Organic trace minerals promote reproduction, hoof health

Trace mineral absorption and use performs an essential role in dairy cow reproduction and hoof health. The trace minerals play critical roles in the proper functioning of enzymes, hormones and cells. Deficiencies can, and often do, result in less-than-optimal performance and lost opportunity cost.

This makes trace mineral absorption one of the integral components of successful herd management programs. With the desire for increasingly precise nutrient delivery, nutritionists often specify organic trace minerals as a way to assure sufficient trace mineral availability, absorption and use.

The benefits of organic trace minerals are well established. They number among the six feed additives Mike Hutjens, professor emeritus, University of Illinois, recommends for use in every dairy ration every day. The other five additives are rumen buffers, yeast culture/ yeast products, monensin, silage inoculants and biotin. The role of each additive in animal nutrition and health has been demonstrated through repeatable research.

Reproduction

Good management, protocol compliance and nutrition create a foundation for good reproductive performance. When effective management and health programs have been confirmed but reproductive performance lags, nutritional factors would be next in line to be evaluated. Suboptimal reproductive performance can reflect a lack of energy in the diet during early lactation. If energy levels are OK, the protein level fed should be closely monitored. Insufficient levels of crude protein can result in non-detectable heats, resulting in poor conception rates.

Vitamins and minerals play a vital role in reproductive performance too. Vitamin A is the vitamin most likely to be deficient in dairy cows. Calcium and phosphorus are the macrominerals most directly related to reproductive performance. Zinc, copper, manganese and selenium highly influence embryonic health and reproductive performance. Deficiencies in any one of these trace minerals can lead to fetal abnormalities, delayed estrus, embryonic death, reduced estrus activity and infertility. In addition, selenium should be monitored and maintained at 0.30 ppm to prevent retained placentas.

Hoof health

Hoof health poses another major concern on dairies. Environmental conditions during the spring and fall often predispose animals to problems ranging from hoof cracks to foot rot. Most hoof problems result from one or a combination of the following factors: genetics, environment, disease and nutrition.
The nutritional causes of foot rot may be some of the hardest to diagnose but the easiest to treat. Nutritional factors affecting hoof quality include amino acids, vitamins, fatty acids and several minerals. Zinc, copper and manganese are particularly vital to hoof health. Both zinc and copper contribute to the formation of keratin, the hard outer surface of the hoof. A deficiency in either results in a softening of the hoof wall,which can lead to cracks, foot rot and sole abscesses. Manganese contributes to hoof health by maintaining proper leg formation.

Each of these trace minerals is also involved in proper immune function. Zinc, copper and manganese all play a role in the antioxidant enzyme superoxide dismutase, which helps rid the body of cell-damaging free radicals. Zinc directly contributes to wound healing and antibody formation.

The nutritional causes of hoof problems usually result from a mineral deficiency. The zinc and/or copper concentration in forages in many areas of the U.S. is inadequate to meet animals' needs. The manganese concentration of most grasses may be sufficient, but not available in a form the animal can use. In addition, the feed, water and soil the cow consumes may contain mineral antagonists that bind inorganic trace minerals, leaving them unavailable to the animal. Organic trace minerals, however, are protected from and unaffected by antagonists.

Preferences

Organic and inorganic trace minerals have a fundamental difference. The inorganic trace mineral, a finely ground rock, is complexed within an organic matrix – either by nature or man – to produce an organic trace mineral. The organic trace mineral can have two times or greater bioavailability as compared to the inorganic trace mineral.

Commercially produced organic trace minerals are more bioavailable and more highly absorbed in the small intestine. If the trace minerals are not absorbed here, their nutritional benefits are lost. For the most part, unused, unabsorbed trace minerals are excreted.

Commercially produced organic trace minerals are protected from interactions with antagonists and vitamins. Antagonists interact chemically with inorganic trace minerals. The interactions bind the inorganic trace minerals, leaving them unavailable to the animal.

Antagonists include sulfates, oxides, fiber and many of the inorganic trace minerals themselves. They include the high sulphur content of dried distillers grain, iron contamination from dirt in corn silage and other fermented feeds, and the minerals in hard water, notably sulphur and calcium.

Inorganic trace minerals also chemically react among themselves. High levels of one inorganic trace mineral can decrease the availability and use of another. Known mineral interactions include copper-molybdenum, sulfur-selenium, calcium-phosphorus, calcium-zinc, calcium-manganese, iron-manganese and potassium-magnesium. Trace mineral absorption rates in older animals typically are lower than in younger animals.

Organic trace minerals

Several different brands of organic trace minerals are commercially available. While all are organic, inherent differences exist in their chemical structures due to production processes. The percentage of organic versus inorganic trace minerals fed in the ration has changed over time. Trace mineral guidelines are provided by the National Research Council, but use of organic versus inorganic trace minerals are not. In practice, most nutritionists feed organic trace minerals to meet 30 to 50 percent (minimum) of trace mineral requirements. Situations also exist where positive responses have been seen when up to 100 percent of total mineral requirements are fed as organic trace minerals.

Trace minerals are essential dairy nutrients. Organic trace minerals make more of the trace mineral bioavailable to the animal than inorganic trace minerals. They typically do not interact with antagonists. Inorganic trace minerals, however, do interact readily with any of a variety of potential antagonists. This interaction binds up the inorganics, leaving them unavailable for absorption in the small intestine.

By investing in organic trace minerals, nutritionists and producers can help assure delivery of the essential trace minerals that can affect hoof health and reproduction, including first-service conception rates and days open.

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