

Case report: Copper response trial in weaner deer

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Background

There is widespread belief within the deer farming sector and among New Zealand veterinarians that copper is a highly important trace element essential for optimal growth rates and “good health” in New Zealand farmed deer herds. Copper deficiency is a common diagnosis and copper supplementation, mainly using copper capsules is now routine on many deer farms (Wilson and Audige, 1998, Beatson *et al*, these proceedings).

Despite the widespread diagnosis of copper deficiency, very few trials have been reported which show a consistent growth rate or clinical response to supplemented copper. No velvet antler growth response has been shown after copper supplementation (Walker *et al* 1997). Further complicating the issue is that a reasonable percentage of the national herd has serum copper levels which would, especially by cattle standards, be considered deficient. The exact transition level when deficient becomes depleted, for deer, remains a point of considerable debate, but little substantiated data exists (Wilson and Grace, these proceedings).

There is a growing number of veterinarians who now consider that deer function adequately at copper levels much lower than previously believed acceptable (Walker *et al*, 1997). This paper presents observations of copper deficiency in adult hinds, and a subsequent growth-response trial in rising 1-year-old deer on that property.

Herd history

In early September 1999, I investigated a case of inco-ordinated gait in a mixed-age, red deer hind on a South Waikato deer farm. The animal displayed typical, advanced, hind-quarter inco-ordination consistent with enzootic ataxia. The condition had progressed to the point where the animal fell over when attempting to turn quickly. Further questioning revealed another animal from the same mob which had frequently lost its balance on steep slopes and had been culled. All deer in the mob, even the clinical case, were in excellent condition despite that winter was just ending. No copper supplementation had been used in recent years but sporadic individual cases of enzootic ataxia had been seen several years earlier. Samples were collected for copper analysis.

Results

Serum samples were collected from the cohorts of the clinically affected hind

Table 1. Serum copper concentrations in adult hinds in September

Hind	Serum copper (umol/l)
1	<2
2	<2
3	<2
4	<2
5	<2
6	2 – 3
7	<2
8	<2
Ref Range	8 – 22

There was no detectable serum copper at the level of sensitivity of the lab test

Subsequently, The 9-month-old mixed sex weaner mob were yarded and checked. A further, less advanced case of enzootic ataxia was detected and more random serum samples collected. Results are shown in Table 1.

Table 2 Serum copper concentrations in 9-month-old mixed sex deer

Deer No.	Serum Copper $\mu\text{mol/l}$
1	<2
2	3.5
3	8.2
4	5.0
6	3.8
6	3.1
7	3.8
Mean	4.6
Ref Range	11.0 – 19.0

Once again very low serum copper levels.

Diagnosis - Copper deficiency, based on biochemical measures.

The weaner mob were in excellent condition with the first 30 of approximately 120 reaching slaughter weight targets at the time of examination (September 11th).

Growth rate trial

A trial was started mid-September using the weaners not yet suitable for slaughter. Eighty-eight mixed-sex weaners were randomly allocated to two groups, matched for sex and body weight. One group was treated with 1 x 12gm copper capsule (Bayer) while the other group remained in contact and untreated, as detailed in Table 3.

Table 3. Average liveweights (kg) of rising 1-year-old deer in copper supplemented and control deer at the start and end of the trial

Date	Control	Treated
15/9 (Start)	67.25 (n = 44)	66.75 (44)
12/11 (End)	82.2 (n = 40)	81.77 (n = 44)
Weight Gain (kg/hd)	14.95	15.0
Growth/D (g)	257.7	258.6

Observations included

- 11 Animals from the control group reached target slaughter weight during the trial versus 9 from the treated
- 1 leg fracture occurred in the treated group
- Weight gains in the period prior to trial commencement + 157 g/d

Discussion

No weight gain response was detected following the supplementation of Copper Capsules to 10 month weaner deer despite there being low serum copper levels (4.6 $\mu\text{mol/L}$ av) and clinical cases of enzootic ataxia both in cohorts and other age groups on the farm. These data are consistent with observations of Wilson (1989) who showed no growth response when mean serum copper levels were similar to those reported here. Data of Ellison (1995) suggest that mean serum copper concentrations need to be significantly lower than 4.6 $\mu\text{mol/L}$, before a growth response can be expected. Killorn and Wilson (1991) showed a small but significant growth response in winter when mean copper was 3-3.4

µmol/L, but no response to supplementation was seen in spring. All groups in the current study were well fed, and managed with no concurrent disease issues. A very high conception rate was achieved in the hind groups despite no detectable serum copper, and the occurrence of clinical enzootic ataxia.

This case raises many questions

1. Do low copper levels restrict growth in young deer?
2. If so, how low do biochemical parameters have to get before weight gain is impaired?
3. How do we, as vets, justify a reasonable return on investment to our clients treating depleted/deficient copper levels?
4. Are we primarily in the business of "selling insurance", by prescribing copper on the basis of biochemical measurements only?

This case confirmed the belief of the client that copper supplementation was not necessary in his growing deer and further confused his professional advisor. The client was an ex-bank manager with a very firm eye on expenditure and he pointed out with pleasure that the only return he got from his last attempt at copper supplementation was a severe beating from a less than grateful hybrid hind. He proposed that if the suggested expenditure on copper was spent alternatively on nitrogen and fertilizer, the fiscal benefits appeared more certain! Anything with a slight "wobble" was destined for the slaughterhouse or the Xmas barbeque.

Additional Points

- The summer of 1999 in the Waikato was hot and very dry. All the usual baleage supplement was fed in late summer during the drought, resulting in extensive use of whole grain maize during winter. Copper levels in maize are considerably lower than normal pasture and this may have pushed a marginal status into a deficient status where enzootic ataxia can occur.
- A neighbouring property also had occasional cases of "sway-back" but weaner growth rates were exceptional without copper supplementation.
- In many previously recorded trials and case reports where Cu was considered an important factor the deer body weights reported were very low. This points to complicated management issues covering feed quality and quantity, fawning dates etc, and this greatly complicates trace element issues where simple cause and effect relationships become very blurred. In the case presented, no such issues existed.

References

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