EFFECT OF RUMEN ESCAPE AMINO ACIDS AND MULTIPLE TBA IMPLANTS ON FEEDLOT PERFORMANCE OF LIGHTWEIGHT HOLSTEIN STEER CALVES

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Summary

Two hundred forty Holstein steers (343 lb) were stratified by weight and allotted to one of eight treatment combinations in a 2 × 4 factorial arrangement. Main effects were implant (Synovex-S (S) or Synovex-S + Finaplix-S (SF) on day 0, 87, 168, and 238 and level of rumen escape amino acids (Smartamine-ML (SML) at 0, 5, 10, or 15 grams/head/day). These levels of SML supplied 0, 2.75, 5.5, and 8.25 g/day of L-lysine and 0, .75, 1.5, and 2.25 g/day of DL-methionine. Steers implanted with SF gained 4% faster, had a 4% improvement in feed:gain, a lower dressing percentage, 12% less backfat, 3.4% more rib-eye area, a lower yield grade, less marbling, and fewer Choice grades (P<.05) compared to S-implanted steers. Overall feed intake and carcass weights were similar between S- and SF-implanted steers. Use of SML resulted in a linear decline in hot carcass weight (P<.10) and KPH (P<.05), with other carcass traits unaffected. Increasing the level of SML tended to increase feed intake (P<.15), and quadratically degraded feed:gain (P<.10). Repeated implants of SF did not improve carcass worth and the use of rumen escape amino acids did not improve performance, suggesting that the basal diet was not first-limiting in lysine and(or) methionine.

(Key Words: Estradiol, Trenbolone Acetate, Rumen Escape Amino Acids, Holstein, Steers.)

Introduction

Cattle implanted with combinations of estradiol (E_2) and trenbolone acetate (TBA) typically have greater rates of lean deposition than those implanted with E_2 alone, which may increase amino acid requirements. Because lysine may be the first limiting amino acid in high-grain growing-finishing diets, synthetic lysine coated to resist ruminal degradation may provide a means to meet the added amino acid needs of steers implanted with an E_2/TBA combination. Some research has shown dramatic responses in Holstein steers to a protected amino acid product (Smartamine-ML). Multiple TBA implants may enhance the demand of essential amino acids for growth. Our objectives were: 1) to determine if implanting with multiple doses of TBA in addition to E_2 enhanced the response to added rumen escape amino acids and 2) to determine if lightweight Holstein steers fed for over 300 days responded to repeated E_2/TBA implants, compared to E_2 alone.

Experimental Procedures

Two hundred forty Holstein steers (343 lb) were stratified by weight and allotted to pens (10 steers/pen, 3 pens/treatment) based on weight and previous treatment. Pens were assigned to one of eight treatment combinations in a 2 × 4 factorial arrangement. Main effects were implant (E_2 (Synovex-S) or E_2/TBA (Synovex-S + Finaplix-S) on day 0, 87, 168, and 238 and level of Smartamine-ML (SML) (0, 5, 10, or 15 grams/head/day). These levels of SML supplied 0, 2.75, 5.5, and 8.25 g/day of L-lysine and 0, .75, 1.5, and 2.25 g/day of DL-methionine. Steers were processed using standard procedures and were stepped up to the final diet in 14 days. The basal diet contained (as a percentage of DM) 81.1% dry-rolled corn, 10% alfalfa hay, 2.7% molasses, and 6.3% supplement. The supplement was formulated so that the complete diet contained 2.4% soybean meal, .75% urea, and 13% CP. Initial weights were the averages of two consecutive, early morning weights. Final weights were taken on the morning when steers were shipped. At slaughter, hot carcass weights were taken immediately. Carcass data were obtained after a 36-hour chill. Steers were on feed for 318 days (July 1, 1993 to May 16, 1994). Preplanned orthogonal contrasts compared: 1) S vs SF, 2) linear effect of SML, 3) quadratic effect of SML, and 4) cubic effect of SML. Comparison of 5), 6), and 7) were linear, quadratic, and cubic interactions of SML and implant type.

Results and Discussion

Because few significant interactions occurred between implant type and SML level, only main effect means are presented (Tables 1 and 2). For days 0 to 87, SF-implanted steers gained 4.7% faster and were 5.5% more efficient than S-implanted steers (P<.01), but feed intakes were similar. Feed intake responded quadratically to increasing SML (P<.10), but daily gains were similar, which resulted in a quadratic response in feed:gain (P<.10). Steers fed the intermediate levels of SML had poorer feed:gain ratios than those fed 0 or 15 g/d. For days 88 to 168 and days 169 to 238, daily gain, feed intake, and feed:gain were unaffected by implant or level of SML, with the exception of a quadratic response in feed intake (P<.10) to level of SML from days 169 to 238. For days 239 to 318, SF-implanted steers gained 11% faster and were 9% more efficient than S-implanted steers (P<.01) but had similar feed intakes. Although daily gain and feed intake were unaffected by level of SML (P>.30), the numerical increase in feed intake while daily gain remained similar resulted in a linear degradation in feed:gain (P<.10) as level of SML was increased.

Final weights and overall rate and efficiency of gain were improved for steers implanted with SF (P<.05). Overall daily gain was unaffected by SML level, whereas feed intake tended to respond quadratically (P< .15), with greater feed intake at 5 and 10 g/d of SML than at 0 and 15 g/d. As a result, feed:gain deteriorated quadratically as level of SML increased from 0 to 15 g/d (P<.10). Dressing percentage was lower for steers implanted with SF than for S-implanted steers (P<.05), resulting in similar hot carcass weights. Percentage of kidney, pelvic, and heart fat (KPH) was unaffected by implant, but steers implanted with SF had 13% less backfat, a greater muscling score, 3.3% more rib-eye area, and consequently a lower yield grade (P<.05) than S-implanted steers. However, SF-implanted steers had less marbling (P<.05), resulting in 35% fewer SF-implanted steers reaching the Choice grade (P<.01). Dressing percentage declined linearly and cubically (P<.05) as level of SML increased, ranging from 60.17% for 5 g/day SML to 59.11% for 15 g/day SML. This might be explained partially by the linear decline (P<.05) in KPH as level of SML increased. Hot carcass weights declined linearly (P<.10) as level of SML increased. Backfat, rib-eye area, muscling, marbling, and percent reaching the choice grade were unaffected by level of SML. Reduced marbling with repeated SF implants agrees with previous research (1993 KSU Cattlemen's Day) but differs in that carcass weights were similar between steers repeatedly implanted with S or SF. Although carcass leanness was improved by the use of SF implants, the percentage of steers reaching the Choice grade was reduced. We expected that using four TBA implants would reduce carcass quality grade. Our rationale was to increase muscling and, thus, increase demands for amino acids. Use of SML in this study resulted in lower carcass weights, although steers fed the 5 and 10 g/day levels consumed more feed. Carcass traits were mostly unaffected, with the only noted improvements from feeding SML being a reduction in KPH, a slight numerical increase in rib-eye area, and a trend for an improvement in yield grade. We conclude that repeated use of Finaplix-S implants as an addition to Synovex-S implantation increased muscling, but because fewer graded Choice, did not increase carcass value, and that lysine and(or) methionine were not first limiting in the basal diet.

Table 1. Effects of Implant and Smartamine-ML on Performance of Holstein Steers

	Implant[a]			Smartamine-ML, g/d				
Item	S	SF	SEM	0	5	10	15	SEM
Initial wt, lb	343	343	1	342	344	344	343	1
Final wt, lb[b]	1251	1287	7	1275	1269	1266	1266	10
Days 0-87								
ADG, lb[b]	3.17	3.32	.03	3.19	3.24	3.25	3.29	.04
ADFI, lb[d]	14.8	14.6	.2	14.4	15.1	14.8	14.6	.2
Feed:gain[b]	4.67	4.41	.04	4.52	4.65	4.56	4.43	.06
Days 88-168								
ADG, lb	3.24	3.32	.05	3.25	3.31	3.31	3.26	.06
ADFI, lb[d]	18.8	18.7	.4	18.0	19.2	19.4	18.3	.6
Feed:gain	5.80	5.64	.15	5.54	5.82	5.88	5.63	.21
Days 169-238								
ADG, lb	2.43	2.41	.06	2.52	2.32	2.42	2.44	.09
ADFI, lb	19.4	19.0	.5	18.6	19.4	19.5	19.2	.7
Feed:gain[d]	8.02	7.91	.23	7.41	8.45	8.09	7.91	.32
Days 239-318								
ADG, lb[b]	2.45	2.72	.06	2.63	2.66	2.53	2.53	.09
ADFI, lb	20.6	20.8	.4	20.3	21.1	20.6	20.6	.5
Feed:gain[b,c]	8.43	7.65	.14	7.76	7.97	8.19	8.24	.20
Days 0-318								
ADG, lb[b]	2.85	2.97	.02	2.93	2.91	2.90	2.90	.03
ADFI, lb	18.2	18.1	.3	17.7	18.6	18.4	18.1	.4
Feed:gain[b,d]	6.40	6.11	.09	6.04	6.38	6.36	6.23	.12

[a]S=Synovex-S, SF = Synovex-S + Finaplix-S. [b]Effect of implant (P<.01). [c]Linear effect of Smartamine-ML (P<.10). [d]Quadratic effect of Smartamine-ML (P<.10).

Table 2. Effects of Implant and Smartamine-ML on Carcass Traits of Holstein Steers

	Implant[a]			Smartamine-ML, g/d				
Item	S	SF	SEM	0	5	10	15	SEM
Hot wt, lb[d]	751	760	4.6	762	764	749	748	6.5
Dressing %[b,c,e]	60.06	59.04	.16	59.76	60.17	59.16	59.11	.23
Backfat, in.[b]	.222	.196	.006	.211	.209	.209	.206	.008
KPH, %[c]	2.52	2.52	.02	2.56	2.55	2.49	2.47	.02
REA, sq. in.[b]	12.15	12.57	.12	12.28	12.32	12.48	12.36	.17
Yield grade[b]	2.53	2.38	.04	2.52	2.48	2.39	2.42	.05
Muscling[b,f]	3.00	3.26	.07	2.99	3.25	3.12	3.16	.09
Marbling[g]	5.20	5.01	.04	5.13	5.09	5.09	5.10	.05
% Choice[h]	72	47		55	57	62	63	

[a]S=Synovex-S, SF = Synovex-S + Finaplix-S. [b]Effect of implant (P<.05). [c]Linear effect of Smartamine-ML (P<.05). [d]Linear effect of Smartamine-ML (P<.10). [e]Cubic effect of Smartamine-ML (P<.05). [f]Muscling score: 1=very light muscling, 3=average muscling, 5=very heavy muscling. [g]Marbling score: 4=slight^{0}, 5=small^{0}, 6=modest^{0}. [h]Chi-square analysis, S vs SF (P<.01).