ZINC METHIONINE FOR NEWLY RECEIVED STOCKER CATTLE

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Story in Brief

In five 28-day receiving trials, 773 newly received steer and bull calves (301 pounds) were used to evaluate the effect of adding zinc methionine to the diet on health and performance. Half of the cattle received 3.6 g Zinpro100 which supplied 360 mg zinc per head daily in the form of zinc methionine. The data were analyzed excluding animals that were detected as sick during the first three days of the study because feed treatment could not have had an affect on the cattle that were sick at processing. The Zinpro supplemented cattle gained 10.7% faster (1.55 vs 1.40), required 5.8% fewer medical treatments (2.12 vs 2.25) and had a decrease in morbidity (46% vs 51%). For cattle that became sick during the study, there was a significant decrease ($P<.03$) in the required medical treatments per head (4.45 vs 4.94) among supplemented animals. Considering all cattle in the analysis, daily gains, feed intake and feed efficiency of the total group of animals were not significantly different between supplemented and control groups although again number of mean medical treatments per head were decreased slightly (3.2 vs 3.7) and morbidity was slightly lower (72% vs 74%) in the zinc supplmented group. It appears that the decline in medical treatments required would at least cover the cost of added zinc methionine.

(Key Words: Zinc Methionine, Supplemented, Newly Received Stocker Cattle)

Introduction

Zinc is an essential element which functions as an activator or constituent of several essential enzyme systems. Zinc has been shown to stimulate the immune system of mice, rats and chickens.

Zinc is removed from the circulating blood by the liver in response to viral, bacterial and parasitic infections (Pekarek et al., 1973). Hutcheson and Cummins (1987) reported that serum zinc levels declined after calves were challenged with virulent IBR virus. They also reported that serum levels were lower upon arrival than prior to shipment suggesting that the stress associated with transport may cause redistribution of zinc in calves. Spears (1988) found that stressed steers fed supplemental zinc tended to gain faster the first 14 days of a 28 day study. Compared with controls, steers fed zinc methionine consumed 5.2% more feed during the study. Therefore, the objectives of this study were to evaluate the health and performance responses of newly received, stressed cattle to dietary supplementation of zinc as zinc methionine at a rate of 3.60 g /head/day.

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Material and Methods

Five truck loads of calves (designated as trials), were assembled by order buyers and shipped to Pawhuska, Oklahoma in the summer and fall of 1987. The origin, arrival date and weight, number of head and transit shrink for each load is summarized in Table 1. Upon arrival, cattle were weighed individually, ear tagged and randomly placed in one of eight pens holding 16 to 22 animals each. Pens were randomly assigned to zinc or control supplements.

Cattle had ad libitum access to a 70% concentrate pellet (Table 2) and were fed prairie hay (2 lbs./head/day) throughout the 28-d receiving period. The pellet contained either no supplemental zinc, or 365 mg Zinpro 100/lb DM of pellet (36.5 mg Zn/lb). Two hospital pens were maintained so that sick animals received their assigned feed while in their hospital pen.

Table 1. Origin, arrival date, number of head, arrival weight and intransit shrink for each load of cattle.

	Origin	Arrival Date	Number of Head	Arrival Wt., lb	% Shrink
Trial 1	AL	6-27-1987	145	316	4.66
Trial 2	AL	7-12-1987	135	322	3.99
Trial 3	AL	8-08-1987	145	302	8.37
Trial 4	AL	9-07-1987	134	334	Na[a]
Trial 5	NC	9-16-1987	174	231	Na[a]

[a]NA=not available.

Table 2. Composition of feed supplement.

Ingredient	As Fed %
Corn, #2 ground	20.72
Soybean hulls	19.65
Wheat middlings	27.47
Cottonseed hulls	9.94
Rice meal-run by-products	9.94
Soybean meal	6.16
Cane molasses	4.77
Calcium carbonate	.95
Salt	.28
Vitamin A-30,000 IU/g	.01
Zinpro-100[ab]	.08
Rovimix E 50% SD[c]	.01
Bovatec 68[d]	.02

[a]not included in control diet.
[b]Zinpro, Inc., Chaska, MN 55318.
[c]DL-alpha-Tocopherol acetate, to provide 50 IU/lb Vitamin E, Hoffmann-La Roche, Inc., Nutley, NJ 07110.
[d]To provide 15 mg of lasalocid per lb.

On the morning following arrival, individual cattle in each pen were processed as follows:

1. Body temperature and time were recorded.

2. Cattle were vaccinated with IBR-PI3 (MLV) intermuscularly, Leptospira pomona bacterin, and Clostridia chavoei, septicum, novyi and sordellii bacterin and dewormed with Ivomec[5].

3. Cattle with clinical signs of illness or a body temperature of 104 F or greater received antibiotic treatment and sick animals were placed in the hospital pen and healthy animals were returned to their home pen.

Cattle were checked twice daily for signs of illness. Sick animals were moved to the processing area where body temperature was measured and severity of illness was clinically appraised. If body temperature exceeded 104 F, the animal was considered sick. Sick animals received a medical treatment based on a specified sequence of antimicrobial drugs (Table 3). Sick animals were treated initially with the first drug in the sequence. If body temperature decreased within 24 h, this drug was continued for two more days. If no improvement was apparent within 24 h, the next drug in the sequence was administered. This process was repeated until a health improvement was detected.

Least squares analysis of variance was performed on data for all response criteria. Responses to the feed treatments were analyzed using pens as the experimental unit. The initial models for weight gains, medical treatment, morbidity, feed intake and feed efficiency included trial (truck load), feed treatment and trial by feed treatment interaction as class variables. All models, excluding feed treatment, were reduced when sources of variation had observed significance levels greater than .20.

Table 3. Sequence of drugs used for treatment of BRDC.

Treatment No.1:[a]	Spectinomycin (Spectam)[b] -5 mg/lb.
Treatment No.2:[a]	Erythromycin (Gallamycin)[b] deep in the muscle -10 mg/lb.
Treatment No.3:[a]	Procain Penicillin G[c] subcutaneously -30,000 IU/lb.
Treatment No.4:	Oxytetracycline (Biomycin-C)[d] subcutaneously-5mg/lb. Plus Sulfamethazine Boluses (Sulmet-15gm)[e] 1 bolus/150 lb on day 1. 1 bolus/300 lb on subsequent days.

[a]Certain antimicrobial drugs used in this study were used for extra-label purposes or at extra-label dosages and require a veterinarian-client-patient relationship before use.
[b]Ceva Laboratories, Ft Scott, KS 66701.
[c]Pfizer, Inc., Lee Summit, MO 64063.
[d]Boeringer-Ingelheim Animal Health, Inc., St Joseph, MO 64502.
[e]American Cyanamid, Co., Wayne, NJ 07470.

[5]MSD Agvet, Rahway, NJ 07065.

Results and Discussion

All the cattle were stressed as a result of handling, transportion, and their new environment which attributed to a high sickness rate of the newly received cattle. Because supplemental zinc in the receiving diet could not influence health on arrival, the data were analyzed with those animals that were detected as sick at processing and on day 1 or day 2 excluded. Daily gains, medical treatments, and morbidity of the remaining cattle are reported in Table 4. The zinc supplemented group of cattle had 10.7% faster daily gains (1.55 vs 1.40 lb/d), a 5.8% decline in required medical treatments (2.1 vs 2.3) and a slight decrease in morbidity (46% vs 51%).

The effects of zinc methionine on daily gains, medical treatments and repulls only for the sick cattle (animals pulled as sick at processing or during day 1 or day 2 excluded) are reported in Table 5. Responses were similar to those noted in cattle receiving supplemental zinc, with a slight increase in daily gains (1.25 vs 1.18 lb/d) and a decline in required medical treatments (4.10 vs 4.40). However, the number of repulls as sick was slightly lower in the control group (13% vs 20%) compared with the zinc group.

The effects of zinc methionine on performance and health of sick cattle including those sick on arrival are presented in Table 6. Again a slight increase (3.1%) in average daily gains (1.33 vs 1.29 lbs.), a significant decrease ($P<.03$) in medical treatments per head (4.45 vs 4.94) as well as a decline in the number of repulls as sick (20.70% vs 21.32%) was noted for cattle receiving the zinc feed treatment.

Table 4. Effects of Zinc Methionine on daily gains, medical treatments and morbidity in stressed cattle with sick head pulled at processing or on day 1 or day 2 excluded.

	Control	Zinc
Number of head	196	207
Arrival weight, lb	298	298
Average daily gain, lb/d[a]	1.40	1.55
Medical treatments per head[a]	2.25	2.12
Morbidity, %[a]	51.19	46.23

[a]Expressed as least square means.

Table 5. Effect of Zinc Methionine on daily gains, medical treatments, and repulls in sick cattle with head pulled during day 1 or day 2 excluded

	Control	Zinc
Number of head	103	111
Average daily gain, lb/d[a]	1.18	1.25
Medical treatments per head[a]	4.40	4.10
Repulls as sick, %[a]	13.37	19.88

[a]Expressed as least square means.

Daily gain, mean medical treatments per head, morbidity and mortality of all cattle (sick plus healthy) are shown in Table 7. Daily gains, feed intake and gain to feed ratios were similar for both treatments. However, the cattle receiving supplemental zinc required less ($P<.08$) medical treatments (3.21 vs 3.66). Although extremely high in both treatment groups, morbidity was slightly lower (72% vs 74%) in the zinc group. This level of illness may have masked any benefits from zinc supplementation.

Feed intake as well as gain to feed ratio are reported in Table 8. The calves in the zinc group consumed an average of 7.9 lb of pellets per day supplying an additional 322 mg of zinc above the control diet.

Table 6. Effects of zinc methionine on daily gains and medical treatments in sick cattle.

	Control	Zinc
Number of head	266	257
Average daily gains, lb/d[a]	1.29	1.33
Medical treatments per head[a]	4.94[b]	4.45[c]
Repulls as sick, %[a]	21.32	20.70

[a]Expressed as least square means.
[b,c]Means with different superscripts differ ($P<.03$).

Table 7. Effect of Zinc Methionine on weight gains, morbidity and mortality in stressed cattle

	Control	Zinc
Number of head	368	365
Number of head never sick	93	96
Arrival weight, lb	301	301
Daily gain, lb/d[a]	1.45	1.47
Daily gain of head never sick, lb[a]	1.69	1.75
Medical treatments per head[a]	3.66	3.21
Morbidity, %[a]	73.90	72.49
Total mortality, %	1.07	1.44

[a]Expressed as least square means.

Table 8. Effects of feeding zinc methionine on feed intake and gain to feed ratio

	Control	Zinc
Number of pens	20	20
Feed intake, lb[a]	9.88	9.88
Gain/feed[a]	.137	.140

[a]Expressed as least square means.

Brandt and Elliot (1987) reported that 350 mg of zinc/day increased feed intake, gains of morbid steers and reduced sick pen days and the reoccurrence of illness over non-zinc supplemented steers in a receiving study using feeder calves. The level of zinc consumed in this study elicited no improvement in feed intake or gain/feed ratio.

Supplemental zinc methionine, under the conditions of this study, increased performance, decreased the number of required medical treatments per head and slightly lowered morbidity in the newly received cattle. More trials need to be conducted with supplemental zinc methionine at different levels of intake during the receiving period to further evaluate responses to this compound.

Literature Cited

Brandt, R.T. and J.K. Elliot. 1987. Zinc and vitamin E effects on stressed feeder calves. Sw. Ks. Agr. Exp. Sta. RP-518:13.

Hutcheson, D.P. and J.M. Cummins. 1987. Effects of trace minerals on the immune system of cattle. Proc. 38th Montana Livestock Nutrition Conference, Special Report 23:12.1.

Pekarek, R.S., R.W. Wannemacher, Jr., M.C. Powanda and W.R. Beisel. 1973. Clinical Research. 21:608.

Spears, J.W. 1988. Evaluation of Zinc Methionine in Ruminant Diets. Zinpro Technical Manual, 1988.