7 reasons to replace inorganic trace minerals

Trace elements such as copper (Cu), manganese (Mn) and zinc (Zn) are of great importance for optimal health and performance. These elements perform crucial functions in the animals' metabolism as a cofactor for multiple metalloenzymes, and deficiencies can lead to a range of disorders. The new generation Excential Smart hydroxy trace minerals are highly available to the animal without negatively influencing stability of surrounding nutrients or health of the intestinal tract.

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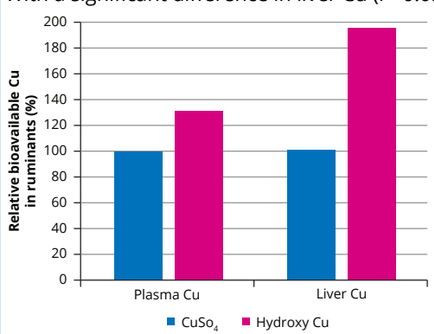
Hydroxy trace minerals have low solubility due to a unique crystal matrix structure with covalent bonds, providing reliable stability, as can be seen by the few interactions with other feed components. After passage in a more acidic environment like the stomach, the molecule provides a "slow release" effect, generating high delivery of trace elements in the small intestine, available for uptake.

This high uptake ensures higher bioavailability of hydroxy trace minerals in the animal and, as a result, lower excretion of Cu, Mn and Zn in the environment.

Figure 1 - Relative bioavailability of hydroxy Cu compared to Cu-sulphate in growing cattle. With a significant difference in liver Cu (P<0.05).



Findings from studies regarding trace mineral nutrition conducted by Orffa and from literature show many reasons to replace inorganic trace minerals with Excential Smart.

1 Smart/stable bonds

Hydroxy minerals are composed of stable covalent bonds, rather than the weak ionic bonds in sulphates. In ruminants, for example, the hydroxy trace minerals will bypass the rumen due to low solubility, which results in few interactions with other nutrients and reduced antimicrobial effects. This ensures enhanced ruminal function and increased fermentation and digestibility.

In comparison, for sulphates, negative effect on volatile fatty acid (VFA) production was observed in trials. Using stable (hydroxy Excential Smart) minerals in diets makes it easier to provide the animals with the desired amount of the specific trace element.

Additionally, it may also decrease the non-absorbed minerals in waste, supporting sustainable animal nutrition.

2 Homogenous product

Hydroxy trace minerals have excellent product characteristics, ensuring safe and easy use. Excential Smart products have low hygroscopicity and good free-flowing characteristics. They are dust-free, with particles that are homogenous in shape, size and colour.

In addition, Excential Smart C (hydroxy-Cu) and Excential Smart Z (hydroxy-Zn) are compatible in organic feed.

Improved handling, precision and uniformity in feed can lower the risk of carryover effect, make measuring easier and more predictable and avoid clumping in complete feeds.

3 Stability of the feed

Hydroxy trace minerals contain strong covalent bonds, which protect the reactive metal from being released too early in the feed or digestive tract.

High reactivity in the feed is detrimental to the stability of other nutrients and can lead to oxidation of fat, degradation of vitamin levels and reduced phytate availability for phytase. Reactive trace elements are able to interact with other feed components and form complexes, making other feed components as well as the trace elements unavailable for absorption.

4 Improved bioavailability

The minerals from hydroxy sources become available in the small intestine, where they can be taken up by receptors and create an optimal mineral supply to the animal. When hydroxy Cu was used versus copper sulphate in a diet for growing cattle, almost twice as much Cu reached the liver (*Figure 1*). Especially in soils that are high in antagonists, such as molybdenum, absorption of Cu is significantly reduced. These results indicate a possible easier usage for precision feeding, especially in feed with high levels of antagonists in the ration.

5 Improved palatability

Even in low concentrations, Cu, Mn and Zn can have a negative effect on palatability, probably due to the metallic taste. Sulphates especially have a negative effect on feed preference across a variety of animal species. Hydroxy trace minerals, however, are only minimally soluble above pH 6.0 and will barely dissolve to the ionic form in the saliva when the feed is consumed by animals. A higher preference for feed containing hydroxy trace minerals is confirmed in various animal species. In an experiment in young calves, free-choice access was provided to mineral supplements differing in sources of Cu, Mn or Zn. Per individual trace element, there was a preference for the hydroxy form. When in a fourth experiment all three minerals were combined in the mineral supplement, calves almost exclusively selected the hydroxy source compared to supplements with sulphates or organic sources (*Figure 2*). Hydroxy trace minerals show a clear improvement in palatability compared to other sources. Especially when high feed intake of the animals is targeted, this is of high importance.

6 Improved health and performance

Hydroxy trace minerals with higher bioavailability ensure more adequate mineral supply to support animal performance and health. Higher availability of trace elements can result in more resilient hooves and improved fertility, as this is observed in trials comparing hydroxy trace minerals with the traditionally used inorganic sources. Furthermore, improved health and optimal rumen function lead to an increase in milk production, which is an economic advantage of hydroxy trace minerals.

7 Improved sustainability

Sulphate trace minerals are highly reactive in the rumen and within feed. After release of the ion, interaction with other nutrients can occur and complexes unavailable for absorption are formed, resulting in excretion to the environment. This is counter to a current major concern: sustainability. When providing a more stable source of trace minerals, such as Excential Smart hydroxy trace minerals, the precision inclusion of trace elements in diets can be improved, while supporting health and performance. Furthermore, precision feeding by using hydroxy trace minerals will minimise degradation of other nutrients in the feed and maximise absorption in the animal, resulting in reduced excretion to the environment. The influence of the trace mineral source on the bioavailability of other nutrients can be illustrated by the formation of phytate-mineral complexes. Phytate, as a natural source of phosphorus (P), exists in plants. Released Cu or Zn, from weak mineral sources like sulphates, bind with phytate, resulting in non-available phytate-mineral complexes to the animal. As P cannot be released anymore from such a complex, it will be excreted in the environment. Using hydroxy trace minerals in the diet reduces the binding with phytate, which makes release and absorption of P possible instead of excretion, indicating a great advantage in terms of sustainability.

PHOTO: KOOS GROENEWOLD

Conclusion

When evaluating supplemental trace minerals, the source of the trace minerals not only impacts the animal itself, but also influences feed intake, rumen function, feed stability and the environment. Therefore, improved sources of trace minerals (Excential Smart hydroxy) offer great advantages compared to inorganic trace minerals.

Figure 2 - Effect of mineral source on preferential supplement intake by young calves, when they have free-choice access to three different mineral supplements (Significant difference (a,b,c): P<0.05).