The effects of different mineral supplementation strategies on feedlot performance of mineral deficient cattle

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Introduction

Disease is the main cause of morbidity and mortality in feedlot cattle. Trace minerals are crucial in the immune system response to disease and also are particularly important to the health and performance of stressed feedlot cattle (Galyean, 1999). Approximately 60-70% of beef cattle coming off range in Utah will be deficient in minerals such as Cu, Se, Zn or Mn (Halladay, 2018). Currently, there is no standard protocol that can be followed to improve welfare and health of mineral deficient animals being received into a feedlot. Therefore, we wanted to determine the effects of providing natural, trace mineral supplementation to increase cattle health and possibly eliminate the need to use prophylactic antibiotics.

Methods

- Steers were blocked by initial body weight and mineral status and allocated into one of four different treatment groups: Con (n = 10); 2XIND (n = 10); IND (n = 10); and Multi-Min® (n = 10).
- Prior to beginning the study, steers experienced 5 hr of travel stress.
- Animals were housed in pens equipped with GrowSafe® feed bunks at the USU South Farm.
- The following measurements were collected:
  - Weights every 2 weeks.
  - Blood on days 0, 5, 10, 20, 30 and 40.
  - Backfat thickness and ribeye area were measured by ultrasound on days 5, 20 and 40. Then every 28 days after day 40.
- Steers were harvested at a commercial facility in Hyrum, UT and carcass characteristics were obtained.
- The Proc Mixed procedure of SAS was used to analyze weight gain over the feeding period with a repeated measures analysis where treatment, time, and their interaction were included as fixed effects and pen was a random effect. All other variables were analyzed by including treatment as a fixed effect and individual animal as a random effect. Differences between treatments were split out by analyzing least squares means with Tukey adjustments.

Hypothesis & Objectives

- **Hypothesis**: Providing mineral deficient receiving cattle with supplemental minerals through the first 40 d of being in the feedlot will result in improvements in growth, feedlot performance, carcass quality and mineral status.
- **Objectives**:
  - Determine how different mineral mitigation treatments alter mineral status in receiving feedlot cattle.
  - Determine how mineral status of receiving cattle affects the immune system, feedlot performance and carcass quality.

Carcass Characteristics Results

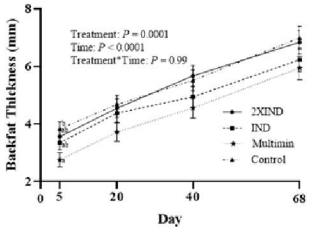

Figure 1: Mean backfat thickness of steers as measured by ultrasound during the feed trial.

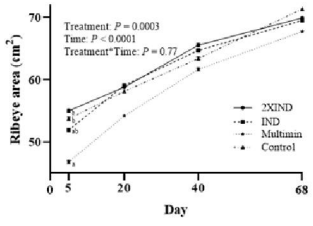

Figure 2: Mean ribeye area of steers as measured by ultrasound during the feed trial.

Liver Mineral Status Results

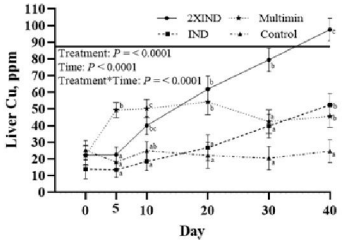

Figure 3: Mean hepatic copper concentrations of finishing steers over a 110 day period. The bold black line indicates the lowest level of copper in an animal with adequate mineral status.

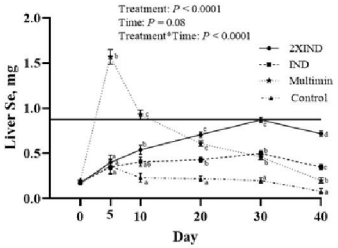

Figure 4: Mean hepatic selenium concentrations of finishing steers over a 110 day period. The bold black line indicates the lowest level of selenium in an animal with adequate mineral status.

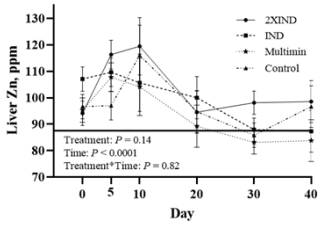

Figure 5: Mean hepatic selenium concentrations of finishing steers over a 110 day period. The bold black line indicates the lowest level of selenium in an animal with adequate mineral status.

Feedlot Performance Results

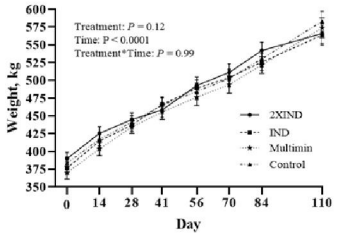

Figure 6: Average gain of finishing steers over a 110 day period.

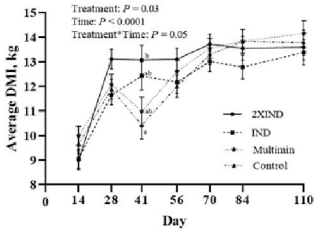

Figure 7: Average dry matter intake (DMI) of finishing steers over a 110 day period.

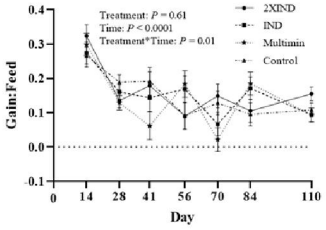

Figure 8: Average Gain:Feed ratio of finishing steers over a 110 day period.

Summary

- The 2XIND treatment increased liver copper and selenium status of the steers when compared to the control animals that did not receive any supplemental mineral.
- Carcass characteristics measured by ultrasound were not different among our different treatment groups.
- Overall weight gain and feed efficiency were not affected by treatment. However, animals given MultiMin had increased DMI compared to the animals that received IND levels of mineral

Conclusions

The results of this study demonstrate that feeding varying levels of minerals to mineral deficient steers at receiving has little effect on ultrasound measurements and feedlot performance. However, providing oral minerals at two times the typical concentration provided in the industry results in increased levels of copper and selenium in the liver compared to the control animals.

Acknowledgements

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