B-TRAXIM® 2C

pancosma

Supply of two copper sources in steers fed diets with increasing content of molybdenum and sulfur.

KEY FINDINGS

B-TRAXIM® 2C Cu showed:

- ***A higher bioavailability (+25%) compared to $CuSO_4$.***
- ***An improved efficiency with increasing dietary Cu-antagonists compared to $CuSO_4$.***

INTRODUCTION AND OBJECTIVE

Copper deficiency is a major problem in cattle, primarily due to low dietary available Cu. Antagonists, such as Mo, S and Fe, are frequently high in ruminant diets and reduce the bioavailability of Cu. S and Mo interact in the rumen to form thiomolybdates that form insoluble molecules with Cu which are poorly absorbed. A form of Cu that would not interact with thiomolybdate, and thus, remain available for absorption is therefore needed. Crystalline copper glycinate (B-TRAXIM® 2C) is a stable organic trace mineral form, which may be more resistant to interactions in the rumen and therefore more bioavailable.

The goal of this study was to investigate the efficacy of two copper sources in steers to:

- *Prevent Cu-deficiency*, when fed a diet containing additional Mo and S.
- *Restore Cu-status* of Cu-deficient steers, when fed a diet containing no additional Mo and S.

MATERIALS AND METHOD

The study was conducted at North Carolina State University, Raleigh (U.S.A.) by Prof. J. W. Spears.

Experimental design:
"Prevent deficiency": 60 Angus and Angus*Simmental steers (av. 277 kg BW) were blocked by weight within breed and assigned to one of five treatments (table 1) for 148 days.
"Restore status": 30 Cu-deficient (liver Cu <19 mg/kg DM) Angus and Angus*Simmental steers were blocked by weight within breed and assigned to one of the five treatments (table 1) for 21 days.

Table 1: Treatments

Cu-Source	*Prevent deficiency* [ppm]	*Restore status* [mg/d]
Control	-	-
Copper sulfate	5	75
B-TRAXIM® 2C	5	75
Copper sulfate	10	150
B-TRAXIM® 2C	10	150

All steers were housed in slotted floor pens.

Experimental diet:
Steers were individually fed a corn-silage based TMR diet ad-libitum (table 2).
"Prevent deficiency": For the first 120 days, the TMR diet was supplemented with 2 mg/kg DM of Mo and 0.15% S. For the last 28 days, Mo addition was increased to 6 mg/kg DM.
"Restore status": No Mo nor S was added.

Table 2: Basal TMR diet

Corn silage	[% DM]	90.00
Soybean meal	[% DM]	8.20
Urea	[% DM]	0.75
Salt	[% DM]	0.25
Calcium sulfate	[% DM]	0.80
Analyzed Cu	[mg/kg DM]	7.9
Analyzed Mo	[mg/kg DM]	3.6

Statistical Analysis:
Data were analyzed by analysis of variance using general linear model procedure. In addition, multiple linear regressions and slope ratio method for Cu bioavailability.

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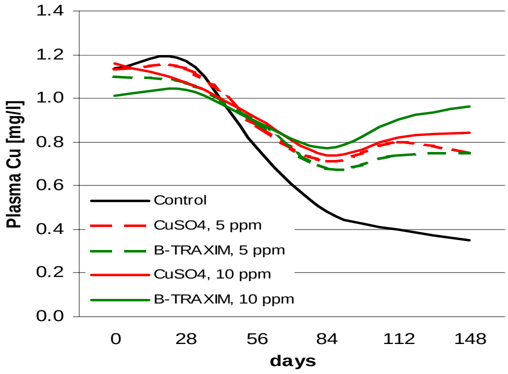
RESULTS AND CONCLUSION

"Prevent deficiency":
In presence of dietary Cu antagonists, DMI (p=0.09), BWG (p=0.01), feed efficiency (p=0.01) and final BW (p=0.03) were improved with supplemental Cu. Highest DMI (9.1 kg/d), BWG (1420 g/d) and Final BW (489 kg) were reached by supplementing 10 ppm of B-TRAXIM® 2C.

Over the 148-day study, plasma Cu levels from Control decreased rapidly (graph 1). The supplementation of 5 ppm Cu permitted to stabilize the final levels at 0.75 mg/l, and 10 ppm Cu between 0.84 and 0.96 mg/l, whereas B-TRAXIM® 2C was more efficient (+14.3%, p=0.15) compared with $CuSO_4$..

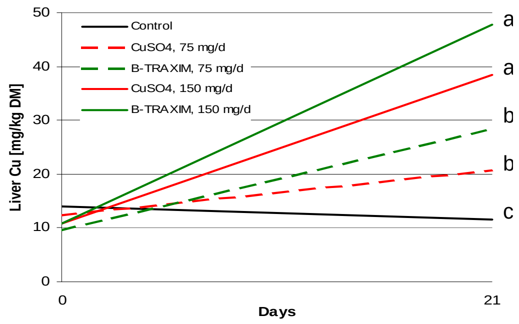
Graph 1: Plasma Cu evolution.



Final ceruloplasmin and liver Cu values were also greater (p<0.05) in steers fed supplemental Cu compared with Control. Those final values were, as well, dose-dependent (p<0.05). At supplemental 10 ppm Cu, ceruloplasmin levels were higher with B-TRAXIM® 2C (+30.1%, p=0.05) than with $CuSO_4$.

"Restore status":
Over a period of 21 days, Cu-deficient steers could restore (p<0.01) their Cu status based on plasma Cu, ceruloplasmin and liver Cu. Liver Cu evolutions are presented in graph 2. Final liver Cu status, using 75 mg/d Cu from B-TRAXIM® 2C, were 37% (p>0.05) higher than from $CuSO_4$. Using 150 mg/d Cu, the difference was 24% (p>0.05).

Graph 2: Liver Cu evolution.



Overall copper bioavailability:
The relative bioavailability of B-TRAXIM® 2C to $CuSO_4$ (table 3) is based on multiple linear regression and ranking orders of the different measured parameters (Jongbloed et al., 2002). Individual Cu intake was used.

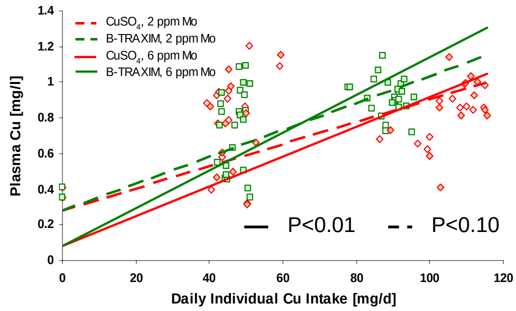
Table 3: Bioavailability of B-TRAXIM® 2C.

Variable	Antagonist	Rel. Bioavailability	P
Plasma Cu	0 ppm Mo	**69**	0.19
	2 ppm Mo	**140**	< 0.10
	6 ppm Mo	**144**	< 0.01
Ceruloplasmin	0 ppm Mo	**49**	0.41
	2 ppm Mo	**131**	0.12
	6 ppm Mo	**150**	0.01
Liver Cu	0 ppm Mo	**108**	0.69
	2 ppm Mo	**141**	0.09
	6 ppm Mo	**156**	0.01
(Based on multiple linear regressions)			
Average	0 ppm Mo	**86**	-
Average	2 ppm Mo	**138**	-
Average	6 ppm Mo	**153**	-
Overall average	0-6 ppm Mo	**125**	**-**

(Based on evaluation by Jongbloed et al. 2002, using regressions as basis)

For liver Cu, plasma Cu and ceruloplasmin, the increase of dietary Mo from 2 to 6 ppm reduced levels and enhanced the difference between sources in favor to B-TRAXIM® 2C. On plasma Cu levels (graph 3) for example, 51.5 mg Cu/d of $CuSO_4$ or 42.6 mg Cu/d of B-TRAXIM® 2C were required in diets with 2 ppm Mo, to reach minimal sub-deficiency Cu status (estimated 0.6 mg/l). This difference represented 1 ppm dietary Cu less for B-TRAXIM® 2C compared to $CuSO_4$. With 6 ppm Mo in the diet, this difference was increased to 1.5 ppm dietary Cu.

Graph 3: Plasma Cu levels with 2 and 6 ppm dietary Mo.



This study finally demonstrates that Pancosma's B-TRAXIM® 2C Cu, is an efficious and highly bioavailable copper source for cattle exposed to diets containing copper antagonists, such as Molybdenum and Sulfur. The higher the dietary content of copper antagonists, the higher the bioavailability or efficacy of B-TRAXIM® 2C compared to copper sulfate.

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