

## Evaluation of Trace Mineral Sources on Newly Arrived Stocker Cattle

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### Introduction

Light weight stocker calves experience variable degrees of physiological and psychological stressors as they are assembled from various marketing points and transported to their destination. Susceptibility to disease in young, long hauled calves is greatly enhanced and the consequence of sickness is a major cause for poor production outcomes. Enhanced nutritional trace mineral programs that contain zinc, copper, and manganese from organic or hydroxy sources may be more efficacious as a means of minimizing disease or realizing improved performance than the sulfate form of these respective trace minerals.

Key words: trace minerals, stocker, drylot

### Experimental Procedures

A total of 283 crossbred heifers (initial body weight =  $511 \pm 29$  lb) were blocked by weight and randomly assigned to one of 3 treatments with 6 pens per treatment (18 pens with 15 heifers each). Treatments consisted of supplemental zinc (360 mg/day), copper (125 mg/day), and manganese (200 mg/day) from sulfate, organic complexes (Availa<sup>®</sup> 4, Zinpro Corp., Eden Prairie, MN), or hydroxy (Intellibond<sup>®</sup>, Micronutrients, Indianapolis, IN) trace mineral sources fed during a 45 day receiving and backgrounding period (Table 1).

Diets were fed once daily. Unconsumed feed was removed from the bunk, weighed, and a subsample was dried as needed to determine actual feed intake. Body weights were captured at initial processing, during revaccination (day 14), and at completion of the study at day 45. All calves were observed daily for signs of sickness or lameness. If any signs were observed, cattle were pulled from their pens and a rectal temperature was taken. If a temperature of 104°F or higher was found, antibiotics were administered according to the Kansas State University Beef Stocker Unit health protocol. Diagnosis of non-bovine respiratory diseases (lameness, pink eye, etc.) was treated according to the health protocol. The trial was conducted as a randomized complete block design. Statistical analyses were conducted using the MIXED procedure of SAS (version 9.4; SAS Institute, Cary, NC). Data were arranged in a randomized incomplete block design, with pen serving as the experimental unit for growth and health outcomes as impacted

<sup>1</sup> Micronutrients USA LLC, Indianapolis, IN.

by treatment. In the model, the fixed effects were treatment and lot number while the random effects were lot  $\times$  treatment, pen, and animal ID. Treatment differences were considered significant at P-value less than 0.05 and tendencies at P-value less than 0.10.

## Results and Discussion

The effects of source of zinc, copper, and manganese on heifer performance are shown in Table 2. Overall, the cattle performed well on feed among all treatments. There were no significant differences in body weight gain, average daily gain, feed intake, or feed efficiency during the 45 day receiving and growing trial.

## Implications

Trace mineral source did not affect total weight gain, average daily gain, feed efficiency or morbidity during the receiving and subsequent growing phase of stocker calves in this particular trial.

**Table 1. Basal diet composition of heifers fed a trace mineral supplement**

| Item, % dry matter basis                   | Basal diet | Hydroxy | Organic | Control |
|--|------------|---------|---------|---------|
| Dry rolled corn                            | 19.38      |         |         |         |
| Wet corn gluten feed                       | 40.00      |         |         |         |
| Alfalfa hay                                | 17.50      |         |         |         |
| Trace mineral premix <sup>1</sup>          | 5.63       |         |         |         |
| Prairie hay                                | 17.50      |         |         |         |
| Analyzed nutrient composition <sup>2</sup> |            |         |         |         |
| Dry matter, %                              |            | 73.04   | 73.22   | 73.27   |
| Crude protein, %                           |            | 17.14   | 17.49   | 17.26   |
| Acid detergent fiber                       |            | 16.75   | 17.39   | 17.56   |
| Net energy gain, Mcal/lb                   |            | 0.48    | 0.47    | 0.47    |
| Calcium, %                                 |            | 0.68    | 0.61    | 0.63    |
| Phosphorus, %                              |            | 0.60    | 0.61    | 0.62    |
| Potassium, %                               |            | 1.27    | 1.29    | 1.32    |
| Magnesium, %                               |            | 0.36    | 0.35    | 0.36    |
| Copper, ppm                                |            | 10.51   | 9.13    | 9.64    |
| Manganese, ppm                             |            | 37.07   | 35.47   | 39.00   |
| Molybdenum, ppm                            |            | 0.73    | 0.80    | 0.73    |
| Zinc, ppm                                  |            | 52.93   | 52.70   | 53.73   |

<sup>1</sup> Formulated to provide 150 mg/day Rumensin (Elanco Animal Health, Greenfield, IN) and to contain the following nutrient levels: 28,000 IU/lb vitamin A; 31 IU/lb vitamin E; 170 ppm added copper; 510 ppm added zinc; 340 ppm added manganese; 2.63 ppm added selenium; 2.5% salt; 4.7% calcium; and 9.4% crude protein from sulfate, organic, and hydroxy mineral sources for the elements of zinc, copper and manganese.

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**Table 2. Performance data for cattle supplemented with sulfate, organic complexes, or hydroxy trace minerals**

| Item  | Sulfate | Organic | Hydroxy | Standard error | P-value |
|---|---------|---------|---------|----------------|---------|
| Pens, number  | 8       | 8       | 8       |                |         |
| Animals on trial, number                              | 94      | 93      | 89      |                |         |
| Days on feed  | 45      | 45      | 45      |                |         |
| Initial weight, lb                                    | 511     | 511     | 510     | 2.26           | 0.9362  |
| Revaccination weight, lb                              | 582     | 578     | 579     | 3.03           | 0.7276  |
| Final shrunk weight, lb                               | 645     | 645     | 641     | 6.84           | 0.7778  |
| Receiving period average daily gain, lb/day           | 2.97    | 3.00    | 2.94    | 0.11           | 0.9053  |
| Bovine respiratory disease pull rate, % per treatment | 0.81    | 1.66    | 2.02    |                | 0.4333  |
| Day 14 dry matter intake, lb/day                      | 12.18   | 12.38   | 11.91   | 0.36           | 0.6754  |
| Day 14 feed:gain, lb dry matter feed/lb gain          | 2.38    | 2.53    | 2.36    | 0.098          | 0.4061  |
| Day 14 gain:feed, lb gain/lb dry matter feed          | 0.425   | 0.398   | 0.427   | 0.016          | 0.3897  |
| Overall dry matter intake, lb/day                     | 16.36   | 16.61   | 16.15   | 0.503          | 0.8134  |
| Overall feed:gain, lb dry matter feed/lb gain         | 5.53    | 5.54    | 5.51    | 0.164          | 0.9895  |
| Overall gain:feed, lb gain/lb dry matter feed         | 0.182   | 0.181   | 0.182   | 0.005          | 0.9786  |