EFFECT OF ZINC METHIONINE ON LIVE PERFORMANCE AND CARCASS MERIT OF FEEDLOT STEERS

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Story in Brief

Zinc methionine, marketed under the trade mark Zinpro[R], is a commercial complex of zinc and methionine. In some trials this product has tended to increase marbling of finished feedlot cattle. To test this concept, 480 steers (initial weight 703 lb) were fed high concentrate diets with addition of 0 or 1.8 g per animal per day of zinc methionine. Sixty steers (2 pens of cattle) from each treatment were slaughtered at 100, 114, 128 and 142 days on feed. Zinc methionine addition to the diet did not statistically alter rate of live gain (3.56 vs 3.52 lb/day for zinc methionine vs control); carcass adjusted daily live weight gain (3.85 vs 3.80); feed intake (21.2 vs 21.2 lb/day); or feed efficiency on either a live (5.96 vs 6.03) or carcass weight basis (5.50 vs 5.59). Zinc methionine did not significantly alter the incidence of liver abscesses (8 vs 5%), dressing percentage (64.2 vs 64.1), rib eye area (13.2 vs 13.2 square inches), fat cover over the 13th rib (.45 vs .46 inches), kidney-heart-pelvic fat (1.9 vs 1.8%), marbling score (13.2 vs 13.2), carcass grading choice (57 vs 56%) or carcass value ($87.59 vs 87.54/cwt). However, due to the slight increases in rate (%) and efficiency of gain (%), zinc methionine tended to increase return above feed plus yardage costs ($59.20 vs $54.07 per animal). This economic difference was not statistically significant. Results from more experiments are needed.

(Key Words: Zinc Methionine, Carcass Characteristics, Slaughter Date.)

Introduction

Zinc methionine has been fed to feedlot steers in a number of experiments (Brethour, 1984, 1986; Rust, 1985; Brandt and others, 1986). Rate and efficiency of gain have been increased an average of 1.8 and 2.1%, respectively, with addition of zinc methionine to the diet. Percentage of cattle graded choice at marketing also has been increased in some of these trials which might be attributed partly to faster gains and heavier carcasses. Mechanism of ruminal or post-ruminal action of the zinc methionine is unknown. Some Ohio work has suggested that the complex escapes ruminal digestion. However, preliminary work using high performance liquid chromatography in our laboratory does not support that suggestion. The amount of methionine provided (1.4 g per head daily) is quite small relative to estimated requirements for absorbed methionine plus cystine (12 g per day) for

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finishing steers. The amount of zinc provided by zinc methionine often added to the diet (37.4 ppm) should easily meet the zinc requirement of finishing steers which is suggested to fall between 25 and 40 ppm. The basal diet in our study analyzed 48 ppm zinc so no direct response from added zinc or methionine would be expected. Nevertheless, due to the previous reports of increased gains, efficiencies and marbling scores, its usefulness as a supplement for finishing steers needed to be checked. To examine effects of this product on marbling score, we used a large number of cattle and slaughtered cattle at four different dates which ranged from 100 to 142 days so that differences in marbling at different degrees of finish could be appraised.

Materials and Methods

Steers, primarily crosses of British and exotic cattle, born in the spring of 1985 with an average initial weight of 700 lb were purchased from one stocker operator in the Camargo, Oklahoma area. Steers had been pastured together and had not received supplemental feed hays and minerals on native grass. A total of 857 steers were trucked to Goodwell, OK on August 14 and 15. Weights were taken, and 480 steers were selected for feeding. Steers were allocated so that the mean weight was similar for each group of 30 steers placed in each of 16 pens. Each steer was ear tagged, received routine feedlot treatment (IBR-PI3-lepto vaccine, 4-way clostridium vaccine, Ivomec) and was implanted with Synovex-S. The final diet consisted of 72.5% steam flaked corn, 6.3% hominy, 5% corn silage, 4% alfalfa, 3% cane molasses, 2% fat and 7.2% supplement [64% soybean meal, 14.7% limestone, 7.6% urea, 6.0% salt, 4.7% dicalcium phosphate, vitamin A-30 (1500 IU/lb), Rumensin-60 (27 g monensin per ton), .02% trace minerals (to add 35 ppm Zn) and Tylan-40 (9 g/ton)], This diet was commercially prepared at Hitch Feedlot at Guymon, OK and transported twice daily to Goodwell for feeding. At each meal, after the control cattle had been fed, an appropriate amount (.42 lb per head) of a pelleted zinc methionine premix (79% ground corn, 20% ground wheat, .95% Zinpro-200) was added to the remaining feed in the truck. This would provide about .36 g Zn per animal daily, or add about 37 ppm zinc to the diet. Feed was then remixed in the truck, and the remaining pens were fed the diet containing the added zinc methionine. All feed weights were taken by truck scales which were checked daily against mill scale weights of total feed. During the first 28 days on feed, three steers died of hardware disease and were replaced by one of the 40 extra animals of similar size and type.

Cattle weights were shrunk, off truck weights at the start of the trial but were taken as on-full feed weights on days 30, 60 and 90 and on the day prior to slaughter. For calculation purposes, all full weights were shrunk by 4% to compensate for digestive tract fill. Two pens of cattle in each treatment were slaughtered on days 100, 114, 128 and 142 of the study. Liver abscesses were recorded, and carcass measurements were taken. Statistical comparisons included level of zinc methionine (0 vs 1.8 g per head daily) and slaughter date. Economic projections were also calculated. These were based on a feed price of 4.35 cents per pound of dry matter, yardage at 35 cents/head/day and a cattle cost of 65 cents per pound. Carcass value was calculated at 90 cents per pound of hot carcass adjusted for yield (+1 for yield grade 1 or 2; -8 cents for yield grade 4) for quality

grade (-7 cents for carcasses graded good) and for carcass weight (-8 cents for carcasses under 600 lb).

Results and Discussion

Effects of slaughter date on gain, efficiency and carcass parameters are discussed in a companion paper and will not be presented here. Effects of added zinc methionine for cattle slaughtered at each date are presented in Table 1. No interactions of zinc methionine supplementation and slaughter date on performance or carcass parameters were detected (P>.10). Hence, only the main effects will be discussed.

No effects of added zinc methionine were detected as being statistically significant. As gains and efficiencies were markedly increased by added zinc methionine during the first 28 days on feed in a trial by Brandt et al. (1986), we examined this period as well as the total feeding trial. In our study, gains and efficiencies were increased by about 1.9 and 1.1% during this period compared to 1.1 and 1.2% for the total trial. Calculated metabolizable energy of the diet was increased by about 1.2% with added zinc methionine.

On the first slaughter date, marbling scores and percent of carcasses grading choice tended to be greater for steers fed zinc methionine (40% vs 33%; table 2). This would match observations by Brethour (1984) and Rust (1985). This difference disappeared later which would match results of some other studies. Overall, zinc methionine did not significantly increase marbling score or percent of carcasses graded choice in this trial.

Due to the slight increases in gain (1%) and feed efficiency (%), profit per head tended to be increased (59 vs 54 per head) by addition of zinc methionine to the diet. This does not include the cost of this product plus carrier. Depending on cost of the zinc methionine, feeding of this product may be justified. Repeatability of this difference, however, is uncertain as changes in performance or carcass characteristics were not significant. This makes it important to contrast results of our trial with results of other feeding trials using zinc methionine.

Results of our experiment and 6 other trials in which various levels of zinc methionine have been fed are summarized in table 3. Weighted means indicate that, on the average, added zinc methionine slightly increased daily gains (1.8%; P<.01) and feed efficiency (2.1%; P<.05) and calculated metabolizable energy (1.4%; P<.10). Also, despite lack of a significant response in marbling score, the percent of carcasses grading choice tended to increase (57% vs 50%) with supplemental zinc methionine. With slight increases in rate of gain and heavier carcasses, slight increases in marbling score and quality grade might be expected. Yet, it is difficult to explain how the percent of carcasses grading choice could increase without a corresponding increase in marbling score as marbling score is typically the factor limiting quality grade. Distribution in marbling scores may be responsible. The coefficient of variation in marbling score in this study tended to be reduced by zinc methionine supplementation (13 vs 21%). Hence, though the mean marbling scores were similar, the minimum marbling score tended to be higher with feeding of zinc methionine which would increase the percent of carcasses grading choice.

TABLE 1. Influence of slaughter date and supplemental zinc methionine on performance, feed intake and feed efficiency of steers.

	Slaughter date									
	100		114		128		142		Averages	
Diet	Con	Zinc	Con	Zinc	Con	Zinc	Con	Zinc	Con	Zinc
Pens, number	2	2	2	2	2	2	2	2	8	8
Cattle, number	60	58	59	60	60	60	60	60	239	238
Daily gain, lb/day										
0-30 days	3.12	3.26	2.86	3.13	3.69	3.41	2.85	2.96	3.13	3.19
0-slaughter	3.67	3.72	3.46	3.52	3.57	3.61	3.38	3.37	3.52	3.56
0-carcass/.62	3.87	3.84	3.78	3.92	3.82	3.90	3.70	3.75	3.80	3.85
Feed intake, lb/day										
0-30 days	16.8	17.6	17.6	17.4	18.1	18.2	17.7	17.6	17.5	17.7
0-slaughter	20.6	21.4	21.4	21.1	21.5	20.9	21.3	21.3	21.2	21.2
Feed/gain ratio										
0-30 days	5.42	5.46	6.16	5.60	4.94	5.38	6.36	5.99	5.72	5.61
0-slaughter	5.59	5.76	6.21	5.99	6.02	5.79	6.31	6.31	6.03	5.96
0-carcass	5.30	5.58	5.67	5.40	5.62	5.36	5.75	5.68	5.59	5.50
Calculated ME of diet mcal/kg	3.26	3.14	3.16	3.28	3.13	3.35	3.23	3.26	3.23	3.27

TABLE 2. Influence of slaughter date and supplemental zinc methionine on carcass characteristics of feedlot steers.

	Slaughter date								Averages	
	100		114		128		142			
Diet	Con	Zinc	Con	Zinc	Con	Zinc	Con	Zinc	Con	Zinc
Cattle, number	60	58	59	60	60	60	60	60	239	238
Dressing %	63.4	62.9	64.3	64.7	63.9	64.2	64.6	65.0	64.1	64.2
Rib fat thickness, in	.40	.38	.43	.40	.48	.50	.55	.50	.46	.45
Marbling score[a]	12.4	12.7	13.4	13.2	13.6	13.6	13.5	13.4	13.2	13.2
Choice carcasses, % of total	33	40	63	52	58	73	71	62	56	57
Yield grade	2.22	2.25	2.41	2.23	2.76	2.82	2.87	2.78	2.56	2.52
Live value, $/cwt	58	57	59	60	59	60	60	61	59	59
Profit above feed costs, $/head	33	31	48	57	63	76	71	73	54.0	59.2

[a]12 = slight plus; 13 = small minus.

Table 3. Influence of zinc methionine on live and carcass measurements in past trials.

Reference	Zin g/d	Cat. No.	Daily gain			Daily feed			Feed/gain			ME			Percent choice		
			Con[a]	Test[b]	%Chng[c]	Con	Test	%Chng	Con	Test	%Chng	Con	Test	%Chng	Con	Test	%Chng
Breth 84	9	114	2.99	3.09	3.3	22.8	22.8	0.09	7.7	7.5	-3.0	3.01	3.07	2.1	50	68	36
Rust 85	9	98	2.82	2.86	1.6	21.6	21.5	-0.71	8.1	7.9	-2.3	3.05	3.09	1.3	37	47	27
Breth 85	9	74	2.55	2.88	12.9	22.6	23.1	2.03	8.9	8.0	-9.9	2.70	2.85	5.6	28	25	-11
Breth 86	9	19	3.63	3.79	4.4	25.2	25.0	-1.03	6.9	6.6	-5.2	3.25	3.39	4.3	37	53	43
Breth 86	9	19	3.65	3.75	2.7	24.3	25.4	4.45	6.7	6.8	1.7	3.35	3.32	-0.9	47	53	13
Brandt 86	3.6	32	3.26	3.29	1.1	21.2	21.3	0.35	6.6	6.6	0.2	3.24	3.28	1.2			
Brandt 86	1.8	32	3.26	3.26	0.2	21.2	20.7	-2.22	6.6	6.3	-3.4	3.24	3.27	0.8			
Spears 86	1	12	1.89	2.05	8.1	15.9	16.0	0.42	8.4	7.8	-7.1	2.77	2.87	3.6			
Greene 87	1.8	15	2.80	2.97	6.3										57	79	39
Gill 87	1.8	238	3.52	3.56	1.1	21.2	21.9	-0.14	6.0	6.0	-1.2	3.32	3.36	1.2	56	57	2
Total		653															
Weighted means			3.15	3.24	2.9	21.8	21.9	0.13	7.1	6.9	-3.2	3.13	3.19	1.8	47	54	14
Probability of difference being chance[d]					<1%			NS			<5%			<5%			<5%

[a]Control diet.
[b]Diet with zinc methionine added at specified level.
[c]Percentage change in measurement.
[d]Considering the results from each trial as a paired observation.

Literature Cited

Brandt, R. T. et al. 1986. Impact of zinc methionine level on feedlot performance and carcass traits of medium and large-frame steers. Cattle Feeders' Day, Garden City, KS. pp. 4-7

Brethour, J. R. 1984. Zinc methionine in steer finishing rations. Report of Progress 452. Hayes Branch, Kansas State University. p 11.

Brethour, J. R. 1985. Zinc methionine in steer finishing rations. Report of Progress 475. Hays Branch, Kansas State University. p. 22.

Brethour, J. R. 1986. Effect of calcium source on response to zinc methionine in steer finishing rations. Report of Progress 498, Hayes Branch, Kansas State University. pp. 26-27.

Greene, L. W. et al. 1987. Performance and carcass characteristics of steers fed zinc oxide and zinc methionine. J. Anim. Sci. 65(Suppl. 1):28.

Rust, S. R. 1985. Effects of zinc methionine and grain processing on performance of growing-fattening steers. J. Animal Sci. 61(Suppl. 1):482.

Spears, J. W. and L. J. Samsell. 1986. Relative availability of zinc in zinc methionine and zinc oxide for ruminants. J. Anim. Sci. 63(Suppl 1):402.