Trace Mineral Imbalances in Cattle

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The effects of trace mineral imbalances on cattle production and health are becoming better understood as producers, veterinarians and nutritionists begin to place an emphasis on fine-tuning management practices.

As their name implies, trace minerals are needed only in small amounts, and in most situations requirements are met with feedstuffs and standard trace mineral supplements. But direct or induced deficiencies of trace minerals can occur and may be underlying problems in infectious or physiological diseases.

There are 15 trace minerals required by cattle, however, most are never or very rarely deficient, Therefore, only six trace elements may be deficient in forage-based diets. Early research indicates that chromium may be added to the list of minerals that are occasionally deficient, but, at this time, the elements known to be important are: copper, cobalt, iodine, selenium, zinc and manganese.

The diagnosis of trace mineral deficiency is becoming more common throughout the United States due to increased awareness of the manifestations of low trace mineral concentrations and because of modern farming and husbandry practices that decrease trace mineral availability and/or increase animal requirements for trace minerals.

Among the factors contributing to trace mineral imbalances are frame size, growth rate, feed source and water source. Breed is also a factor, with Simmentals requiring more dietary copper than Angus. Probably more important than breed is production potential; heavy-milking or fast-growing cattle require higher concentrations of trace minerals than do cattle that do not have such genetic capabilities.

Because of the complexity of determining trace mineral requirements, a veterinarian or nutritionist familiar with trace mineral nutrition should be consulted when dealing with potential trace mineral imbalances. Feed and water analysis, and serum and liver sampling are often needed to identify high levels of mineral antagonists or primary deficiencies of trace minerals.

A baseline for trace mineral requirements is the National Research Council (NRC) recommendations most recently published in 1984. NRC recommendations should be considered a minimum level and other factors should be considered when determining requirements for a particular herd or situation.

During high milk production, rapid growth or stress, NRC recommendations are probably inadequate and should be exceeded. Also, trace minerals have many antagonists whose presence will alter the amount of trace mineral needed in the supplement. For example, other minerals, nitrate, sulfate, protein and plant estrogens are known to reduce copper utilization.

The first priority in trace mineral nutrition is to reduce the intake of antagonists in order to minimize the amount of supplemental mineral required. This may be accomplished by changing water sources, rotating pastures so animals are not on pastures with high levels of antagonists for long periods of time, or changing harvested forage sources.

Biologic availability is a measure of the degree to which a trace mineral source can support the physiologic processes in an animal. For example, different forms of copper have different availabilities. Copper as chloride is more readily available than the other forms, with oxide being the least available and copper sulfide being totally unavailable. Several products containing trace minerals chelated to amino acids have been made available in recent years.

Research in non-ruminant animals has shown increased trace mineral absorption and availability when delivered in this form. Very little research has been done to evaluate the availability of chelated minerals in ruminant animals, so a firm value for bioavailability of trace mineral chelates is unavailable.

Research investigating the bioavailability of trace mineral chelated to amino acids in ruminants is just beginning and hopefully a clear answer will be forthcoming. Chelated mineral supplements are much more expensive than their inorganic counterparts and any benefits must be weighed against the cost.

The most common way to supplement trace minerals for beef cows on summer pasture or winter forage is by adding the deficient trace mineral to the salt and macro-mineral supplement. Because cows do not have the nutritional wisdom to consume the proper amount of mineral supplement to meet their dietary requirement or avoid a toxicity, it's important to monitor mineral intake.

Weighing of mineral consumed over several days is necessary in order to know the herd's average consumption of the supplement. If consumption is too low, feed intake enhancers such as dry molasses, wheat mids, cottonseed meal or flavoring may be added. If consumption is too high, salt may be used to limit intake to desired levels.

Once your veterinarian or nutritionist has determined the level of trace mineral supplementation needed, it's important you maintain surveillance of the herd. Observe for positive changes in body condition, hair coat, fertility and other external signs of trace mineral deficiency. In 3 to 6 months repeat liver and serum sampling. If the deficiency or imbalance is not completely resolved, your veterinarian or nutritionist will adjust the initial recommendations and re-evaluate again in three to six months.

Diagnosis and treatment of trace mineral imbalances can be challenging. After gathering liver, serum and feedstuff samples, a careful evaluation of the causes of mineral deficiency on a given farm or ranch can be made. Because of the many factors involved, levels of supplementation will vary greatly from one situation to the next— even in closely aligned geographic areas. For this reason, thorough food re-evaluation is essential.