Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 503

1998

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FEEDING SYSTEMS AND IMPLANT STRATEGIES FOR CALF-FED HOLSTEIN STEERS

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Summary

Two hundred sixty-four Holstein steer calves (308 lb) were used in a 2×3 factorially designed experiment to compare the effect of two feeding systems and three implant strategies on performance and carcass characteristics. Steers were allowed ad libitum access to a conventional, high-grain diet for the entire feeding period or were program-fed a high-grain diet to gain 2.2 lb/d for 109 days and 2.6 lb/d for 92 days and then allowed ad libitum access to feed for the remainder of the feeding period. Steers were fed to a common weight endpoint (1260 lb). Implant strategies were: 1) Synovex®-S on days 1, 109, and 201 (S-S-S); 2) Synovex®-C on day 1, Synovex-S on day 109, and Revalor®-S on day 201 (C-S-R); and 3) Synovex-C on day 1 and Revalor-S on days 109 and 201 (C-R-R). Over the entire feeding period, steers finished on the ad libitum system consumed 7% (P<.01) more feed daily and gained 7.2% (P<.01) faster than those in the programmed feeding system. Steers in the programmed feeding system required an additional 24 days to achieve similar finished weights and had smaller (P<.05) ribeye areas and less (P<.01) backfat than steers feeding ad libitum throughout. Feed efficiency and total feed consumed were similar between feeding systems. Compared to S-S-S, feed efficiency was improved 4.3% by C-S-R and 6.7% (P<.05) by C-R-R. The C-R-R implant strategy reduced marbling (P<.01) and percentage of USDA Choice carcasses (P=.01) compared with S-S-S or C-S-R. A two-phase, programmed feeding system can result in improved feed efficiency and a compensatory gain response during the latter phase of the feeding period. However, the gain restriction over the first 200 days in this study probably was too severe to allow program-fed steers to finish at a similar weight with a similar number of days on feed those feeding ad libitum. Implanting calf-fed Holstein steers with a low dose of estrogen and then increasing implant potency step-wise optimized performance and carcass quality.

(Key Words: Holstein, Calf-Fed Steers, Feeding Systems, Implants, Carcasses.)

Introduction

Holstein steers placed on feed as young calves (300 to 400 lb) often are fed high-grain diets for 280 to 350 days. These steers often display reduced feed consumption during the final 80 to 100 days on feed. The cause of this "stalling out" phenomenon remains unknown but may be related to extended ruminal acidic conditions, metabolic signals associated with physiological maturity or body composition, and(or) boredom with the diet. Managing calf-fed Holsteins in a two-step programmed feeding system before placing them on full feed may improve feed efficiency, take advantage of compensatory growth, and minimize "stall out" from continuous ad libitum feeding.

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Implant programs that optimize performance and carcass characteristics for calf-fed Holsteins remain elusive. Implants too potent early in the feeding period may down-regulate receptors and reduce responses to subsequent implants.

Our objectives were to 1) compare a two-phase programmed feeding system followed by full feeding a high-grain diet to a conventional, full-fed system and 2) evaluate three implant programs using products varying in hormonal compounds and concentration.

Experimental Procedures

Two hundred sixty-four Holstein steer calves (308 lb) were stratified by weight into one of four weight replicates. Within each replicate, steers were allotted randomly to one of six pens (11 head/pen) in a 2x3 factorially arranged experiment. Factors were two feeding systems and three implant strategies. Steers in 12 pens were allowed to feed ad libitum on a conventional high-grain finishing diet for the entire feeding period. Steers in the other 12 pens were limit-fed a high-grain diet and programmed to gain 2.2 lb/day for 108 days, 2.6 lb/day for 92 days, and then allowed ad libitum access to a finishing diet for the remainder of the feeding period. Programmed rates of gain represented approximately 65% and 85% of maximal rate of gain for the respective periods. Four pens within each feeding system received one of three implant strategies: 1) Synovex-S on days 1,109, and 201 (S-S-S); 2) Synovex-C on day 1, Synovex-S on day 109, and Revalor-S on day 201 (C-S-R); and 3) Synovex-C on day 1 followed Revalor-S on days 109 and 201 (C-R-R).

During the first 200 days of the experiment, the finishing diet (Finisher 1) was based on dry-rolled corn and contained (dry basis) 10% corn silage (Table 1). Because feed intake was restricted in the programmed feeding system, corn silage was increased to 25% of the diet. When programmed steers were changed to ad libitum intake (day 201), all steers were fed a common diet based on

Table 1. Composition of Experimental Diets (Dry Matter Basis)

Ingredient	Programmed[a]	Finisher 1	Finisher 2
Dry-rolled corn	56.1	77.9	23.4
High-moisture corn	–	–	54.5
Corn silage	25.0	10.0	10.0
Molasses	3.0	3.0	3.0
Soybean meal	11.9	5.2	5.2
Urea	.5	.5	.5
Ammonium sulfate	.3	.3	.3
Minerals/vitamins[b]	2.2	2.1	2.1
Rumensin/Tylan premix[c]	1.0	1.0	1.0
% Crude protein			

[a]Diet for periods of programmed gain.
[b]Provided .8% Ca .4% P, 1.0% K, 2000 IU/lb vitamin A, and 20 IU/lb vitamin E in programmed diet. Provided .7% Ca, .35% P, .7% K, 1500 IU/lb vitamin A, and 15 IU/lb vitamin E in Finisher 1 and Finisher 2.
[c]To supply 275 mg Rumensin and 90 mg Tylan per steer daily.

high-moisture and dry-rolled corn (Finisher 2; Table 1). All diets provided 275 mg of Rumensin® and 90 mg of Tylan® per head daily. Initial and final weights were the averages of two consecutive, early morning, full weights taken before feeding. Steers were slaughtered by feeding system at a weight-constant endpoint (1260 lb). Steers in the ad libitum system were fed for 326 days, whereas those on the programmed feeding system were fed for 350 days.

Results and Discussion

Because no interactions between feeding system and implant strategy occurred for feedlot performance or carcass characteristics, only the main effects are presented. Nine steers either died or were removed from the experiment for reasons not related to treatment. They were distributed approximately equally across treatments.

During the first implant period (day 1 to 108), programmed feeding resulted in lower (P<.01) daily gain, but feed efficiency was improved 3.7% (P<.10) compared with ad libitum feeding (Table 2). Daily gain of programmed steers (2.4 lb/day) was slightly higher than the 2.2 lb/day predicted. Implanting steers with Synovex-C tended (P=.13) to improve feed efficiency compared with Synovex-S.

During the second implant period (Day 109 to 200), programmed feeding resulted in lower (P<.01) daily gain, but feed efficiency was improved 5.4% (P<.05) compared with ad libitum feeding. Steers implanted with Synovex-S that had initially received Synovex-C gained faster (P<.05) and more efficiently (P<.05) in this period than steers initially implanted with Synovex-S.

During the third implant period (day 201 to 326 or 350), all steers were allowed ad libitum access to a common finishing diet. Steers previously programmed to gain 2.2 and 2.6 lb/day had higher (P<.01) feed intake, gained 15% (P<.01) faster, and were 7% (P<.05) more efficient than those having continuous access to feed. Increased feed intake and daily gain and improved feed efficiency are characteristic of compensatory growth. Steers reimplanted with Revalor-S gained faster (P<.05) and more efficiently (P<.05) than those reimplanted with Synovex-S and those receiving their first Revalor-S.

Over the entire feeding period, steers finished using the conventional, ad libitum system consumed 7% (P<.01) more feed per day and gained 7.2% (P<.01) faster compared with steers in the programmed feeding system. Feed efficiency was similar between feeding systems, and equal amounts of feed were required to achieve similar finished weights. Although steers finished on the programmed gain system expressed compensatory growth during the final 150 days on feed, an additional 24 days were required to achieve a finished weight similar to that of steers in the continuous ad libitum system. The length and(or) severity of restriction likely increased the time required to achieve the desired finished weight. Steers implanted with C-S-R or C-R-R gained faster (P<.05) than steers implanted with S-S-S. Steers implanted with C-S-R or C-R-R were 4.3 and 6.7% (P<.05) more efficient, respectively, than steers implanted with S-S-S.

Hot carcass weights were heavier (P<.05) for steers implanted with C-S-R or C-R-R than S-S-S (Table 3). Carcass weights were similar between feeding systems. However, fat thickness (P<.01), ribeye area (P<.05), marbling (P<.10), and percentage of Choice carcasses (P<.01) were greater for steers in the ad libitum than the programmed feeding system. These data indicate that the level of restriction during the programmed feeding was severe enough to alter body composition. Dressing percentage, kidney, pelvic, and heart fat, yield grade, and the incidence of

abscessed livers were unaffected by feeding system or implant strategy. The C-R-R implant strategy reduced marbling (P<.01) and percentage of Choice carcasses (P=.01) compared with S-S-S or C-S-R. Compared to S-S-S, implanting with C-S-R had no effect on marbling or percentage of Choice carcasses.

A two-phase programmed feeding system followed by full feeding produced a compensatory growth response later in the finishing period compared with continuous ad libitum feeding. However, the duration and level of restriction that is needed to improve overall feed efficiency remains elusive. Implanting steers with a low dose of estrogen initially and then increasing implant potency step-wise optimized animal performance and carcass quality in calf-fed Holstein steers.

Table 2. Effects of Feeding System and Implant Strategy on Performance of Calf-Fed Holstein Steers

	Feeding System[a]			Implant Strategy[b]			
Item	Programmed	Ad Lib	SEM	S-S-S	C-S-R	C-R-R	SEM
No. pens	12	12		8	8	8	
No. steers	128	127		85	85	85	
Initial wt, lb	308	308	.98	310	306	308	1.2
Final wt, lb	1259	1264	9.4	1231	1272	1282	11.5
Day 1 to 108; programmed gain=2.2 lb/day; 1st implant period							
Daily feed[c], lb	10.1	13.4	.21	11.8	11.7	11.7	.25
Daily gain[c], lb	2.39	3.07	.03	2.69	2.76	2.73	.04
Feed/gain[de]	4.22	4.38	.06	4.39	4.22	4.28	.07
Day 109 to 200; programmed gain=2.6 lb/day; 2nd implant period							
Daily feed[c], lb	14.1	18.6	.31	16.4	16.4	16.3	.37
Daily gain[cg], lb	2.63	3.30	.05	2.84[h]	3.07[i]	2.97[hi]	.06
Feed/gain[fg]	5.37	5.66	.09	5.75[h]	5.32[i]	5.49[hi]	.11
Day 201 to 326 or 350; all steers ad libitum access to feed; 3rd implant period							
Daily feed[c], lb	21.4	19.4	.27	20.4	20.7	20.0	.33
Daily gain[cg], lb	3.01	2.56	.04	2.66[h]	2.77[h]	2.91[i]	.05
Feed/gain[fg]	7.12	7.62	.14	7.71[h]	7.54[h]	6.87[i]	.18
Overall (Day 0 to 326 or 350)							
Daily feed[c], lb	16.0	17.2	.22	16.6	16.7	16.4	.27
Daily gain[cg], lb	2.72	2.93	.03	2.72[h]	2.86[i]	2.88[i]	.03
Feed/gain[g]	5.90	5.87	.08	6.11[h]	5.85[hi]	5.70[i]	.09
Total feed, lb	5,598	5,609	71.3	-	-	-	-
Days fed	350	326	-	338	338	338	

[a]Programmed= Feed intake limited for steers to gain 2.2 and 2.6 lb/day during first and second implant periods, respectively, and ad libitum access during the third implant period.

[c]Feeding system effect (P<.01).
[b]S=Synovex-S; C=Synovex-C; R=Revalor-S.
[d]Feeding system effect (P<.10).
[e]Synovex-C versus Synovex-S (trend; P=.13).
[f]Feeding system effect (P<.05).
[g]Implant effect (P<.05).
[h,i]Means in a row not bearing a common letter differ (P<.05).

Table 3. Effects of Feeding System and Implant Strategy on Carcass Characteristics of Calf-Fed Holstein Steers

	Feeding System[a]			Implant Strategy[b]			
Carcass Trait	Programmed	Ad-Lib	SEM	S-S-S	C-S-R	C-R-R	SEM
Hot carcass wt[c], lb	726	729	7.0	709[k]	735[l]	738[l]	8.6
Dressing %	60.1	60.2	.63	60.1	60.3	60.0	.77
12th rib fat[d], in	.19	.22	.01	.20	.22	.20	.01
KPH[e] fat, %	2.15	2.20	.05	2.16	2.23	2.14	.06
Yield grade	2.64	2.43	.10	2.61	2.45	2.55	.13
Ribeye area[f], in^2	11.1	12.0	.28	11.1	11.9	11.6	.35
Marbling score[ghi]	5.10	5.28	.06	5.43[l]	5.29[l]	4.86[k]	.08
USDA Choice[j]%	58	74	-	75	69	53	-
Liver abscesses, %	13	14	-	13	14	14	-

[a]Programmed=Feed intake limited for steers to gain 2.2 and 2.6 lb/day during first and second implant periods, respectively, and ad libitum access during the third implant period.
[b]S=Synovex-S; C=Synovex-C; R=Revalor-S.
[c]Implant effect ($P<.10$).
[d]Feeding system effect ($P<.01$).
[e]KPH=kidney, pelvic, and heart.
[f]Feeding system effect ($P<.05$).
[g]Slight 0=4.0, Slight 50=4.5, Small 0=5.0, Small 50=5.5.
[h]Feeding system effect ($P<.10$).
[i]Implant effect ($P<.01$)
[j]Chi square statistic: Feeding system ($P<.01$); Implant strategy ($P=.01$).
[kl]Means in a row not bearing a common letter differ ($P<.05$).