"Weight Responses to Copper Therapy in Cattle"

By L. E. DONALDSON*

Copper deficiency in cattle has been reported in Queensland by Harvey (1952), Sutherland (1952), Chester, Marriott, and Harvey (1957), Alexander and Harvey (1957). However, significant increases in growth rate have not been recorded following copper therapy in cattle affected with copper deficiency.

Copper deficiency was suspected in beef cattle on a property south of Townsville, because of poor growth rate of animals in the age group nine months to two years. In June, 1958, and November, 1958, liver samples were collected by biopsy for copper analysis from five animals. Results were:—

	June, 1958	November, 1958
Average	13 p.p.m.	13 p.p.m.
Range ..	7-23 p.p.m.	2-42 p.p.m.

These results were regarded as indicative of an inadequate copper status and an investigation to evaluate responses to copper therapy was initiated.

Ninety cattle, nine to thirteen months of age, were divided at random into four groups with comparable ratios of males and females. Two groups remained as untreated controls. Animals of the third group received 400 mgm. copper glycinate (120 mgm. copper) by intramuscular injection into the semi-tendinosis muscle. Animals of the fourth group were treated with 20 c.cs. of 2.5% solution of copper sulphate (125 mgm. copper) by intramuscular injection.

The animals received the above treatments on the 3rd November, 1958, the 5th January, 1959, and the 8th April, 1959, and all were weighed on the same dates.

At the commencement of the trial dry conditions prevailed, no rainfall having been recorded for approximately five months. Good rains fell on the 16th December and subsequent dates and from that period until the conclusion of the trial, green feed was abundant.

The data on liveweight performance of the animals are presented in Table I and II:—

TABLE I

Weight Gains — 3/11/58 to 5/1/59

Group	sex	No. of Animals	Mean Initial Weight (lbs.)	Mean Gain (lbs.)	Treatment Means (lbs.)
Control 1	Steers	10	361	15	
	Heifers	7	362	23	18 ± 5
Control 2	Steers	10	385	18	
	Heifers	9	375	29	24 ± 5
Glycinate	Steers	10	376	44	
	Heifers	9	377	49	46 ± 5
Sulphate	Steers	8	397	30	
	Heifers	9	392	36	35 ± 5

* Department of Agriculture and Stock, Townsville, Queensland.

* Adjusted for differences in initial weights, regression co-efficient -0.08 lb. per lb.
** Sulphate > Control 1 at 5% level of probability.
*** Glycinate > both controls at 1 % level of probability.

TABLE II

Weight Gains — 3/11/58 to 8/4/59

Group	Sex	No. of Animals	Mean Initial Weight (lbs.)	Mean Gain (lbs.)	Treatment Means (lbs.)
Control 1	Steers	8	355	174	
	Heifers	4	347	159	166 ± 9
Control 2	Steers	8	396	168	
	Heifers	6	374	172	171 ± 9
Glycinate	Steers	10	376	197	
	Heifers	8	380	198	198 ± 8
Sulphate	Steers	7	387	180	
	Heifers	7	397	168	176 ± 9

There are no significant differences among treatments.
* Adjusted for differences in initial weights, regression co-efficient -0.10 lb. per lb.

The results indicate that a response to copper therapy was obtained during the period when dry conditions prevailed. At this time grazing was concentrated on drying swamps in which para grass (Brachiaria mutica) and salt water couch (Sporobolus virginicus) were the main pasture constituents. After rains in December cattle grazed on sandy ridges where rat-tail grass (Sporobolus poiretii), couch grass (Cynodon dactylon), crowsfoot (Eleusine indica), and Townsville lucerne (Stylosanthes sundaica) were the major species.

At the commencement of the trial cattle had been grazing for some months on the drying swamps. It is assumed that bodily reserves of copper had been depleted by this stage and that the weight response resulted from restoration of adequate copper levels by therapy. Failure to obtain a response during the period when adequate green feed was available suggests that animals could select a diet with adequate levels of available copper from the greater range of pasture species on the sandy ridges.

Following this pilot trial a more intensive investigation is now in progress to evaluate effects of therapy with copper and/or cobalt over a complete twelve month period.

ACKNOWLEDGEMENTS

The author acknowledges the assistance of Dr. J. M. Harvey for chemical analysis and of Mr. A. W. Beattie for statistical analysis of the data.

REFERENCES

Harvey, J. M. (1952)—Aust. Vet. J. 28 : 209-15.

Sutherland, D. N. (1952)—Aust. Vet. J. 28 : 204-8.

Chester, R. D., Marriott, S. M., and Harvey, J. M. (1957)—Qd. J. Agric. Sci. 14: 1-22.

Alexander, G. I., and Harvey, J. M. (1957)—Qd. J. Agric. Sci. 14: 23-8.

DISCUSSION

Dr. E. A. Campbell (Qld.) asked the level of copper in the pasture and soil.

Answer.-The paragrass had a low copper status, 5.5 p.p.m.

R. J. Moir (W.A.) asked if the sulphate situation had been studied in the pastures.

Answer.—No.

Dr. J. Harvey (Qld.) had checked copper, sulphate, and molybdenum levels. The sulphate level was greater than 0.2 gms. % and ranged up to 0.3 or 0.4 gms % in Queensland. It would appear that the data reported are the result of a Mo.-induced copper deficiency.

G. Osborne (Qld.) asked which injection route was considered preferable.

Answer.—Subcutaneous was preferred. Intramuscular injections with copper sulphate may cause carcase damage though copper glycinate may be better. Intravenous injections were too slow for commercial conditions.

Professor N. T. M. **Yeates** (N.E.) asked for information on the clinical symptoms of copper deficiency in the field.

Answer.-There is insufficient information on this subject. There is a bleaching and harshness of the coat in areas known to be deficient in copper, but this is not necessarily critical or diagnostic. Scouring certainly occurs when the condition is advanced and the animal is close to death. In other cases it may not occur in animals with only 5 p.p.m. copper in the liver. There does not appear to be an effect on reproduction.

H. J. Lee (S.A.) agreed that copper deficiency was in need of redefinition. Diagnosis in Queensland had been based on copper levels in liver and blood but these conventional criteria have not been accompanied by signs, of deficiency, nor have animals responded to copper therapy. This seems to be the first case of a response to copper therapy in Queensland. The situation in southern Australia with sheep is similar.