TRACE MINERAL COMPARISON: INORGANIC vs ORGANIC

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Earlier in the century, when kelp was king, considerable world-wide research documented the merits of feeding kelp (seaweed) meal to livestock. The technological advances achieved in the 1960's spurred the interest in and growth of synthetic inorganic minerals. Kelp was considered obsolete and no longer needed by our rapidly advancing space-age society. Modern man now believed that our problems could be solved in the laboratory. The abandonment of Nature and its offspring began a long downward spiral that has forever altered agriculture as our forefathers once knew it. Nutrition is now sold in a bag, not harvested from the land and sea.

Inorganic mineral sources were cheap (relatively speaking!), readily available and formed the basis of NRC mineral requirements. The problem with inorganic minerals is that they are not efficiently utilised by animals.

Inorganic minerals have a low availability, ranging from 4-22%. Many of the inorganic products have molecular weights which are too large to be absorbed by the intestinal tract. These must be broken apart and restructured if they are to be transported through the intestinal wall and ultimately into the bloodstream.

Up to 80% of these inorganic minerals, when broken apart, can combine with substances such as phytic acid and oxalic acid which are present in the digesta. These free minerals, after cleavage, are usually positively charged and seek negatively charged substances. This results in the formation of insoluble substances which simply pass through the digestive system with little absorption. Consequently, these substances never contribute to the nutritional welfare of the animal.

Although a small portion of the digested inorganic minerals will combine and reform as metal chelates, this occurs with only 1-6% of the total inorganic mineral intake. The low availability of inorganic minerals has shifted the focus of trace mineral nutrition to improving bio-availability. Bio-availability means that a mineral can be more effectively utilised by an animal to meet its nutritional needs. Chelates are organic molecules which form ring structures which encircle and firmly bind metallic ions (trace minerals). The resulting ring structure protects the mineral from entering into unwanted chemical reactions.

Neutrally charged chelated minerals can be easily transported across the negatively charged intestinal wall. Specialised cells, which line the upper portion of the small intestine , enable minerals to enter into the bloodstream. These chelated minerals have a 300 to 500% greater efficiency than the inorganic minerals.

An example of inorganic trace mineral inadequacy came to light at Oklahoma State University, USA in 1986. Increasing fertility problems initiated an investigation, which further revealed clinical signs of hair coat depigmentation, broken bones, hoof problems, reduced growth rates and respiratory edema. It was determined that the herd was suffering from a copper deficiency.

A study involving first calf heifers, comparing chelated minerals to inorganic minerals was overseen by Dr Bob Kropp.

The results are as follows:

	Chelated Minerals	Inorganic Minerals
Cows, total	18	19
Cows, exhibiting estrus	14	8
% cows exhibiting estrus	77.8	42.1
Cows, first service conception	10	2
% cows first service conception	55.6	10.5
%cows in heat that conceived first service	71.4	25.0
Calves, total	15	15
205 day weaning weight, lbs	543	496

The chelated mineral group clearly showed significantly more estrus activity and a greater first service conception rate than the inorganic control group. In addition, the chelated group weaned calves that weighed 47 pounds more than the inorganic mineral treatment. Copper-zinc Superoxide Dismutase (SOD) activity was monitored. SOD is an enzyme found in erythrocytes and liver cells which contain equal amounts of copper and zinc. Increased SOD activity indicated that chelated copper was more biologically available than inorganic copper (copper sulphate).

Dr Kropp calculated that every dollar spent on chelated minerals returned twelve dollars. If a trace mineral deficiency can silently exist in the herd of a major university, it can certainly happen to the average producer.

In a seven year dairy study conducted at the University of Maryland, USA, comparing chelated minerals and inorganic minerals, the following conclusions were reached:

1. The normal level of inorganic minerals supplied in rations, although present in sufficient amounts, is not adequate for optimum reproductive performance.

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2. Adding additional inorganic minerals could lead to toxicity, whereas additional chelated minerals showed no toxicity problems.
3. Chelated minerals are more absorbable and available at the intracellular level.
4. Chelated minerals are necessary if optimal reproductive performance is to be achieved.

I experienced a similar problem with one of my red "paint" cows. Her dark red colouration could now only be described as a dingy dirt brown. She was also experiencing hoof and bone problems and appeared arthritic and lethargic. A blood sample confirmed my suspicions, low copper. My veterinarian said, "No problem, a quick shot of copper will cure this deficiency." Unfortunately this is only a temporary solution to a serious problem. My nationally known brand of inorganic minerals should have prevented this deficiency. I realised that it was only a matter of time before the other cows exhibited similar symptoms.

To be objective, I gave my inorganic minerals another chance to redeem themselves. For several months, I closely monitored the herd's mineral consumption, making sure there was always an adequate supply of fresh minerals. The cattle were consuming more than twice the manufacturer's recommendation. Obviously the cattle were eating to fulfill a mineral need, but they were not able to satisfy this craving. There was still no change in the cow's condition or colour. Since inorganic minerals were ineffective, I turned to Mother Nature.

Kelp meal, which contains over sixty minerals and elements, twelve vitamins, twenty one amino acids, carbohydrates, proteins, fats and unidentified growth factors, was chosen over man-made chelates. Also, the different forms of man-made chelates make this a difficult and perplexing decision. It is not only important to have the correct forms of minerals, but to also have them in the correct proportions. The complex interrelationships and interdependencies of trace minerals make it exceedingly difficult for man to precisely determine trace mineral requirements.

Man has not yet found the key that will unlock Mother Nature's secrets. The most common sense approach is to work with Nature and utilise natural products (kelp meal, bone meal, yeast, etc). "University personnel" insist that the mineral analysis of natural products is too low to be considered useful. Their conclusions are based on NRC requirements which were established by extensive testing with inorganic minerals. Quantity is not what is important in trace mineral nutrition, bio-availability should receive priority. Although not proven, it is postulated that naturally chelated trace minerals found in kelp meal are more available than man-made chelates.

Now back to the story. To bolster the low level of calcium and phosphorus found in kelp meal, steamed bone meal was added at a ration of 1:4 OR 1:5 (bone meal : kelp meal). After putting out the kelp meal, I was concerned with whether the cattle would consume it. Not to worry, I could hardly keep the mineral feeder filled. The cows acted like sugar deprived kids in a candy store! After approximately one month, kelp meal consumption leveled off. This equalisation was never accomplished with inorganic minerals. After one month, the cow's hair colour returned to normal and she was experiencing significantly less trouble walking. I also observed that the rest of the herd's coats were slick and shiny. Their bright eyes exuded life and there was a pronounced bounce in their gaits.

According to "experts", kelp meal could not have corrected my copper deficiency. After all, they state that kelp meal does not contain enough copper to be of any use. This simplistic thinking does not take into account the high bio-availability of kelp's trace minerals. It only focuses on the established NRC mineral requirements.

For years, abundant scientific literature showing the numerous benefits of seaweed (kelp) has been ignored by mainstream agriculture. Why? They just cannot comprehend how such low levels of minerals can be of any benefit. The problem lies in their inability to understand several basic premises:

1. Our soils are severely depleted of trace minerals and therefore the plants grown on them will also be trace mineral deficient. The animals that consume the plants will , due to substandard trace minerals, not be able to function at peak health, performance and efficiency. The application of chemical NPK fertilisers to soils will not resolve these inadequacies.
2. The addition of inorganic trace minerals too our deficient feeds will not compensate for all the mineral inadequacies; the bio-availabilities of these inorganic constituents are low and therefore their contributions are limited.

Since kelp meal fulfils a basic need or requirement in regard to trace mineral nutrition, it can be reasonably expected that multiple benefits would result. Nothing magical, just simple down-to-earth logic! From this point on, kelp (seaweed) meal has a place in my heart and mineral feeder.

FOR FURTHER INFORMATION CONTACT

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