Copper deficiency in New Zealand dairy cattle

Copper (Cu) deficiency in cattle is a common and complex problem. Dairy cows are most likely to be deficient in winter/early spring, coinciding with higher demands over this period for pregnancy and early lactation. Fast growing calves over six months of age are also likely to be deficient.

Symptoms of Copper deficiency

In cows
- Weight loss
- Scouring
- Reduced milk yields
- Reproductive problems
- Lightening of coat colour
- Anaemia

In calves
- Poor growth rates
- Scouring
- Bone fractures
- Lightening of coat colour
- Loss of co-ordination in hind limbs

Types of deficiency

Primary
When the pasture diet is deficient. Pasture will contain insufficient copper in early lactation.

Secondary
Primary deficiency of Cu is often made worse by interactions with other elements in the rumen (e.g. Molybdenum, sulphur, Iron) and Zinc in the small intestine.

Factors contributing to deficiency

1. Soil types associated with Cu deficiency include sandy soils, peaty loams and pumices, however this will vary between districts and even paddock to paddock. In general cows that are not being supplemented with Cu will be deficient in early lactation.

2. Elements interfering with Cu absorption: Zinc (Zn), Molybdenum (Mo), Iron (Fe), Sulphur (S)

The following factors may decrease Cu absorption

- Prolonged Zn treatment for Facial Eczema
- Clover contains higher concentrations of Cu than grasses. In winter/early spring clover content in pasture is less than at other times of the year
- Fertiliser additions (Nitrogen and Lime) increase the uptake of Mo by plants
- Winter rationing limits cow intakes making less plant Cu available
- Wet muddy conditions increase the amount of soil (therefore Fe) eaten
- Internal parasites increase the loss of Cu in dung
- Rapid new plant growth has low Cu levels and higher Mo content
- Winter feeding of brassica (e.g. swedes and choumollier), which can have higher levels of S
Monitoring/Prevention

Methods listed in order of effectiveness:

*Liver biopsy (6-10 animals required).*
The liver is the most important storage organ and reflects the long term Cu intake of an animal.
TIMING: Late autumn/winter (not after seven months pregnant).

*Blood samples (10 animals required).*
Blood sampling can be used to monitor the Cu level trends, however does not reflect the Cu stored in the liver.
TIMING: Late autumn/winter.

*Pasture testing.*
Helps to determine the cause of the Cu deficiency (i.e. the Cu, Mo, S, and Fe interactions), however does not indicate the levels inside the animal.
TIMING: Quickly grown grass in late autumn.

*Soil testing.*
Of little value because there is a poor relationship between soil copper levels and plant copper levels.

Treatment

In general, early lactating dairy cows will not be getting sufficient copper from a pasture diet, therefore supplementation is likely to be beneficial.

- Two weeks should elapse after Zn treatment has finished, and animals that have Facial Eczema should not be treated for Cu due to risk of heavy metal poisoning.
- Be aware that Cu poisoning can occur as a result of excess intakes of Cu (drenches, licks and eating pasture recently fertilised with Cu additives).
- If in doubt consult your vet.

Methods are listed in order of effectiveness:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Use if liver Cu level umol/kg</th>
<th>Use if blood Cu level umol/litre</th>
<th>Dosage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullets</td>
<td>&lt; 45 (deficient)</td>
<td>&lt; 4.5 (deficient)</td>
<td>Calves &amp; Yearlings: 10g bullet Cow: 20-30 g bullet if low late autumn. 10-20g bullet if low late winter.</td>
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<td>(8 month release)</td>
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<td>For animals over 150 kg lwt: 200-240 mg Cu every 4-8 months. (e.g. 4 ml Coprin.)</td>
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<tr>
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<td>45 - 95 (marginal)</td>
<td>100-120 mg Cu every 4-8 months. (e.g. 2 ml Coprin.)</td>
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<td>4.5 - 8 (marginal)</td>
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<tr>
<td>Injections</td>
<td>&lt; 45 (deficient)</td>
<td>&lt; 4.5 (deficient)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45 - 95 (marginal)</td>
<td>4.5 - 8 (marginal)</td>
<td></td>
</tr>
<tr>
<td>Drenches (CuSO₄)</td>
<td>45 - 95 (marginal)</td>
<td>4.5 - 8 (marginal)</td>
<td>1-2g CuSO₄/cow/day</td>
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<tr>
<td>Drinking water</td>
<td>45 - 95 (marginal)</td>
<td>4.5 - 8 (marginal)</td>
<td>1-2g CuSO₄/cow/day</td>
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<td>(In-line dispenser)</td>
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<tr>
<td>Fertiliser</td>
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<td>5-10kCuSO₄/ha</td>
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