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Effects of carnitine on performance of finishing steers

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EFFECTS OF CARNITINE ON PERFORMANCE OF FINISHING STEERS

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Summary

Ninety-five crossbred steers (787 lb initial body weight) were fed finishing diets (14.5% crude protein) for 129 days. Diets were based on steam-flaked corn and contained 6% alfalfa and 4% tallow. Steers were supplemented with 2 g per day of L-carnitine, or not supplemented (control). Feed intakes, gains, and feed efficiencies were not impacted by carnitine supplementation. However, steers receiving L-carnitine had fatter carcasses as indicated by tendencies (P<.2) for more subcutaneous fat, higher marbling scores, and higher yield grades. Carnitine supplementation may increase fat deposition and alter carcass quality of finishing cattle.

(Key Words: Steers, Carnitine, Performance, Carcass Quality.)

Introduction

Carnitine is a vitamin-like substance that facilitates fat oxidation. Research with swine has indicated that supplemental carnitine improves feed efficiency and alters carcass composition. However, little carnitine research has been conducted with finishing cattle and has not been conclusive. In one study, heifers fed a high-grain diet had lower quality grades when they received 1 g/day carnitine, whereas in another study, carnitine-supplemented steers and heifers had higher quality grades. Our objective was to evaluate the effects of 2 g per day of supplemental L-carnitine on the performance and carcass attributes of finishing cattle.

Experimental Procedures

This study was conducted during the spring and summer of 1999. Ninety-five crossbred yearling steers (average initial weight of 787 lb) were used in a randomized complete block design experiment. Steers were fed for 129 days on a typical finishing diet (Table 1) based on steam-flaked corn. Treatments were 0 or 2 g/day of L-carnitine top-dressed to the diets at feeding. This carnitine level was based on a previous metabolism experiment. Steers were implanted with Component TE-S®. Cattle were sorted into 12 pens with eight steers per pen (one pen contained only seven steers) to provide six pairs of pens as similar as possible in weight and breed characteristics. For each pair, one pen received carnitine and the other (control) did not. Feed was provided once daily and cattle had ad libitum access. After 129 days on feed, steers were shipped to a commercial slaughter facility. Except for hot carcass weights, carcass characteristics were obtained after a 24-hour chill. Final live weight of steers was calculated as carcass weight divided by a common dressing percent (64%).

Results and Discussion

No differences in feed intake, gain, or efficiency occurred between treatments (Table 2). However, carcasses of steers supplemented with carnitine appeared to be fatter than those of controls (Table 2). Backfat thickness (P=.12), marbling score (P=.14), and yield grade (P=.19) all tended to be increased by carnitine, which, in turn, led

to shifts in carcass quality and yield grades. Carnitine-supplemented steers had a numerically greater percentage of carcasses grading USDA Choice (73 versus 64%) and numerically lower percentage of carcasses with a yield grade of 1 or 2 (35 versus 58%; Table 2). Percent kidney, pelvic, and heart fat was not affected by treatment, suggesting that carnitine effects may be specific to particular fat depots.

If carnitine increased fatty acid oxidation (as we expected based on its metabolic function), lipid deposition should decrease. However, it is possible that 1) our measures of carcass fatness did not reflect whole-body lipid deposition and 2) the site of lipid deposition was impacted more than was the amount of lipid deposited.

Our data suggest that lipid, but not protein, deposition by cattle fed grain-based diets may be impacted by carnitine status.

Table 1. Composition of Diets for Finishing Steers

Ingredient	% of Dry Matter
Steam-flaked corn	79.08
Alfalfa hay	6.00
Cane molasses	4.00
Tallow	4.00
Soybean meal	3.77
Limestone	1.28
Urea	1.21
NaCl	.30
Ammonium sulfate	.20
Mineral premix[a]	.07
KCl	.05
Rumensin 80[b]	.02
Tylan 40[c]	.01
Vitamin A premix[d]	.01
Nutrient, analyzed	
Crude protein	14.5
Calcium	.62
Phosphorus	.27

[a]Provided 48 ppm Mn, 48 ppm Zn, 8.0 ppm Cu, .50 ppm I, .43 ppm Fe, .30 ppm Se, and .04 ppm Co to diet (dry basis).
[b]Provided 27 g/ton monensin (dry basis).
[c]Provided 9 g/ton tylosin (dry basis).
[d]Provided 1200 IU vitamin A per pound (dry basis).

Table 2. Performance and Carcass Characteristics of Finishing Steers

Item	Control	2 g/d Carnitine	SEM
No. of steers	47	48	
Initial weight, lb	788	787	5.0
Final weight[a], lb	1235	1233	8.9
Dry matter intake, lb/day	19.6	19.7	.12
Average daily gain[a], lb	3.47	3.45	.074
Gain:feed[a]	.177	.176	.0037
Hot carcass weight, lb	790	789	5.7
Ribeye area, in^2	13.1	13.2	.14
Fat thickness, in	.41	.45	.015
Kidney, pelvic & heart fat, %	2.07	2.08	.042
Average yield grade	2.38	2.63	.11
Yield grade 1, %	13	4	4.4
Yield grade 2, %	45	31	7.4
Yield grade 3, %	34	63	8.7
Yield grade 4, %	8	2	3.0
Marbling score[b]	Sm^{08}	Sm^{36}	12
USDA Choice, %	64	73	5.7
USDA Select, %	30	23	5.8
USDA Standard, %	6	2	1.9

[a] Final weight calculated as carcass weight /.64.
[b] Sm=Small.