each pen were slaughtered after 155 days on feed (early slaughter), while the remaining 10 steers in each pen were slaughtered after 174 days on feed (late slaughter). Serial slaughter was used to evaluate changes in carcass characteristics late in the feeding period and to determine whether these changes are influenced by implant strategy. Feed conversion for the first 155 days on feed (early slaughter group) was calculated using the DMI based on 20 steers per pen. Feed conversion for the late slaughter group (174 days on feed) was calculated using the DMI from 20 steers per pen for the first 155 days plus the DMI of the remaining 10 steers per pen for the final 19 days. Final live weights were recorded for both slaughter groups prior to shipment and were pencil shrunk 4%. Hot carcass weights (HCW) were recorded on the respective slaughter day and were used to calculate gain and feed conversion on a carcass-adjusted basis (HCW adjusted to a 63 common dressing percentage). Carcass fat thickness, rib eye area (REA), and USDA quality and yield grade (YG) were recorded following a 24-hour chill. Yield grade was calculated based on fat thickness, hot carcass weight and rib eye area measurements. Empty body fat (EBF) was calculated using fat thickness, HCW, marbling and

Table 1. Effect of implant strategy on performance and carcass characteristics in finishing steers.

	Implant Strategies									Contrasts			
	Choice/ Choice	RevIS/ RevIS	Choice/ RevS	RevIS/ RevS	Ralgro/ RevS	Ralgro/ Syn+	SEM[a]	Implant* Kill	Implant F-test	Choice/ Choice RevIS/ RevIS	RevS Syn+	Choice RevIS	Initial Choice Initial RevIS
Initial BW	619	619	618	620	620	619	<1	0.25	0.48	0.67	0.40	0.30	0.06
DMI	20.8	20.6	20.9	20.5	20.5	20.7	0.2	0.99	0.35	0.33	0.70	0.06	0.10
Live Performance													
Final BW[b]	1224	1202	1216	1207	1187	1212	7	0.56	0.01	0.02	0.01	0.02	0.30
ADG	3.67	3.55	3.64	3.57	3.46	3.61	0.04	0.64	0.01	0.03	0.01	0.02	0.21
F:G	5.74	5.84	5.79	5.81	6.03	5.79	0.07	0.71	0.07	0.28	0.02	0.37	0.86
Carcass Performance													
Final BW[c]	1254	1228	1241	1236	1218	1246	7	0.27	0.01	0.01	0.01	0.03	0.59
ADG	3.85	3.70	3.79	3.74	3.64	3.81	0.04	0.37	0.01	0.01	0.01	0.02	0.43
F:G	5.44	5.60	5.57	5.54	5.73	5.49	0.06	0.31	0.05	0.09	0.01	0.32	0.73
Carcass Characteristics													
HCW	790	774	782	779	768	785	4	0.27	0.01	0.01	0.01	0.03	0.59
Fat (in)	0.58	0.59	0.61	0.59	0.62	0.58	0.02	0.99	0.65	0.64	0.17	0.86	0.47
Marbling[d]	517	520	518	508	519	524	9	0.29	0.86	0.85	0.69	0.67	0.43
REA (sq in)	13.1	12.7	13.1	13.0	12.8	13.0	0.1	0.82	0.24	0.06	0.18	0.10	0.68
REA-100lb HCW	1.66	1.65	1.68	1.67	1.67	1.67	0.02	0.98	0.93	0.60	0.93	0.69	0.97
YG[e]	3.16	3.25	3.19	3.18	3.27	3.13	0.08	0.99	0.82	0.43	0.23	0.64	0.89
YG1	5.0	2.6	1.6	3.8	3.9	1.4	2.2	0.81	0.84	0.45	0.43	0.95	0.50
YG2	33.8	33.8	34.8	31.9	35.9	46.0	6.7	0.98	0.72	1.00	0.29	0.83	0.76
YG3	55.6	50.9	51.0	56.9	46.0	44.6	5.9	0.93	0.63	0.57	0.87	0.92	0.49
YG4	4.0	11.5	12.9	7.5	13.0	5.5	3.1	0.48	0.20	0.10	0.10	0.74	0.23
YG5	1.6	1.3	0	0	1.3	2.6	1.2	0.64	0.66	0.83	0.44	0.88	1.00
EBF, %[f]	30.13	30.36	30.36	30.15	30.55	30.06	0.32	0.96	0.89	0.62	0.29	0.98	0.64
Choice[g]	62.9	61.3	64.9	63.0	62.0	68.1	6.5	0.55	0.98	0.86	0.52	0.79	0.84
Select[h]	37.3	37.8	35.1	37.0	38.0	32.0	6.5	0.55	0.98	0.87	0.52	0.80	0.84

[a]Standard error of the mean
[b]Final weight = live weight * 0.96
[c]Final weight = hot carcass weight / 0.63 common dressing percentage
[d]Marbling score: 450 = Slight 50; 500 = Small 0; 550 = Small 50; 600 = Modest 0; etc.
[e]Calculated Yield Grade = 2.5 + 2.5(FT) + 0.2(%KPH) + 0.0038* HCW - (0.32 *REA). %KPH was not measured but assumed to be 2% for all steers.
[f]Empty Body Fat calculated from Guiroy et al., 2002 (*J. Anim. Sci*): EBF = 17.76207 + (4.68142*Fat) + (0.01945*HCW) + (0.81855 * QG) - (0.06754 * REA)
[g]Choice and above
[h]Select and below

REA from Guiroy et al., 2002 (*J. Anim. Sci*.).

Treatments were analyzed in a 2 x 6 factorial with implant strategy (Choice/Choice, Revalor-IS/Revalor-IS, Choice/Revalor-IS, Revalor-IS/Revalor-S, Ralgro-Revalor-S, and Ragro/Synovex Plus) and slaughter time (early slaughter and late slaughter) as factors. Contrasts were constructed to compare specific implant strategies including: 1) Choice/Choice vs. Revalor-IS/Revalor-IS, 2) Ralgro/Revalor-S vs. Ralgro/Synovex Plus, 3) Choice vs. Revalor-IS, and 4) initial Choice vs. initial Revalor-IS. Interaction between implant strategy and slaughter time was tested first for all variables. Main effects are presented when the interaction was not significant.

Results

There was no significant interaction between implant strategy and slaughter time for any of the performance or carcass variables; therefore, main effects of implant strategy on performance and carcass characteristics are shown in Table 1. ADG and final weight were different for the six implant strategies ($P < 0.05$) on a live as well as a carcass basis. Steers in the Choice/Choice implant strategy had higher final weights and ADG than steers implanted with Revalor-IS/Revalor-IS. Feed conversion was improved (carcass adjusted basis) for Choice/Choice compared to Revalor-IS/Revalor-IS ($P = 0.09$), presumably related to hormone levels. Steers implanted with Choice/Choice also had larger REA than steers implanted with Revalor-IS/Revalor-IS ($P = 0.06$). Ralgro/Synovex Plus steers gained more than Ralgro/Revalor-S steers and had heavier final and carcass weights ($P < 0.05$). Treatments including Choice had higher ADG and increased final weights (live and carcass). REA tended to be larger for steers implanted with Choice compared to treatments that included Revalor-IS ($P = 0.09$). Comparing Choice and Revalor-IS as initial implants (Revalor-S terminal implant), however, showed no differences in performance between the two implants. Fat thickness and marbling were not different for any of the treatments. Steers were fed to the same end-point as indicated by

(Continued on next page)

similar empty body fat and calculated yield grade among treatments.

The main effect of slaughter time is shown in Table 2. Initial weight and dry matter intake were not different for the early and late slaughter group. Based on live performance, steers in the late slaughter group were 63 lb heavier than steers in the early group ($P < 0.05$); however, live ADG and feed conversion were not different for the early and late slaughter groups. Based on the carcass adjusted final weight (HCW divided by 0.63), steers in the late group weighed 84 lb more than steers in the early group and hot carcass weight increased by 53 lb for the late verses early slaughter group ($P < 0.05$). ADG was improved for the late slaughter group on a carcass adjusted basis ($P < 0.05$) compared to the early slaughter group as more of the gain was deposited on the carcass late in the finishing period. Feed conversion (carcass adjusted basis) also was improved for the late slaughter group compared to the early group ($P = 0.06$) as a result of an increase in dressing percentage with additional days on feed from 64.0% in the early slaughter to 64.9% in the late slaughter group ($P < 0.01$).

REA tended to be greater for the late group than the early group ($P = 0.08$). Calculated YG was greater for steers in the late slaughter group than steers in the early group as a result of increased HCW and fat thickness. EBF was also greater for the late slaughter group than the early slaughter group; however, both groups were above 28% EBF which is the predicted EBF to reach low Choice quality grade. Interestingly, the early slaughter group tended to have a greater percentage of carcasses grading Choice than the late group — 68% and 60%, respectively ($P = 0.12$).

Table 2. Effect of slaughter time (days on feed) on performance and carcass characteristics in finishing steers for the entire feeding period.

	Slaughter Time			Slaughter
	Early	Late	SEM[a]	P-value
Days on feed	155	174	–	–
Initial BW	619	620	<1	0.21
DMI	20.6	20.7	0.1	0.61
Live Performance				
Final BW[b]	1176	1240	4	<0.01
ADG	3.59	3.57	0.02	0.44
F:G	5.81	5.86	0.04	0.33
Carcass Performance				
Final BW[c]	1195	1280	4	<0.01
ADG	3.72	3.79	0.02	0.04
F:G	5.62	5.51	0.04	0.05
Carcass Characteristics				
Dressing %	64.0	64.9	0.1	<0.01
HCW	753	806	3	<0.01
Fat (in)	0.57	0.62	0.01	0.01
Marbling[d]	521	515	5	0.45
REA (sq in)	12.8	13.0	0.1	0.08
REA-100 lb HCW	1.71	1.62	0.01	<0.01
YG[e]	3.07	3.32	0.05	<0.01
YG1	5.7	0.4	1.3	<0.01
YG2	40.0	32.0	3.9	0.15
YG3	47.0	54.7	3.4	0.12
YG4	6.5	11.6	1.8	0.06
YG5	0.8	1.4	0.7	0.57
EBF, %[f]	29.82	30.71	0.19	<0.01
Choice[g]	68.5	58.8	3.8	0.08
Select[h]	31.5	41.3	3.7	0.08

[a]Standard error of the mean
[b]Final weight = live weight * 0.96
[c]Final weight = hot carcass weight/0.63 common dressing percentage
[d]Marbling score: 450 = Slight 50; 500 = Small 0; 550 = Small 50; 600 = Modest 0; etc.
[e]Calculated Yield Grade = 2.5 + 2.5(FT) + 0.2(%KPH) + 0.0038* HCW - (0.32 *REA). %KPH was not measured but assumed to be 2% for all steers.
[f]Empty Body Fat calculated from Guiroy et al., 2002 (*J. Anim. Sci.*). EBF = 17.76207 + (4.68142*Fat) + (0.01945*HCW) + (0.81855 * QG) - (0.06754 * REA)
[g]Choice and above
[h]Select and below

Changes in carcass characteristics late in the finishing period were not influenced by implant strategy. Rate of REA change during the final 19 days was 0.01 sq in/day $\pm$ 0.03 across all implant strategies. The rate of fat deposition (fat thickness) was 0.0025 in/day $\pm$ 0.0037. Rate of yield grade change (0.0129/day $\pm$ 0.0159) was also similar across all implant strategies. Empty body fat increased 0.0451%/day $\pm$ 0.0626 with additional days on feed as a result of increased fat thickness and HCW. Despite the increase in fat thickness, quality as indicated by marbling did not increase with additional days on feed. Intramuscular fat still may have been increasing late in the finishing period but perhaps at a slower rate than the increase in REA. Clearly, any increases in intramuscular fat deposition were not great enough to change the overall marbling score.

[1]Heather Haugen, graduate student; Galen Erickson, assistant professor; Casey Macken, research technician, Animal Science, Lincoln; Court Campbell, Fort Dodge Animal Health, Grand Island, NE.