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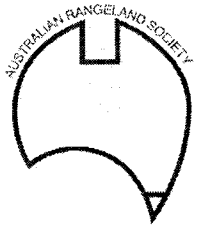

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COPPER CONCENTRATION IN LIVERS OF RANGE CATTLE FROM WESTERN NEW SOUTH WALES

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ABSTRACT

Livers from 228 cattle from western New South Wales were sampled and copper concentrations determined by atomic absorption spectroscopy. Information collected on each beast included its origin, herbage on offer preslaughter and its slaughter data.

Statistical analyses using a tree-based classification model generated six classes. Within each class individual animals had similar copper levels of about 40, 60, 67, 100, 100 and 164 p.p.m. DM. From the description of each class it was concluded that relatively high copper levels were associated with cattle having access to ample dry forage, nil scrub and with carcass weights <246 kg. Other measured variables were not significant. It was concluded that the copper levels of these cattle were higher than those published for non range cattle and the importance of this needs to be investigated.

INTRODUCTION

Some of the symptoms of phosphorus deficiency, such as coat appearance and bone fractures, may be confused with those of copper deficiency in cattle. Because of this, when we conducted an investigation on phosphorus in range cattle in 1978-80, we included a survey of liver copper levels so that we could isolate any deficiency problems. This paper presents the results of that survey.

A national survey of liver copper by Langlands *et al.* (1987) produced estimated median values for Victoria and Western Australia of 40 and 80 p.p.m. DM respectively and a survey of South Australia (Koh 1990, Koh *et al.* 1992) median values of 1.06m mol/kg DM (68 p.p.m. DM). Published indicative levels of a copper deficiency problem range from 7-31 p.p.m. DM.

METHODS

The study area consisted of semi-arid range in New South Wales west of a line generally following the 500 mm rainfall isohyet. Soil/vegetation types represented - hard red, soft red, river plain - have been described by Anon. (1969). Rainfall is non seasonal. Individually identified cattle from this area were sampled at Bourke abattoir where the caudate lobe of each liver was chilled, transported to the laboratory, acid digested and assayed for copper by atomic absorption spectroscopy. The results are expressed on a DM basis.

Data collected on each beast included sex, age, body condition score, breed, carcass weight and its preslaughter environment. This included location (soil/vegetation) and estimates of green forage (ample, limited, fair), dry forage (ample, limited, fair) and scrub (dense, limited, nil). The data were analysed using a tree-based classification model (Chambers and Hastie 1992) which generated six classes of beast. The data were log transformed so that variances of each classification were approximately equal and the results are presented as the retransformed means with their 95% confidence limits.

RESULTS

Mean copper levels between classes ranged from 40-164 p.p.m. DM (Table 1). Class 2 was similar to class 3 and class 4 similar to class 5. The difference between classes 1 and 2 was significant at the 8% level and all other differences were significant at the 1% level.

Sex, age, body condition score, location and current green herbage did not significantly affect copper levels in these cattle. Dry forage, scrub and carcass weight did significantly affect copper levels and they are presented in Table 1.

Table 1. Mean liver copper concentrations (and confidence limits) in six classes of cattle.

	Class					
	1	2	3	4	5	6
Liver copper (p.p.m. DM)	40	60	67	100	100	164
Confidence limits	30,57	40,83	59,81	90,110	84,120	134,209
No. of samples	14	12	50	123	19	10
Scrub	dense/light	light/nil	light/nil	dense/light	light	nil
Dry forage	limited	ample	fair	balanced	ample	ample
Carcass weight (kg)	<246*	>246	<246*	<246*	<246	<246

* mostly < 246 kg.

DISCUSSION

Liver copper levels are a measure of copper storage and reflect plasma copper levels within the normal range. However, our values are higher than published data from other areas and higher than those for cattle on temperate pastures whose livers were assayed at the same time. Elevated levels of copper can come about through: (1) high copper in plant tissue (2) soil ingestion (3) low molybdenum (4) chemicals and (5) weeds, like *Senecio* and *Heleotropium* spp., containing hepatotoxic alkaloids (Grace 1983).

From the tree analysis and Table 1 it appears that high copper is associated with a recent good season with perhaps flowering/senescence (as indicated by ample dry forage), negligible scrub and carcass weights <246 kg. These are dietary factors but provide insufficient information to reach a conclusion. Further investigations are needed to determine the importance of these relatively high liver copper levels.

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