

Northland Pastoral Extension: Popular Summary

Animal Health - Mineral Responses in Northland



Summary of Key Findings

- Trace element research has a long history in Northland.
- MAF Agricultural Research Division ran almost 200 trials.
- Despite trial sites having low soil, plant or blood levels of some trace elements, there have been remarkably few trace element responses to supplementation.
- Copper supplementation is proven to reduce the incidence of post parturient haemoglobinuria (PPH or redwater), a condition seen in dairy cows shortly after calving.
- Trace element deficiencies are unlikely to be limiting livestock performance on Northland farms

Copper and dairy cows

In a large survey of pasture, liver and blood levels of copper in more than 300 North Island herds, Northland cows were found to have the lowest blood copper levels. Those cows which had been supplemented (between 2 – 6 g/head/day of copper sulphate for at least 2 months before collection) showed higher blood copper levels than those not supplemented. The work showed that pasture analysis has limited use for diagnosing deficiencies. Oral supplementation of copper sulphate will raise blood levels and maintain them within the normal range.



Serum copper levels

Area	Period	As Received		Supplemented	
		Herds	Serum Copper (µmol/l)	Herds	Serum Copper (µmol/l)
Waikato	1986-1989	109	9.3±1.6	105	11.7±1.6
Taranaki	1987-1989	49	9.9±1.2	33	11.5±1.6
Northland	1988-1989	31	7.3±2.5	-	-

Post-parturient haemoglobinuria (PPH)

PPH is characterised by anaemia, poor milk production and haemoglobinuria (blood in the urine) after calving. A trial showed supplementation with copper injections reduced incidence of PPH and helped reduce the fall in haemoglobin. Copper fertiliser has also proved to be an effective method of reducing the incidence of PPH. The project involved farmers with a history of PPH giving half their herds copper injections (400mg copper glycinate – 120mg active copper) before calving and leaving the remainder untreated. The incidence of PPH-affected animals fell from 28.5% to 5.2% with the copper injections. Difficulties associated with copper injections prompted the use of copper sulphate or copper oxide as fertilisers to deliver 1.3kg/ha copper.

Effect of copper topdressing on the incidence of PPH

Farm	Cows	Copper Type ¹	Incidence of PPH				Production Increase ²
			1969	1970	1971	1972	
A	86	CuSO ₄	2	60	3	2	45%
B	105	CuSO ₄	16	25	29	0	10%
C	170	CuSO ₄	10	6	26	0	30%
D	190	CuSO ₄	50	30	35	4	25%
E	125	CuO	20	25	14	0	NA
F	130	CuO	6	25	11	0	NA
G	135	CuO	5	40	8	0	50%
H	126	CuSO ₄	24	15	0	0	20%
I	130	CuSO ₄	25	30	10	0	NA
Total	1196		158	256	136	6	

¹ CuSO₄ = Copper Sulphate, CuO = Copper Oxide

² Production increase per farm over the months of Jul – Sept -adjusted for seasonal factors

- An extension of the project showed that an injection of copper (240mg of available copper as copper glycinate) within 48 hours of calving:
 - Reduces the incidence of PPH
 - Maintains higher haemoglobin levels
 - Increases blood copper levels



Phosphorus supplementation

Phosphorus deficiency has only been recorded once in dairy cows in New Zealand. A survey of 200 cows across ten farms in Northland showed average serum Pi (inorganic phosphate) to be 1.3 mmol/l at peak lactation. The suggested normal range is 1.3 – 2.8 mmol/l. Animals with a level below 1.1 mmol/l may show clinical signs of P deficiency and may respond to phosphate supplementation. Given the low blood phosphate levels, a milk production response was considered possible. On a farm near Okaihau, 48 cows were divided into two groups and one group given 25g phosphate/head/day as sodium tripolyphosphate (TPP) and the control group

received sodium chloride. After four weeks the blood response to TPP was small, so the control group were given dicalcium phosphate to compare phosphate availability. Serum phosphate, bodyweight, condition score and milk production were monitored through the trial.

Results

- Liveweight did not vary between groups during the trial.
- Condition score showed a small, but significant ($P < 0.05$) difference during the first and fourth period – Condition score in the cows receiving phosphate averaged 4.7, compared with 4.4 in the salt treated cows
- Additional dietary calcium appeared to have no effect on availability of phosphate.
- Serum Pi levels were increased by supplementation
- Despite the increase in serum Pi, there was no significant difference in milk production (milk, milk-fat or milk-protein) during the trial.
- The conclusion was that phosphate nutrition for most NZ dairy cattle should be adequate.

Copper supplementation:

Beef cattle

One trial on a volcanic soil near Kaikohe examined the live weight response to copper supplementation (by injection) in weaner Angus steers over 11 months. The results indicated a decrease in growth rate with supplementation. Blood copper levels were adequate.

Sheep

One trial involved 14 farms on two soil types (a heavy clay and a sand). Blood copper concentrations were all adequate. Copper supplementation had no effect on liveweight gain or blood copper concentrations.



Dairy cattle

A trial on two farms on sandy peat soils showed no response in milk production, condition score or reproductive performance to copper supplementation.

Cobalt supplementation:

Beef cattle

On three east coast properties and eight west coast properties, B12 in the blood was found to vary between sampling time and site. Only on one occasion did the concentration fall below adequate. No significant effect of supplementation was observed on blood B12 levels or live weight.

Sheep

Similar results were found with sheep on 14 sites - eight on clay and six sandy soils. Only two sites had low serum B12 levels. Small positive liveweight gains occurred following supplementation on these two sites and one other site. On nine sites liveweight gains were slightly lower after supplementation.

Selenium supplementation

Beef cattle

A trial run on three farms situated on clay soils indicated no response to liveweight gains following selenium supplementation in the first year. A second trial on eight sandy soils on the West Coast indicated a small but statistically significant response. On one property (Farm 5) the response was greater than on the other farms.

Effect of selenium supplementation on growth of beef cattle

Farm	Period	Liveweight gain (kg/head)		Blood Test*
		No Selenium	Selenium	
1	April - Mar	106.5	116.2	7.2
2	April - Mar	131.4	127.6	31.9
3	April - Mar	118.3	121.4	28.8
4	April - Mar	73.8	74.3	21.1
5	April - Mar	126.9	151.5	10.0
6	April - Mar	102.1	106.4	19.3
7	April - Mar	111.3	111.1	9.0
8	April - Mar	94.1	98	9.0
		108.3	111.3	

* *Glutathione peroxidase activity (i.u./litre) collected in April before the trial as an indicator of selenium status*

Sheep

A trial looked at selenium responses on eight farms on clay soils and six on sandy soils. There was no evidence of a selenium response. Selenium supplementation increased blood glutathione activity on most farms.

Effect of selenium supplementation on liveweight gain of sheep (Dec-Jun).

Soil Type	Farms	Liveweight gain (kg/head)		Blood Glutathione (i.u./l)	
		+ Se	No Se	+ Se	No Se
Clay	8	5.67	5.38	13.7	7.9
Sand	6	3.72	3.79	18.5	9.4

Dairy cows

The effect of selenium supplementation on dairy production was tested on two farms on sandy peat soils. There was no effect of selenium on milk production or on reproduction.

Conclusion

- Trace element deficiencies are unlikely to be limiting livestock performance on Northland farms
- Supplementation needs to be discussed with animal health professionals
- Trace elements nutrition is very complex:
 - There is low correlation between dietary copper and blood copper
 - Blood selenium is highly correlated with dietary selenium
 - Blood cobalt levels are influenced as much by grazing pressure as by supplementation
- Cobalt supplementation via injections and topdressing significantly increased serum levels in cattle, but has failed to produce a response.

Compiled by Gareth Baynham, edited by Hugh Stringleman
 A project co-ordinated by the Northland Pastoral Farming Development Group.
 The complete research stocktake on Minerals Responses in Livestock in Northland is on
 the Enterprise Northland website: www.enterprisenorthland.co.nz