

Use of Trace Minerals in Diets for Feeder Cattle

Trace minerals are added to diets for feeder cattle for various nutritional purposes and fed continuously to meet specific requirements. Below, we describe the function of various trace minerals, periods when trace minerals should be increased, and when organic forms are needed.

Function of Trace Minerals in Feeder Calves

Cobalt (Co) – Required for vitamin B₁₂ synthesis by ruminal microbes, which in turn is involved in metabolize propionate, a major energy source.

Iodine (I) – A component of the thyroid hormones that regulate body metabolism, growth, temperature, circulation, and muscle function.

Iron (Fe) – Required in oxygen transport by hemoglobin. Excess Fe binds other trace minerals and is a pro-oxidant.

Manganese (Mn) – A component of many enzymes involved in carbohydrate and connective tissue metabolism, antioxidant, and immunity.

Selenium (Se) – Required in antioxidant and immunity in conjunction with vitamin E.

Zinc (Zn) – An enzyme component involved in protein synthesis, antioxidant, and immunity.

Key Differences in Inorganic Sources of Trace Minerals

Zinc and Cu have two common forms available in the feed industry, oxides and sulfates. In general oxides are 60 to 80% as available as sulfates and 80 to 90% the cost. Thus, sulfates are the preferred source nutritionally and economically. Cu chloride is as available as Cu sulfate. Mn oxide is quite a lot less expensive than Mn sulfate even though it is 80 to 90% as available, thus the oxide form is the most cost effective. Iron oxide is virtually unavailable and is not a nutritional option, but it is used as a coloring agent.

When to Use Organic Source of Trace Minerals

Organic sources are generally more available than inorganic sources and should not be bound by antagonists such as Fe, sodium (Na), sulfates (SO₄), molybdenum (Mo), etc. For example, diets exceeding 100 ppm Fe and 1 ppm Mo and water supplies exceeding 2,500 ppm SO₄ will reduce the availability of Cu and other trace minerals. During periods where trace mineral depletion is needed or during periods of stress, we can justify the more expensive organic trace mineral sources. For example, in calves destined for shipment and stress and newly received feeder calves, feeding organic

sources of trace minerals for 2 to 4 weeks to insure adequate trace mineral status and a good immune responses to pathogenic challenges and vaccines is advised. Organic sources of trace minerals are available from different manufacturers and they do differ in quality. Choose only to use organic trace minerals from manufacturers who have solid research on their products. Feed according to the recommendations of the manufacturer in addition to the nutritional levels of trace minerals supplied by inorganic forms. Recommended feeding rates are approximately 25% of the trace mineral requirements. Commonly supplemented organic trace minerals are Zn, Mn, Cu, and Co.

Forage Levels of Trace Minerals

A recent survey of U.S. forages reflected most forages are deficient in several trace minerals, with many forages being very deficient in at least one trace mineral (Table 1). High morbidity and poor gains in new feeder cattle are often traced back to severe deficiencies of trace minerals and vitamins in the vow/calf programs that produced the feeder cattle. Forages cannot be relied on for adequate trace mineral nutrition. The common use of trace mineralized salt cannot be relied to adequately supplement feeding programs, since the typical trace mineralized salt will provide less than one-third of the animal's requirement for any one trace mineral (Table 2) when fed at one ounce daily.

Table 1.

Trace Mineral Status in Forages (% of forages)		
<u>Mineral</u>	<u>Deficient</u>	<u>Marginal</u>
Co	48%	17%
Cu	14%	49%
Mn	4%	19%
Se	44%	19%
Zn	63%	34%

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Table 2.

Percent of Mineral Requirement Met with 1 oz. Of TM Salt			
<u>Product</u>	<u>Cu</u>	<u>Mn</u>	<u>Zn</u>
A	18	30	30
B	14	20	19
C	7	22	22
D	9	12	18
E	3	7	12
F	2	8	8

Importance of Trace Minerals in Growing and Finishing Diets

Omission of trace minerals from 500 lb feeder cattle diets resulted in a .15 lb reduction in average daily gain and .24 increase in feed/gain over a 218-day feeding period until slaughter (OK St. Univ.; J. Anim. Sci. 76, Suppl. 1:752, 1996). Consistently researchers find a reduction in immune function when trace minerals are omitted and an improvement in immune function when organic trace minerals are used to replace part the inorganic minerals in receiving cattle studies (CO St. Univ.; Proc. 1991 Range Beef Cow Symp. P. 239). The 1996 Beef NRC suggests increasing the concentration of most trace minerals by 2 to 3 fold to take into account a greater need for trace minerals combined with the reduced intake common in new feeder cattle.

Summary

Use an accurately fortified diet for the trace mineral needs of feeder cattle. Inorganic forms are acceptable to meet nutritional requirements if antagonist elements are absent. Use recommended levels of organic trace minerals when antagonistic levels of elements are present and animals are stressed.