LOW COST COW/CALF PRODUCTION

The Bulletin   For Alumni Of The School

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28	29	30
Ni	Cu	Zn
58.6934	63.546	65.39
2-8-16-2	2-8-18-1	2-8-18-2

Do you recall this from high school chemistry? It is a chunk out of the Periodic Table of the Elements. Let's talk about # 29 – Copper. Remember from the School - when formulating a forage supplement, the Cu requirement was met by multiplying NEm consumption by 16. We then subtracted the Cu being consumed via the forage. The difference was that which had to go into the supplement. There was one final step. We multiplied the Molybdenum consumption times four and compared the product to total Cu consumption. Even though the Cu requirement had been satisfied in the first step, we know that Mo can cause a deficiency of Cu in ruminants. Mo reacts with Sulfur in the rumen to form thiomolybdates, which are potent antagonists of Cu metabolism. To overcome this potential deficiency, we ratio Cu:Mo at 4:1. If necessary, more Cu is added to the supplement.

Mo and No Mo

Researchers from N. Carolina State U.[1] recently published the results of a study of Cu deficiency and the interaction of Cu with Mo. Calves weighing about 560 lb were divided into two groups. One group received an injection of 90 mg of Cu 28 days prior to weaning. Upon weaning, both groups were placed on a receiving diet. The injected group's diet was supplemented with Cu. After the 29 d receiving period, the steers were randomized into four groups according to body weight and liver Cu concentration. They then were placed on a growing diet for 196 d. Following the growing phase, the steers again were randomized and placed on a finishing diet for 49 days. The Cu and Mo levels (that the experimental diets contained) are shown in Table 1.

Table 1. Dietary copper and molybdenum levels (ppm).

	No added Cu		Added Cu	
	No Mo	Mo	No Mo	Mo
	Receiving			
Cu	6.89		14.39	
Mo	1.78		1.78	
	Growing			
Cu	5.20	5.20	10.20	10.20
Mo	1.16	6.16	1.16	6.16
	Finishig			
Cu	2.85	2.85	7.85	7.85
Mo	.86	5.86	.86	5.86

Minimum = 0.6 mg/L

Plasma Cu levels below 0.6 mg/L are thought to indicate Cu deficiency. Plasma Cu levels observed in this study are shown in Table 2. The pre-weaning Cu injection is evidenced by the 0.93 mg/L in the +Cu group at the start of the study. The plasma level continued to increase with +Cu for the first 14 days. Calves in the -Cu group during the receiving phase were marginally deficient (0.57 mg/L) at the start of the study. This reflects the low level of Cu contained in milk. Plasma Cu fell below acceptable levels by 28 days into the growing phase in cattle consuming the diet containing 5.2 ppm Cu and 6.16 ppm of Mo. When both Cu and Mo were added to the receiving diet, plasma Cu remained at levels similar to that of Cu supplementation only. Had the growing phase of the study been extended, the plasma levels would have fallen below normal, as indicated by the declining liver Cu level for the +Cu +Mo group (Table 3). Plasma levels will remain normal until storage forms of liver Cu are depleted. Liver Cu was quite low for the -Cu groups at the start of the growing phase. With the inclusion of Mo, it practically went out of sight.

Table 2. Effect of Cu and Mo on plasma Cu (mg/L).

Day	No added Cu		Added Cu	
	No Mo	Mo	No Mo	Mo
	Receiving			
0	.57		.93	
14	.90		1.14	
28	.90		1.13	
	Growing			
0	1.03	.90	1.14	1.15
28	.95	.57	1.12	1.02
56	.84	.33	.91	.92
84	.82	.30	.89	.93
112	.87	.27	.92	.96
140	.89	.21	.92	1.00
168	.90	.25	1.02	.99
196	.90	.20	.98	.93
	Finishing			
28	1.22	.22	1.29	1.30

Table 3. Effect of Cu and Mo on liver Cu (mg/kg).

Day	No added Cu		Added Cu	
	No Mo	Mo	No Mo	Mo
	Receiving			
31	20.95		149.17	
	Growing			
0	18.39	23.79	144.17	154.84
140	32.92	12.98	190.78	67.48
196	40.53	7.53	188.74	55.42

Eating and Gaining

Average daily gain, dry matter intake and feed conversion are shown in Table 4. ADG, during the receiving and growing phases, was quite similar for all treatment groups. By the time the cattle were into the finishing phase, the -Cu groups fell out of bed, especially the -Cu +Mo group. Again, DMI was similar for all treatment groups throughout all phases. The real hurt was during the finishing phase when feed conversion skyrocketed.

Table 4. Effect of Cu and Mo on cattle performance.

	No added Cu		Added Cu	
	No Mo	Mo	No Mo	Mo
	ADG, lb/d			
Receiving	2.65		2.69	
Growing	2.25	2.25	2.27	2.27
Finishing	1.87	1.23	2.25	2.20
	DMI, lb/d			
Receiving	11.33		11.95	
Growing	15.26	16.98	17.35	17.99
Finishing	20.19	20.92	21.05	21.19
	Feed Conversion			
Receiving	4.28		4.44	
Growing	6.78	7.55	7.64	7.92
Finishing	10.78	16.95	9.36	9.61

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[1] Ward, J.D. and J.W. Spears. 1997. Long-term effects of consumption of low-copper diets with or without supplemental Molybdenum on copper status performance and carcass characteristics of cattle. J. Anim. Sci. 75:3057.