AN111

UF UNIVERSITY of FLORIDA
IFAS Extension

Copper Oxide Boluses for Grazing Cattle[1]

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The significance of supplemental copper for grazing cattle in Florida has been realized for many years. In most all situations, a balanced, free-choice, salt-based mineral supplement will provide adequate copper nutrition. More recently, I have had several inquires at the Range Cattle REC regarding the use of commercial boluses containing copper oxide needles. This form of supplementation involves the oral administration of a gelatin capsule (bolus) containing a measured amount of copper oxide in the form of small needle particles. Once administered, the capsule presumably drops into the reticulum-rumen where it dissolves slowly over time. This form of supplementation is not new. In the 1994 / 1995 calving season we investigated the use of these boluses in two cowherds in southwest Kansas. At the start of the trial, cows assigned to the treated group received two boluses (20 g of copper oxide needles), and their calves received one (10 g of copper oxide needles). The effect of treatment on the copper status of the cows was determined by liver biopsy collections at the start and end of the study (106 and 154 d for Herd one and two, respectively). While control cows experienced moderate declines in liver copper, copper-oxide bolus administration increased liver copper levels in both herds (21 and 129 ppm in Herd one and two, respectively). This increase was less dramatic for cows in Herd one, which is probably explained by the high levels of forage molybdenum found at this location. Molybdenum is a well-known antagonist of copper absorption. The average forage molybdenum levels for clippings collected over all four seasons were 10.65 and .78 ppm for Herd one and two, respectively. Copper bolus administration decreased calf average daily gain (ADG) in Herd one (1.78 versus 2.11 lb/d for bolused and control caves, respectively). Similarly, copper bolus administration resulted in reduced calf weaning weights for both bull calves (31 lb) and heifer calves (55 lb).

One explanation for the negative impact of copper oxide bolus administration on calf gain is the potential antimicrobial effect of copper in the rumen. Copper may be altering the ruminal microflora and thus impeding forage digestion. To investigate this, we examined the effect of copper bolus administration (28 g) on forage nutrient digestion in growing crossbred steers. During a 39-day study, steers were individually offered ground limpograss hay (8.6 ppm copper) in quantities sufficient to ensure ad libitum access. On day 12 (Period 1; P1) and day 33 (Period 2; P2) steers were placed in metabolism crates. Total forage offered, forage refused, and fecal production were collected for seven days. Liver biopsy samples were collected on

1. This document is AN111, one of a series of the Animal Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Published November 2001, reviewed July 2008. Please visit the EDIS Web Site at http://edis.ifas.ufl.edu.
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day 12 and day 33. Copper oxide bolus administration resulted in an increase in liver copper at the start of P1 and P2 (Figure 1). Bolused steers had increased fecal copper output during both periods (Figure 2). Intake of the forage fiber (NDF and ADF) and crude protein did not differ between treatments for either period, however, digestibility of NDF and crude protein were higher for control steers in P2 (Table 1). Digestibility of ADF tended to be higher for control steers in P2 (Table 1).

These data suggest that although copper oxide boluses are effective in increasing tissue Cu stores, they may contribute to lower forage fiber digestibility and poorer cow and calf performance

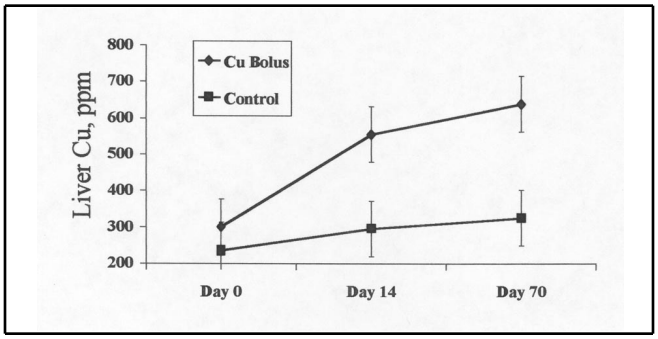

Figure 1. Effect of Cu oxide bolus on liver copper concentration in growing steers.

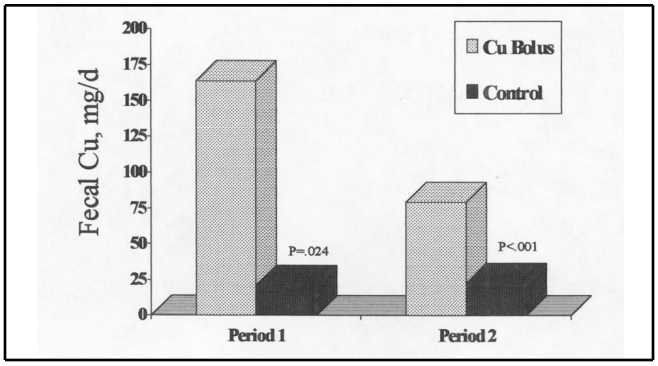

Figure 2. Effect of Cu oxide bolus on fecal Cu excretion in growing steers.

Table 1. Effect of copper oxide bolus on digestibility of nutrient fractions in growing steers[a].

	NDF Digestibility, %[a]		ADF Digestibility, %[a]		CP Digestibility, %[a]	
Treatment	P1[b]	P2[b]	P1	P2	P1	P2
Bolus[c]	65.4	57.2	62.7	52.3	54.9	43.4
Control	66.2	62.2	63.4	57.4	51.6	50.2
P =	0.73	0.02	0.75	0.09	0.51	0.04

[a]Results expressed as a percent of organic matter intake.

[b]On d12 (Period 1; P1) and d33 (Period 2; P2) steers were placed in metabolism crates and total forage offered, refused, and fecal production were collected for 7d.

[c]Bolused calves received 25.0 g of copper oxide needles on d 0.