



FACT SHEET

APRIL 2021

TRACE ELEMENT NUTRITION OF CATTLE

SUMMARY

Trace element deficiencies can be prevented by monitoring the trace element status of any target livestock class and supplementing if necessary. Ongoing monitoring is needed to ensure the effectiveness of the supplementation programme, and to detect any further changes caused by fertilisers, seasons and time.

COPPER

Cattle in New Zealand are commonly deficient in copper. This can cause reduced growth rates, fertility and calf survival.

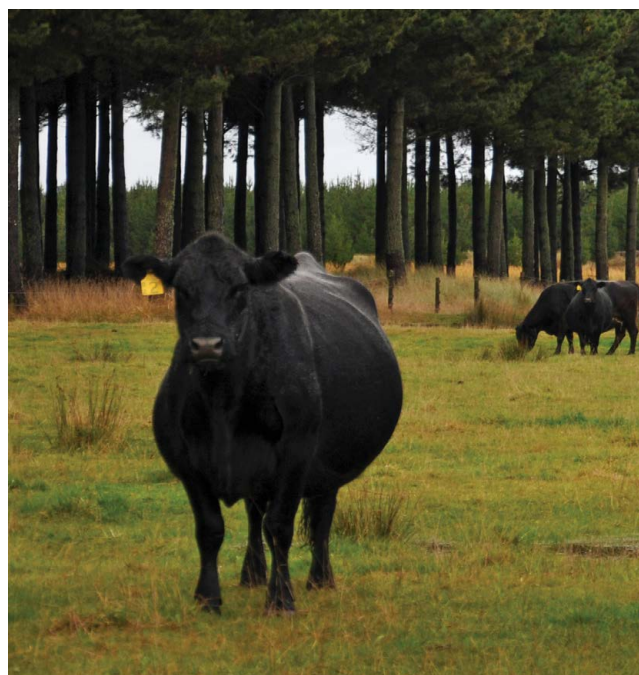
DIAGNOSING COPPER DEFICIENCY

The best way to assess copper status in cattle is to measure copper levels in the liver. This is typically done on liver samples from slaughtered animals, or by live-animal biopsy.

The ideal times to monitor the copper status of various cattle classes are:

- cull cows in the autumn
- pregnant cows in late winter using liver biopsy samples
- culled growing cattle at any time
- rising one-year-old cattle in midwinter using liver biopsy samples

Liver Cu $<45\mu\text{mol/kg}$ fresh weight indicates copper deficiency. Blood can also be tested for Cu levels, but it is a less accurate indicator in that it does not reflect long-term Cu intake. Be aware that changes in hair colour are not a reliable sign of Cu status because other factors can affect the condition of the coat.



TREATMENT AND PREVENTION

Breeding cows need a large amount of copper to support pregnancy and lactation. If cows have adequate storage levels of copper over lactation, their calves will be weaned with high copper stores. Most deficiencies develop over the winter and in the spring. This is largely because the availability of copper in pastures declines over the winter-spring period.

The Cu status of animals must be known before starting a supplementation programme. Care and monitoring are required because intensive and long-term supplementation increases the risk of copper toxicity, and chronic overdosing with Cu can cause deaths. The potential for acute Cu toxicity is greatest in the case of injections.

Drenching is not advised as it provides only brief benefit, but numerous other methods can be implemented to increase the copper levels in cattle:

1. Subcutaneous injection of Cu salts (eg calcium Cu edentate) at a rate of 0.4-1.0 mg/kg live weight is effective for one to two months.
2. Copper can be added to the drinking water supply using an in-line dispenser system (3-6mg Cu/L) to provide as much as 90-180mg Cu/cow/day.

3. Intraruminal boluses containing copper oxide (CuO) particles are effective for six to nine months.
4. Topdressing pasture with copper can increase the Cu content rapidly. Annual application of 6 to 12kg of copper sulphate/ha (1.5-3kg Cu/ha) in the autumn or spring. The effectiveness of topdressed pastures will be less in the presence of high Mo concentrations. Note that treated pastures should not be grazed until rain has washed the concentrated fertiliser off the herbage.

SELENIUM

Selenium deficiency can depress conception rate, lamb and calf survival and growth rate. Selenium status is measured by the level of a selenium-containing enzyme in the blood called glutathione peroxidase (GsPx). This enables predictive calculations of any necessary supplementation. However, if selenium supplementation has already occurred, and follow-up monitoring is being done, then the best monitoring tool is blood selenium level.

DIAGNOSING SELENIUM DEFICIENCY

The most obvious sign of deficiency is white muscle disease, a degeneration of the muscles of the body and the heart. During or following exercise, affected animals become stiff and unable to stand. Calves are affected from one to four months after birth. Depending on the severity of the Se deficiency, ill thrift can reduce liveweight gains of calves by over 40 per cent and decrease milk production in cows by 10 per cent.

MONITORING

Ideally, monitoring selenium status is done:

- just before calving, and
- at any time in growing stock, but at least two months after the administration of any selenised drench or vaccination

If you suspect selenium deficiency, have your vet collect tissue samples, preferably blood. Your vet will compare the test results to published reference ranges to determine Se status. For example, cattle are deficient when the concentration of Se in serum is <85 nmol/L.

The concentration of Se in pasture is also a good indicator of the adequacy of Se intake. Grazing livestock require 0.03mg Se/kg DM.

TREATMENT AND PREVENTION

The type and frequency of supplement is determined by the level of deficiency, time of year, accessibility of stock and ease of administration.

Be certain that livestock are deficient in Se before treating them as excessive intake of Se is toxic and accumulates in the liver and kidneys.

1. Many drenches and vaccines contain Se as sodium selenate or sodium selenite. When these are administered orally or as a subcutaneous injection the dose rate should be 0.1mg Se/kg liveweight. This will produce a rapid increase in blood Se concentration, which gradually declines over six to eight weeks. It is important to note that anthelmintic drenches that have been 'mineralised' through the addition of Se are only partly effective as a long-term strategy to increase the Se status of young animals.
2. Longer lasting supplements are available including injections and intraruminal boluses. A subcutaneous injection containing barium selenate given at a dose rate of 0.5-1mg Se/kg liveweight (500mg for cows) will be effective for 10-12 months. Boluses containing metallic Se and iron are also effective for one year.
3. Selenium can be added to the water supply using an in-line dispenser system to provide 1.5-3mg Se/cow/day.
4. Pastures can be topdressed with Se to prevent deficiency in grazing livestock. Pastures must contain at least 0.03mg Se/kg DM to provide stock with sufficient levels. Pastures can be topdressed with 1kg Se prills/ha (10g Se/ha) in the spring or autumn every one to two years. Note that Se topdressed pastures should not be grazed until rain has washed the fertiliser off the herbage.

COBALT

Cobalt deficiency is unlikely to be a problem in cattle. Deficiencies almost only occur in the summer, and in lambs. Cobalt-deficient diets result in low levels of Vitamin B12, which depresses growth rates. There are perhaps few or no other symptoms.

DIAGNOSING COBALT DEFICIENCY

Cobalt deficiency must be carefully diagnosed because other kinds of health and nutritional problems can also cause poor appetite and poor growth.

MONITORING

If you suspect Co deficiency have your vet take samples - serum or liver - for vitamin B12 determination. Measuring B12 levels in the livers of calves is the best measure of cobalt status. Testing is most effective in late spring so any potential deficiency can be identified and prevented in time.

TREATMENT AND PREVENTION

Cobalt deficiency can be prevented by supplementing animals with either Co or vitamin B12 or topdressing pastures with cobalt.

Vitamin B12 must be given as an injection because oral doses are destroyed by microbes in the rumen. Monthly injections of 2-3 mg of water soluble vitamin B12 will maintain serum B12 concentrations. A long-acting vitamin B12 formulation (where the vitamin B12 is microencapsulated in an organic matrix) is effective for three months in calves. Another effective option is a single injection of 0.12mg/kg liveweight (ie 6mg for a 50kg calf).

Controlled release Co intraruminal boluses made of metal 'bullets' or soluble glass can supply an animal's Co requirements for up to 12 months if they remain in the rumen. The bolus is sometimes lost through regurgitation. Boluses that are retained may become coated with calcium phosphate, preventing efficient cobalt release.

Topdressing pastures is an option to provide grazing stock with sufficient cobalt. Applications of 350g/ha of cobalt sulphate (70g Co/ha) as Co-amended fertiliser will increase cobalt concentration in pasture to approximately 0.5mg/kg DM within four weeks. It will then decline over the following nine to 12 weeks.

ACKNOWLEDGEMENTS AND MORE INFORMATION

More detailed information on cattle trace elements can be found in:

- Managing Mineral Deficiencies in Grazing Livestock, by Neville Grace, Scott Knowles and Andrew Sykes
- Occasional Publication No 15; New Zealand Society of Animal Production
- Profitable Beef Production (2009), Beef + Lamb New Zealand

Contact Beef + Lamb New Zealand for more information: email enquiries@beeflambnz.com or call 0800 BEEFLAMB (0800 233 352)

Website: beeflambnz.com

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