

The Effects of Trace Mineral Source on Performance and Health of Newly Received Cattle

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ABSTRACT

Two hundred sixteen steers, averaging 507 ± 2.21 lbs, were utilized to determine the impact of mineral source on performance and health of newly received steers. Steers were stratified by initial body weight and randomly assigned to pens and treatments within weight stratification. Treatments consisted of 1) inorganic trace minerals (CuSO_4 , ZnSO_4 , MnSO_4 , and CoCO_3) and 2) iso-amounts of organic trace minerals (Cu, Zn, Mn, and Co). Body weights, average daily gain, feed efficiency, feed intake, and morbidity and mortality rates were collected throughout the 27 d receiving trial. There were no significant differences between treatments for any of the response variables measured.

Key Words: Steers, Trace Mineral, Receiving, Feedlot.

INTRODUCTION

Feeder cattle that have been shipped are subjected to various degrees of stress resulting in increased susceptibility to respiratory tract and other infectious diseases (Hutcheson and Cole, 1986). Morbidity and often mortality rates are high in these animals, despite vaccination against respiratory diseases. Several researchers monitoring ranch-to-rail programs have reported improved net returns for cattle that have remained healthy throughout the feeding period as compared with morbid cattle (McNeil, 1994-1998; Griffin et al., 1995; Gardner et al., 1996; Roeber et al., 2001).

Trace minerals such as copper (Cu), zinc (Zn), manganese (Mn), and cobalt (Co) are required for proper growth, immune function, and reproduction in cattle (Underwood, 1977). Typically, these minerals are fed in excess to compensate for the decrease in feed intake observed in weaned calves arriving to the feedlot, potentially, resulting in excess mineral excretion by the animal. Therefore, in order to minimize excretory losses of minerals, sources providing better utilization must be established using immunological, hormonal, and biochemical inducers. The objectives of this research were to determine the impact of trace mineral source on performance and health of newly received steers.

MATERIALS AND METHODS

Care, handling, and sampling of the animals herein were approved by the Colorado State University Animal Care and Use Committee prior to the initiation of the experiment. Two hundred sixteen steers (averaging 507 ± 2.21 lbs) were utilized in this experiment. Steers were purchased from sale barns in Kentucky and shipped to the Colorado State University Southeastern Colorado Research Center in Lamar, Colorado. Upon arrival, trial d -2, calves were vaccinated with Prespense® (Mannheimia Haemolytica and Pasteurella Multocida; Wyeth, Madison, NJ), Bovi-Shield Gold 5® (Bovine Rhinotracheitis-Virus Diarrhea-Parainfluenza₃-Respiratory Syncytial Virus Vaccine, Modified Live Virus-Leptospira Canicola-Grippotyphosa-Hardjo-Icterohaemorrhagiae-Pomona Bacterin; Pfizer Animal Health, Exton, PA), and dewormed with Promectin® (Permethrin (3-phenoxyphenyl) methyl \pm cis, trans-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate; Pfizer Animal Health, Exton, PA), and implanted with Component E-S (200 mg progesterone USP and 20 mg of

estradiol benzoate; Vetlife, Des Moines, IA).

Post arrival, trial d -1, steers were weighed and ear tagged with an electronic ID and housed in group pens. The steers were stratified by weight and were randomly assigned within a successive set of eight steers to one of eight replicates. The steers were then sorted by replicate and weight and randomly assigned within each set of six steers to one of six pens. Three pens within each six were randomly assigned to each treatment. The following day (d 0), steers were ear tagged with a visual ID and sorted into 24 nine head pens (20 x 60 ft) that shared an automatic waterer between two pens. Treatments consisted of: 1) Inorganic CuSO_4 (10.0 mg/hd/d), ZnSO_4 (30.0 mg/hd/d), MnSO_4 (20.0 mg/hd/d), and CoCO_3 (0.10 mg/hd/d) and 2) iso-amounts of Organic Cu, Zn, Mn, and Co (Availa-4; ZinPro Corporation, Eden Prairie, MN).

Steers were fed in 12 ft concrete bunks (1.33 ft/hd) which had a 12 ft wide, 20 ft long concrete apron adjacent to the bunk to provide a solid area to stand on while eating. Steers were fed a standard starter ration for 8 days and then were gradually switched to a high concentrate finishing diet (Table 1). Steers were fed twice daily (starting at 7 a.m. and 11 a.m.) in amounts that allowed ad-libitum access to feed throughout the day. Feed refusals were collected and recorded when necessary throughout the trial. Body weights were collected on d -1, 0, and 27. Day -1 and 0 weights were averaged and used as the initial weight for the trial. Day 27 weight was the final weight. Daily dry matter feed intake was collected throughout the trial for each pen. Feed efficiency was calculated by dividing gain by feed for each pen on trial.

Health Treatments. Pens were monitored daily for health and locomotion problems. Steers showing signs of sickness were pulled and a rectal temperature was collected. If the steers' temperature was greater than 103.5°F, the steers were treated according to the appropriate treatment

protocol and immediately placed back into their trial pen of origin for recovery. Steers that showed chronic signs of health problems (>2 pulls) were removed from the trial.

Statistical Analysis. Performance data was analyzed using the mixed model procedure of SAS (2003). Health data was analyzed using the Glimmix Macro procedure of Proc Mixed in SAS. The model included the fixed effects of treatment and pen was used as the experimental unit for all analysis. Random effects were pen replicate within treatment.

RESULTS AND DISCUSSION

There were no significant differences between treatments for any of the performance data collected (Table 2). In agreement with the present study, Droke et al., (1998) reported similar performance, health, and serum Zn concentrations in lambs supplemented inorganic versus organic Zn. In a study conducted at Oklahoma Panhandle Research & Extension Center, cows and calves had similar growth and reproductive performance when supplemented organic versus inorganic supplements (Hicks, 2006).

Morbidity and mortality rates were similar across treatments (Table 3). Most of the calves were pulled for respiratory symptoms (88%), some were pulled for lameness problems (6%), and a few were pulled for both respiratory and lameness problems during the trial (6%). The number of steers receiving more than one treatment for respiratory problems tended to be greater for the organic as compared with the inorganic treatment. However, differences between treatments were not

statistically significant. Repulls, as a percentage of steers treated for disease, may have been greater for the organic treatment as compared with the inorganic treatment.

IMPLICATIONS

Health of newly received calves is a major determinant of overall performance and profitability. Newly received cattle have an increased susceptibility to respiratory tract and other infectious diseases. Therefore proper nutritional management is imperative to maintaining animal health. There were no significant differences between treatments for performance and health measurements in this study. Further research is needed to determine the role of trace minerals on growth and immunity in beef cattle.

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Table 1. Basal diet composition fed to steers from the starter ration through the step up rations. (%DM)

Day	1-8	9-11	12-14	15-27
Item				
Alfalfa hay	32.07	17.41	13.38	-
Corn Silage	25.00	25.00	15.00	13.78
Steam Flaked Corn	32.60	42.49	58.35	71.07
Distillers Grains	6.28	8.90	5.63	5.10
CCDS ^a	3.01	2.99	3.00	3.01
Yellow Grease	-	0.99	2.00	3.50
Supplement ^{b,c}	1.04	2.21	2.63	3.54

^a Condensed Corn Distillers Solubles.

^b Supplement consisted of: Calcium, Salt, Urea, Min Ad, CoCO₃, CuSO₄, ZnSO₄, MnSO₄, EDDI, FeSO₄, NaSe, Rumensin, Tylan, Vitamin A, and Vitamin E

^c Availa-4 was substituted for the Co, Cu, Zn, and Mn for the organic supplements

Table 2. Effects of inorganic and organic trace mineral supplementation on performance of newly received feedlot cattle.

Item ^a	Treatment		SEM	P <
	Inorganic	Organic		
BW, lbs				
Initial	505.00	509.00	2.00	0.18
Final	573.00	568.00	9.00	0.54
ADG, lbs	2.50	2.20	0.18	0.19
ADFI, lbs DM	10.60	10.20	0.44	0.51
FE (g/f)	0.24	0.21	0.01	0.15

^a Abbreviations used: BW= Body Weight (lbs); ADG= Average Daily Gain (lb/hd/d); ADFI= Average Daily Feed Intake (lb/hd/d); FE= Feed Efficiency (lbs gained/intake).

Table 3. Effect of trace mineral source on morbidity and mortality of newly received steers.

Item	Inorganic			Organic		
	N	% Calculated		N	% Calculated	
		Risk	P <		Risk	P <
Pulled	14	12.04	0.19	19	18.50	0.19
Repulled	3	2.80	0.15	9	9.30	0.15
% Repulled of Pulls	-	22.50	0.17	-	49.50	0.17
Died	0	0.00	1.00	3	1.10	1.00
Railed	1	0.93	1.00	1	0.93	1.00