COPPER SUPPLEMENTATION OF DEER: TRIAL WORK

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INTRODUCTION

In 1985 our practice examined fawns on a property (2-5mth age range) snowing bowed limbs which on radiograph revealed severe disruption of the growth plates. Although enzootic ataxia has never been identified on this property we suspected Copper being involved. Realising the paucity of information regarding Copper in deer highlighted by Familton et al 1985 and Mackintosh et al 1986 stimulated us into some investigagion. Initially we aimed to establish the most satisfactory means of supplementing Copper in deer, but extended this to a weight gain trial and finally on a property where the Copper status was marginal a trial supplementing hinds prefawning to determine if this affected liver Copper reserves in neonates.

MATERIALS AND METHOD

(1) Cu Supplement

Two properties (A & B) were chosen and due to economic considerations weaner stags were chosen as subjects.

Property A runs Wapiti-type animals and winters 215 breeding hinds, 8 breeding stags, 70 velvet stags, 170 fawns. Fawns are weaned pre-rut and in June are housed where they feed on silage and grain.

Property B runs Red deer only and winters 320 hinds, 20 breeding stags, 120 venison stags and 220 fawns. Fawns are grass fed all year round.

Herbage/feed analysis for Cu, Mo, and S was undertaken on both properties.

On each property three trial groups each containing 6 animals were designated. In each case a control group and a group given Cupric oxide wire*, a Cu chelate** group on one property and Calcium Copper edetate*** group on the other property.

Liver Cu levels were analysed before the administration of any supplement and then at periodic intervals. As it was considered liver Cu levels were a more accurate indicator of Cu status no serum Cu levels were taken. Liver samples were obtained by biopsy techniques described by Familton (1985). Analysis of liver samples was done by using a Perkin Elmer 4000 Atomic Absorptiometer after digestion in nitric and perchloric acid.

All liver Cu units are expressed on a WMB.

(11) Weight Gain Trial

108 weaner stags were run together as one mob. 55 of these were treated with one 4gm Cu needle in April and the entire mob was weighed in April August and November. The remaining 53 stags formed the untreated control group.

* Cu needles NZ Veterinary Supplies
** Formula Five Phoenix Pharm Distributors Ltd Auckland
*** Coprin Injection Glaxo

MATERIALS AND METHODS (Cont)

(iii) Neonatal Liver Cu Trial

On Property A 45 days before fawning started approximately half the hinds were given two 4gm needles. Livers from fawns that were born dead or died within 16 days were collected and sent for liver Cu analysis.

RESULTS AND DISCUSSION

(1) Cu Supplement

TABLE 1 - FEED ANALYSIS

		Pasture A			Pasture B		
		Cu (mg/kg)	Mo (mg/kg)	S (%)	Cu (mg/kg)	Mo (mg/kg)	S (%)
February	Pasture	5	0.32	0.23			
April	Pasture	5	0.95	0.30	9	0.21	0.41
June	Silage	6	0.38	0.20			
	Grain	4	0.17	0.17			
August					6	0.20	0.34

On Property A the Cu levels are generally low and availability would be further reduced in the April period when the Mo level is three times that considered normal for mixed herbage. The silage and grain is grown on the property and analysis shows that when these are fed to housed stock the deficiency state would be expected to persist. Property B revealed pasture of adequate Cu status however the trend toward lower seasonal levels in late Winter-Spring is evident.

TABLE 2
AVERAGE LIVER Cu VALUES ON PROPERTY A (UMOL/KG)

	April	June	September
Control (n=6)	12.9	55.7	112.2
Cu chelate* (n=6)		73.6	133.6
Cu needles ** (n=6)		141.2	509.2

* 30mg of Cu administered on 4/3 and again on 25/7

** One 4gm Cu needle administered on 4/3 and then two Cu needles on 25/7 - Due to problems with analysis the original biopsy results (4/3) are not available. Levels of<100 umol/kg are considered to constitute deficiency (Mackintosh et al 1986).

Note the rising level of liver Cu in the control group despite being on a deficient diet. This is contrary to the normal trend of a high birth Cu which declines with age. (Reid et al 1980).

RESULTS AND DISCUSSION (Cont)

The Cu chelate group shows insignificant difference to the control group. Cu needles appear to give a good Cu liver reserve. It should be noted that while the average was 141.2 umol/kg in the treated group (some 3 months after one 4gm Cu needle had been administered) 4 of the 5 stags had levels < 100 i.e. one very high value obscured this average. However 2 months after two 4gm Cu needles had been administered all 5 animals sampled had values > 100 and averaged 509.2 umol/kg. When sampling was undertaken in June subjective assesment indicated a readily visible difference between groups on the basis of palour of coat colour and general condition. The Cu needle group being noticeably better than the other two.

One of the stags in the trial died. This occured some 50 days after it was last biopsied and was unrelated to the procedeure. An autopsy was performed and the only gross abnormality was a very small area of fibrosis in the intercostal region. No adhesions were present in the abdomen or evidence of the previous 3 occassions it had been biopsied. Further to this approximately half the stags in the trial have now been through DSP's and no downgrading from carcass damage has been evident.

TABLE 3
AVERAGE LIVER Cu VALUES ON PROPERTY B (UMOL/KG)

	April	August
Control (n=6)	572	363
Coprin inj* (n=6)		582
Cu Needles ** (n=6)		576

* 1ml (60mg available Copper) injected on 22/4
** 1 4gm Copper needle administered on 22/4

On this property pasture levels were deemed to be adequate. In the control group it is evident the declining Cu liver level with age. This also coincides with a normal seasonal trend for a decline in pasture Cu. Based on the control and pretreatment levels on this property the Cu status of the deer would have to be considered adequate. Treatment was initiated prior to herbage and biopsy results being available.

Of interest to note is that both forms of supplementation yielded liver Cu levels significently higher (approx 200 umol/kg) than the control group some 4 months after administration of Cu.

RESULTS AND DISCUSSION (Cont)

Based on factors on this property one would expect the liver reserve following administration of 1 4gm Cu needle to be maintained approx twice as long as a 1 ml Coprin injection. Where pre-existing levels on the property were adequate then this becomes somewhat academic.

(ii) Weight gain trial - This was carried out on Property B

TABLE 4 - WEIGHT GAIN /KG

	March (weaning wgt)	August	November	Weight Gain
Control n=53	51.6	74.2	98.4	46.8
Treated* n=55	50.2	72.4	96.9	47.6

* The treated group had 1 x 4gm Cu needle in mid April.

Obviously in this situation despite having a higher liver Cu reserve in the treated group (see Table 3) there is no weight gain response in this trial. This is not unexpected in light of pre-existing adequate Cu status on this property.

(iii) Neonatal Liver Cu

On account of the alarmingly low liver Cu reserves found on Property A in fawns at 4-5 mths of age we decided to investigate if supplementing the hinds prefawning would have an effect on the neonatal liver Cu reserve.

TABLE 5 - NEONATAL LIVER Cu UMOL/KG

	range	average
Control n=16	760 - 9378	3674
Treated group n=6	1218 - 6667	3127

Although statistical analysis has not been done I doubt this represents a significant difference.

These results compare with those of Reid et al 1980 who report neonatal liver Cu of 5589 umol/kg WMB. However their figure is based on farmed red deer not Wapiti type as I have on this property.

On this property we see a dramatic drop in liver Cu from around 3524 umol/kg to 13 umol/kg in approx 4½ months. (135 days). From Table 1, the amount of Cu availability from pasture on the property is very low and further their pasture intake preweaning will be low. The lactating hind must be the only other source of Cu to the fawn at this stage. Unfortunately I did not have milk analysed for Cu content to ascertain whether the treatment of hinds with Cu needles would aid this source of Cu for the

RESULTS AND DISCUSSION (Cont)

the fawn. It has been shown to elevate the Cu concentration on milk in lactated ewes. (Whitelaw et al 1983)

SUMMARY

Copper needles would appear to be the optimum means to supplement Cu in deer. Since our present state of knowledge does not give us the Cu requirement for various ages of deer, supplementation requires some form of monitoring to guage when available dietary Cu represents a shortfall on an individual property.

Even in a situation of Cu deficiency it would appear that deer are born with an exceptionally high Cu reserve and this is not affected by supplementation of hinds prefawning.

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