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The Effect of Chromium Propionate Supplementation on Stressed Steer Calves during Receiving and Finishing

A trial was conducted involving 132 Crossbred steer calves to assess the effects of Cr-propionate fed at 0, 100 or 200 ppb of Cr from KemTRACE® brand Chromium Propionate during the receiving and finishing period. During the trial cattle were fed a basal 60% concentrate (receiving) or 91% concentrate (finishing) diet based on steam-flaked corn. The trial consisted of 4 pens/treatment and 11 steers/pen. In this trial, cattle were under adverse environmental and weather conditions during the receiving and initial feeding period. Cattle showed a tendency to respond to an increase in glucose likely as a result of the influence of KemTRACE® Chromium Propionate on cellular insulin receptors. This increased glucose manifested itself in improvements in various parameters during the receiving and finishing period. An additional live response was also seen under the stress of rapid muscle accretion resulting from beta agonist feeding.

KEYWORDS: Beef, Cattle, KemTRACE, Chromium, Feedlot, Glucose

Introduction

A number of studies have been conducted feeding supplemental chromium in various forms to both humans and animals since the mid nineteen hundreds. Chromium supplementation from various Cr-sources has improved weight gain during receiving and growing periods in beef cattle[1,2,3]. Little published information was available on the effects of chromium propionate fed to beef cattle prior to the initial work of Rounds[4]. Literature suggests that supplemental sources of organic chromium (chromium yeast or chelated chromium) can increase rate of gain from 0-30%, depending on level of stress and disease challenge[1]. Reduced morbidity and improvements in growth performance were observed after arrival of transit stressed feeder calves fed various forms of supplemental chromium[3,5,6]. The objective of this trial was to assess if Cr-propionate may add benefit in high-risk calves fed to slaughter.

Materials and Methods

A trial was conducted involving 132 Crossbred steer calves with an average arrival weight of 575 lbs. Cattle were shipped from the same order buyer barn in West Point, MS and were processed upon arrival. Processing included: castration by knife, metaphylaxis with tilmicosin (Micotil, Elanco Animal Health), individual left ear tag identification, a color-coded treatment tag in the right ear, vaccination against infectious bovine rhinotracheitis (IBR), pulmonary influenza 3 (PI3), bovine respiratory syncytial virus (BRSV), and bovine viral diarrhea (BVD) type I and II (Titanium 5, Agrilabs), vaccination against clostridial toxoids (Vision 7, Intervet/Schering-Plough), treatment for internal and external parasites (Safeguard, Intervet/Schering-Plough; Ivomec Plus, Merial), implanting with Ralgro (Intervet/Schering-Plough), and horn tipping as needed.

Calves were randomly sorted and assigned to treatments. Calves were housed in a total of 12 pens. The receiving period was designated as the first 56 days, followed by a finishing period of 170 days in which zilpaterol hydrochloride (Zilmax, Intervet/Schering-Plough) was fed from 23 to 3 days before shipment to slaughter. Treatments included a basal diet (Table 1) with 0, 0.1, or 0.2 mg/kg Cr from Cr-propionate. For up to the first 6 days on study, cattle were offered 2 lbs/animal (as-fed) of long-stem prairie hay.

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Table 1: Diet ingredient and formulated chemical composition. (% of DM)

Receiving period	
Steam-flaked corn	37.43
DDG	15.41
Wet distiller's grains with soluble	4.7
Supplement	3.34
Sorghum-sudan hay	31.61
Sorghum-sudan silage	7.51
CP	14
Ca	0.81
P	0.37
K	1.21

Finishing period	
Steam-flaked corn	71.07
Wet distiller's grains with soluble	14.75
Supplement	3.68
Yellow grease	1.49
Sorghum-sudan hay	9.01
CP	14.5
Ca	0.71
P	0.36
K	0.65

The diet during the receiving period contained approximately 40% forage, and protein was supplied by DDG for 44 days; then wet DGS was used thereafter (Table 1). The finishing diet fed was typical of current industry conditions in the region. KemTRACE® Chromium Propionate was included in premixes specific to each treatment, which were then included in supplements specific to each treatment. Diets were prepared twice daily. Steam-flaked corn was prepared three times per week. Corn was tempered to 18% moisture for at least 18 hours and was steamed for approximately 35 minutes before flaking to 27 lb/bu. The weighted average as-fed composition during the study and weekly ingredient dry matter content were used to calculate actual diet composition on a dry matter basis at the end of the study.

Results and Discussion

During the receiving phase, the high-risk health status of these cattle was further complicated by adverse weather conditions. The first two months of this trial were characterized by below average temperatures and above average precipitation. The average daily temperature was 34ºF, and the average maximum wind speed was 21 mph. During this trial, mortality averaged 4.6% during the first 56 days; however, the control cattle experienced a 9.1% mortality compared to the treatment groups with a death loss of 2.3%. These results represent significant monetary differences. A key challenge in interpreting data with higher mortality rates is the relative performance of surviving cattle. On a deads in basis, meaning all data for dead cattle including a final dead weight was included in the data-set.

With high feed costs and shrinking profit margins in the feedlot, cattle producers are looking for additional options that will help enhance profitability. The average performance of the treatment groups during the receiving period showed a difference in ADG and F/G by 3.86% and 2.73%, respectively over the control.

Table 2: Receiving period, Days 0 - 56

Deads In	Control	0.1	0.2	Cr Mean	% Over C
DMI, lbs	14.78	15.07	14.72	14.9	100.78%
ADG, lbs	2.33	2.47	2.37	2.42	103.86%
F/G	6.41	6.18	6.29	6.24	102.73%
Mortality, %	9.1	2.3	2.3	2.3	396%

During the finishing period the average of the treatment groups showed a 3.25% difference in ADG and 4.70% difference in F/G over the control (Table 3). During the Zilmax feeding period, there was a linear improvement in ADG and F/G of 6.70% and 4.49%, respectively over the control (Table 4).

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Table 3: Finishing period, Days 0 – 226

Deads In	Control	0.1	0.2	Cr Mean	% Over C
DMI, lbs	19.44	19.90	19.04	19.47	100.15%
ADG, lbs	3.08	3.21	3.15	3.18	103.25%
F/G	6.49	6.29	6.08	6.19	104.70%
Mortality, %	9.1	2.3	2.3	2.3	396%

Table 4: Feedlot Zilmax feeding

	Control	0.1	0.2	Cr Mean	% Over C
DMI, lbs	21.43	22.02	21.68	21.85	101.96%
ADG, lbs	3.51	3.70	3.79	3.75	106.70%
F/G	6.13	5.98	5.73	5.86	104.49%

Conclusions

The understood mode of action of KemTRACE® Chromium Propionate suggests that chromium propionate acts to increase glucose uptake by the cell. Increasing glucose could manifest itself in various ways depending on the environment, health status, genetic potential, stress level and nutrition of the steer calves. At the same time, any one of those parameters at an extreme could override a positive response additional glucose may provide.

In this trial, under adverse environmental and stress conditions during the receiving and initial feeding period, cattle responded to an increase in glucose provided by the influence of chromium propionate on cellular insulin receptors. It appears this increased glucose manifested itself in improvements in various parameters during the receiving and finishing period. An additional positive effect of glucose on the stress of rapid muscle accretion is seen in the live response during the Zilmax feeding period. In this trial, the results shown by the Chromium Propionate treatment groups represent an additional option for cattle producers to help enhance their profitability.

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