THE EFFECTS OF SLOW-RELEASE COPPER BOLUSES ON COW REPRODUCTIVE PERFORMANCE AND CALF GROWTH

J. D. Arthington, R. L. Larson, and L.R. Corah

Summary

Two Kansas cow/calf herds known to be copper deficient were utilized to examine the effect of slow-release copper boluses. In herd I, 34 spring-calving cows and calves were divided into a treated and control group at 3-4 months following calving. In herd II, 1106 fall-calving cows and 172 calves were divided into a treated and control group at 3-4 months following calving. In both herds, cow liver and serum samples were collected and assayed for copper and iron. Cows in herd II were also examined for various reproductive parameters. Calf ADG was monitored over a 42-day treatment period in herd I, and a comparison of calf weaning weights was made in herd II. We concluded that copper boluses elevated liver copper levels. However, no effect on reproductive performance was noted, and calf performance was adversely affected.

(Key Words: Copper, Iron, Beef, Weight Gain, Reproduction.)

Introduction

The need for emphasis on bovine trace mineral nutrition is becoming more evident in Kansas. As we continue to push our animals toward their genetic potential, trace mineral imbalance starts to become a major player. One particular trace mineral, copper, is an integral part of many physiological functions affecting cattle performance. Indeed, as we examine the present status of Kansas beef herds, copper deficiencies appear to be much more common than previously suspected. Copper deficiencies can result from feedstuffs low in copper (primary deficiency), or feedstuffs high in compounds that interfere with copper absorption, such as molybdenum and sulfur (secondary deficiency). Classic symptoms of copper deficiency include altered hair coat color, greying of hair around the eyes and ears, difficulty in shedding winter hair, calf scouring, delayed estrus, and embryonic death.

Many products have been developed to prevent and treat copper deficiencies. One new product recently marketed is a slow-release bolus containing copper oxide needles[1]. These trials were conducted with two Kansas cow/calf herds with the objective of examining the effect of copper oxide administered as a slow-releasing bolus on cow liver copper and iron status, cow reproductive performance, and calf performance. The two herds were selected based on their known history of being copper deficient.

Experimental Procedures

Herd I

Copper bolus effect on cow and calf ADG was examined. Thirty-four springcalving cows and calves were divided into a treated (bolused administered; n = 18) and a control (n = 16) group. At the start of the trial, cows assigned to the treated group received two boluses, whereas calves received one. Copper and iron status were determined by liver and serum samples collected on days 0, 64, and 106 of the trial. Liver samples were collected by liver biopsy

[1]Cuprax® Pitman-Moore Company, Mundelein, Illinois 60060.

technique using Tru-Cut Biopsy needles[2]. Blood samples were collected from the jugular vein. Liver and blood samples from cows in herd I were analyzed by atomic absorption methods to determine copper and iron levels.

Herd II

Bolus effects on cow reproductive parameters and calf ADG were examined. Fall calving cows were divided, three months after calving, into treated (n = 276) and control (n = 830) groups. Liver and serum samples were collected on days 0, 97, and 154 of the trial.

Results and Discussion

Herd I

Data are presented in Table 1. Although not statistically significant, bolus administration appeared to increase liver copper levels, whereas liver copper appeared to decrease in the non-treated cows. Liver iron levels tended to be lower (P = .068) in the treated group, indicating an increase in the biological activity of copper. Serum copper values did not respond to bolus treatment.

Calf ADG was determined after a 42-day treatment period. The treated calves tended (P = .063) to have a lower ADG compared to the control (1.79 vs 2.11 lb/d).

Herd II

On days 97 and 154 of sampling, bolus treatment elevated (P < .05) liver copper levels (Table 1). Similar to the results in herd I, serum copper showed no response to bolus treatment throughout the trial. AI pregnancy rate, AI first service conception rate, and number of inseminations per female did not differ (P > .10) between treatment groups.

Bull calves in this herd were divided into a treated (n = 56) and a control group (n = 43). Weaning weights were heavier (P < .05) for control (780.6 lb) compared to treated (749.7 lb). Heifer calves were also divided into a treated (n = 36) and control group (n = 37). Heifer weaning weights also tended (P = .093) to be heavier for control (721.1 lb) compared to treated (690.2 lb).

In both herds, supplementing copper oxide via slow-releasing boluses tended to increase liver copper and decrease liver iron. However, it did not appear to alter cow reproductive performance. Copper boluses also appeared to adversely affect ADG and weaning weights of calves.

[2]Baxter Tru-cut biopsy needles, Baxter Healthcare Corporation, Valencia, CA 91355-8900.

Table 1. Copper and Iron Status of Herd I

	Day	Treated (ppm)	Non-Treated (ppm)
Liver Copper	64	17.3	13.4
	106	24.1	8.1
Liver Iron	64	462.8[a]	524.0[b]
	106	490.8[a]	661.8[b]
Serum Copper	0	.550	.526
	64	.502	.420

[ab]Row means tend to differ (P < .07)

Table 2. Copper and Iron Status of Herd II

	Day	Treated (ppm)	Non-Treated (ppm)
Liver Copper	0	162.3	195.6
	97	323.8[a]	173.6[b]
	154	291.2[a]	187.0[b]
Liver Iron	0	461.8	435.8
	97	599.6	671.4
	154	423.4	548.4
Serum Copper	0	.712	.738
	97	.632	.653
	154	.568	.588

[ab]Row means differ ($P < .05$)