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CLAYTON LIVESTOCK RESEARCH CENTER

PROGRESS REPORT

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Effects of Different Zinc Sources and Levels, With or Without Copper Lysine, on Performance of Newly Weaned Calves[1]

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The functions of copper and zinc are related as both are constituents of several enzymes and are essential for the function of these enzymes in the animal. Previous research has indicated that supplemental trace mineral complexes in the form of zinc methionine (ZnMet) and copper lysine (CuLys) may stimulate feed intake and growth by newly weaned calves during the initial stress period (Spears and Kegley, 1991; Spears et al., 1991; Blezinger et al., 1992; Ward et al., 1992). Our objective was to evaluate the effects of supplemental copper lysine and supplemental zinc source and level on performance and health of newly received steer calves.

Two hundred and eighty-eight mixed breed (British x British and British x Brahman) weanling calves were shipped by semi-tractor trailer from Roswell, NM to the Clayton Livestock Research Center (CLRC). Calves were in transit for approximately 6 h and experienced a 4.9% shrink from a pay weight of 541 lb. The calves arrived on October 12, 1992, and were held in holding pens with access to large, round bales of sorghum sudangrass hay and water until processing the next day. At processing, each calf was weighed, eartagged, branded, vaccinated with Bovishield 4; (Norden Labs) and with a clostridial seven-way vaccine (Beecham Labs), treated for internal (Syanthic; Syntex Animal Health) and external (Tiguvon; Cutter Animal Health) parasites, injected with vitamin A and D (AgriLabs) and implanted with Synovex S (Syntex Animal Health). Calves were assigned randomly to one of eight dietary treatments based on processing order. Treatments were 1) basal - standard 65% concentrate, steam-flaked milo diet (see Progress Report No. 70 for diet) containing 30 mg/kg supplemental Zn (from zinc oxide) and 3.25 mg/kg supplemental Cu (from copper oxide) 2) basal plus 5 mg/kg supplemental Cu in the form of CyLys, 3) basal plus supplemental Zn (70 mg/kg) from $ZnSO_4$ without supplemental Cu, 4) basal plus supplemental Zn (70 mg/kg) from $ZnSO_4$ with 5 mg/kg supplemental Cu from CuLys, 5) basal plus supplemental Zn (35 mg/kg) from ZnMet without supplemental Cu, 6) basal plus supplemental Zn (35 mg/kg) from ZnMet with 5 mg/kg supplemental CuLys, 7) basal plus supplemental Zn (70 mg/kg) from ZnMet without supplemental Cu and 8) basal plus supplemental Zn (70 mg/kg) from ZnMet with 5 mg/kg supplemental CuLys. Calves were moved to feedlot pens (three pens of 12 calves each per treatment) and offered their assigned treatment diets plus small bales of wheat hay. Fresh supplies of baled hay were fed during the lst week of the trial only. Body weights were measured at arrival and on days 14 and 28. Feed bunks were cleaned on days 14 and 28 to determine pen intake. Samples of diets were collected weekly and will be analyzed for dry matter, ash, crude protein, acid detergent fiber, Ca, P, Zn, and Cu. Three calves from each pen (nine per treatment) were selected randomly for collection of jugular blood samples on days 0 and 28. Serum was harvested and will be analyzed for Zn, Cu and alkaline phosphatase activity. Any calves that had symptoms of bovine respiratory disease (BRD) were pulled for evaluation of their rectal temperature. If treatment was required, antibiotic therapy (Naxcel plus penicillin) was initiated on day 1 and calves were bled to obtain a serum sample. Calves were treated for two additional days with Naxcel and bled on the final day of treatment.

The percentage of calves treated for BRD throughout the receiving period did not differ among treatments. One calf in the high ZnMet without supplemental Cu treatment died during the receiving period. Dietary treatment did not affect daily gain (Table 1) during the 28-day receiving period. In previous research with beef cows and calves, and also stressed calves, feeding ZnMet + manganese methionine (Chirase et al., 1991; Spears et al., 1991; Spears and Kegley, 1991) increased weight gain compared with herdmates fed a control diet .

Dry matter intake during days 0 to 14 of the experiment was affected by an interaction ($P < .05$) of Cu with different zinc sources and levels. Calves that received no CuLys with low ZnMet (7.19) and CuLys added to a high ZnMet (7.21) diet ate more ($P < .05$) than basal calves that did not recieve CuLys (6.31) and calves receiving added CuLys and low ZnMet (6.23 lb/day). This response in feed intake was not apparent during days 14 to 28; however, dry matter intake for the entire 28 days showed a similiar effect to days 0 to 14. Kegley and Spears (1992) reported that supplemental inorganic Zn in the sulfate or oxide form increased ADG and daily dry matter intake by lambs, whereas ZnMet addition had no affect on performance.

Feed-to-gain ratio was not affected by treatments during any period of the experiment, but calves fed the low ZnMet with no added CuLys or high ZnMet plus CuLys throughout the 28-day period tended to be more efficient than calves fed the other diets.

This research indicates that supplemental Zn in the methionine form tended to increase steer gain, intake and overall performance, but effects depended on copper level. These results also suggest that, given the level of Zn and Cu in the basal diet, there was no reduction in morbidity

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from BRD with either supplemental Zn source or CuLys. Further research is being conducted to investigate the effect of these Zn sources and levels on performance and carcass characteristics.

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Table 1. Effects of different zinc sources and levels, with or without copper lysine, on performance of newly weaned calves during a 28-day receiving period

	Treatments[a]								
	Basal		Low Zn Met		High Zn SO_4		High Zn Met		
Item	-Cu	+Cu	-Cu	+Cu	-Cu	+Cu	-Cu	+Cu	SE
No of steers (pens)[b]	36 (3)	36 (3)	36 (3)	36 (3)	36 (3)	36 (3)	35 (3)	36 (3)	-
Initial BW, lb	529.9	538.4	550.7	510.9	533.6	557.4	531.8	567.4	13.8
28-d BW, lb	594.5	601.8	622.7	566.4	594.8	608.4	597.7	637.5	16.5
Daily gain, lb									
Days 0 to 14	1.57	1.90	1.73	1.52	1.49	1.26	1.41	1.85	.39
Days 14 to 28	3.05	2.63	3.41	2.44	2.88	2.38	3.11	3.16	.50
Days 0 to 28	2.31	2.26	2.57	1.98	2.18	1.82	2.26	2.50	.27
Daily DMI, lb/steer									
Days 0 to 14									
Concentrate	6.31[c]	6.95[cd]	7.19[d]	6.23[c]	6.66[cd]	6.97[cd]	6.49[cd]	7.21[d]	.29
Hay	1.11	1.04	1.19	1.25	1.30	1.32	1.12	1.24	.14
Days 14 to 28	12.23	12.84	13.77	11.62	13.44	13.04	13.13	13.43	.62
Days 0 to 28	9.82[c]	10.41[cd]	11.08[d]	9.55[c]	10.70[cd]	10.67[cd]	10.37[cd]	10.94[cd]	.43
Feed-to-gain ratio									
Days 0 to 14	4.89	4.83	5.48	5.73	6.84	7.82	6.51	4.75	1.61
Days 14 to 28	4.18	5.14	4.09	5.29	5.50	6.16	4.26	4.41	.96
Days 0 to 28	4.38	4.63	4.31	5.44	5.09	6.27	4.60	4.39	.72
No. of morbid steers	6	1	0	5	4	3	3	3	-

[a]Basal supplied 30 and 3.25 ppm added Zn and Cu, respectively; Low Zn Met = Basal + 35 ppm Zn from Zn methionine; High Zn SO_4 = Basal + 70 ppm Zn from $ZnSO_4$; High Zn Met = Basal + 70 ppm Zn from Zn methionine; -Cu = no Cu added; + Cu = 5 ppm added Cu from Cu lysine.
[b]One steer died in the High Zn Met, -Cu treatment group.
[cd]Means in the same row with different superscripts differ ($P < .05$)

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