Measuring copper status

There are several methods for measuring the copper status of an animal. Direct measurement of plasma copper is relatively easy and accurate. However, the plasma copper level of an animal changes very quickly and this value can only assess the copper status on that day. Serum caeruloplasmin (a copper containing protein) is also used to assess copper status. The enzyme superoxide dismutase (SOD) and the concentration of plasma copper soluble after precipitation with trichloroacetic acid give an indication of the presence of copper-thiomolybdates. Clinical copper deficiency is due to the presence of unassociated/free thiomolybdates in blood (MoS4) and therefore a total blood copper level may not reflect the animal's clinical condition.

The most recent research work has shown that the ratio of caeruloplasmin activity to plasma copper is likely to identify animals that have a clinical problem and which will respond to copper therapy. The current values for plasma copper levels (micro-moles/1) are:-

	Sheep	Cattle	VIC
Adequate	12 to 23	12 to 23	9.4 to 23
Marginal	8 - 12	8 - 12	-
Deficient	below 8	below 8	below 9.4

Serum caeruloplasmin levels above 15mg/100cm3 are regarded as being adequate in both sheep and cattle.

Our results show that the ratio of caeruloplasmin activity to plasma copper (based on above units) provides a method of identifying cases in which copper supplementation will be of benefit. Animals with ratios of 1.9 or more will not respond to copper, animals with ratios of 1.6 to 1.8 are likely to respond to supplementation and animals with ratios of 1.5 or less will definitely respond to supplementation.

At the University of Leeds we have completed analysis of samples from over 5,000 cattle. Less than 5% of these had blood copper levels less than 9.4 but over 80% had low Caeruloplasmin/plasma copper ratios and respond to copper therapy. It can be assumed that in the majority of these cases you may have suspected copper deficiency and had considered having VIC blood copper level analysis done. However straight forward measurement of total blood or liver copper does not provide a satisfactory answer.

If your clients cows show poor bulling behaviour, anoestrus and/or returning after AI regularly beyond 3 weeks our results indicate that you should suspect that the root cause may be molybdenum and that you should have this analysed. If molybdenum is shown to be of a level which results in the deactivation of copper enzymes the only treatment is to provide supplemental copper.

Only Cosecure provides the most available form of copper to the rumen every few minutes - copper which can deactivate thiomolybdate in the place it is produced. Other boluses and copper needles contain copper oxide which can only dissolve in the acid environment of the abomasum, and by this stage the thiomolybdate has already entered the blood.

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