

Mineral Feeding For Healthy Cows

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Feeding the proper amounts of each mineral and vitamin is essential for the health, growth, and optimum milk production of dairy cattle. Feeding less than the optimum amount of any mineral or vitamin can result in an increased incidence of disease and reproductive problems, lower milk production, and decreased growth rate in heifers. To prevent these costly problems, the proper amounts of minerals and vitamins must be supplied and *actually consumed* by all dairy cattle, including the milking herd, dry cows, and heifers.

Nutritionists are actively investigating the role of various minerals and vitamins in preventing disease as well as enhancing performance. Recent research has suggested that slight deficiencies of certain trace minerals may detrimentally affect a cow's immune function and her natural ability to fight off infections, such as mastitis and other diseases. A decrease in immune function may be seen before decreases in milk production or severe deficiency symptoms, such as change in

hair coat color or skin lesions. Thus, close attention to your herd's mineral needs is very important. Figure 1 lists the trace minerals and vitamins which are currently believed to be important in optimizing disease resistance in dairy cattle. After more research, chromium also may be added to this listing.

Figure 1.

Trace Minerals and Vitamins
Important for Optimum Disease
Resistance

Trace minerals

Copper

Zinc

Iron

Selenium

Vitamins

Vitamin E

Vitamin A

Means of Supplementing Minerals and Vitamins

Ideally, supplemental minerals and vitamins should be added in the recommended amounts to the grain mix or total mixed ration. This feeding scheme regulates the intake of minerals and vitamins so that each cow or heifer receives the adequate and expected amount. Research has shown that cattle do not consume the correct proportions and amounts of minerals other than salt when minerals are offered separately or cafeteria-style (for example, limestone, salt, trace mineral premix are offered separately through a mineral feeder). Thus, adding them at the appropriate amounts through the grain mix, heifers, dry cows and milking cows receive the expected amount of each mineral and vitamin supplemented.

Heifers and dry cows are commonly fed free-choice mineral supplements where salt is used to regulate the intake of the mineral/vitamin supplement. Mineral intake has been shown to be highly variability with intake varying between animals and from day-to-day. Thus, whenever possible the correct amount of mineral should be included in the grain mix.

Trace mineralized salts generally do not supply adequate amounts of the trace minerals needed by heifers and dry or milking cows. They often do not contain selenium or vitamins A, D, or E. Thus, trace mineralized salt should not be used to supply trace minerals or vitamins. When looking at a feed recipe, make sure to differentiate between trace mineralized **salt** and a trace mineral **premix**. Trace mineral premixes are used by many feed mills and often times provide an adequate amount of trace minerals and/or vitamins when added at the proper rate for a heifer, dry cow or milk cow grain mix or total mixed ration.

Evaluating Your Mineral Program

Mineral feed tags for dairy cattle are required to list the concentration of calcium, phosphorus, salt, magnesium, potassium, selenium, and vitamin A. They are not required to list the concentration of the other required trace minerals or vitamins. Thus, when evaluating a mineral to see if it supplies the trace minerals needed, the first step is to check the feed tag for a source of the trace minerals listed in figure 2. These minerals can be found in the listing of the ingredients on the mineral feed tag. Finding these minerals in the listing says that these have been added but does not indicate how much of the element will be supplied by the grain or mineral mix. Often times, this information will be supplied by the manufacturer upon request. This information along with the mineral content of the forages obtained from the forage analysis can be used to see if your dairy heifers or cows are receiving the proper amount of each mineral. Table 1 indicates the total amount of various trace minerals and fat-soluble vitamins to be added to the total diet (forages and concentrates) for milking and dry cows.

Figure 2.

Trace minerals and vitamins required and commonly supplied to dairy cattle

<u>Trace Minerals</u>	<u>Vitamins</u>
Cobalt	Vitamin A
Copper	Vitamin D
Iodine	Vitamin E
Manganese	
Selenium	
Zinc	

The old adage, "A little is good, more must be better" does not apply when supplementing minerals. The amount of one mineral affects the absorption of other minerals which are just as essential. Thus, each trace mineral must be added in the correct amount and in an amount which is relative to all other minerals. For example, excess amounts of iron, sulfur, or molybdenum in the water and/or feed will reduce

the amount of copper and zinc absorbed by cattle. Thus, when deficiencies are suggested by blood or liver tissue analysis, the feeds and water supply need to be evaluated by a highly-trained nutritionist and a nutritional plan devised to correct the deficiency if necessary.

Table 1. Suggested amounts of trace minerals and fat-soluble vitamins added to the total diets (forages and concentrates) fed to milking or dry cows.

Trace Mineral/Vitamin	Milking Cows	Dry cows
Copper	200-250 mg	100-150 mg
Zinc	900-1200 mg	450-600 mg
Selenium	6 mg	3 mg
Vitamin A	100,000-150,000 IU	50,000 IU
Vitamin E	400-800 IU	1000 IU

Assumes 45 lbs DMI for milking cows and 25 lbs DMI for dry cows
(Adapted from Dairy NRC, 1989 and Hutjens, 1996)

Generally, supplemental trace minerals are supplied through inorganic sources. These inorganic sources generally are in the form of sulfates, phosphates, chlorides, carbonates, or oxide forms of the trace mineral. Research has shown that some inorganic sources of trace minerals are more available than others. For example, sulfates are generally more available than the oxide forms of the trace mineral. Research at the University of Kentucky and other states has shown that copper oxide does not provide adequate copper to dairy or beef cattle as well as pigs and chickens. Iron oxide is used to color mineral mixes red but provides very little nutritional value. Table 2 lists the different sources of each of the trace minerals. Also listed are the current relative bioavailability of the trace mineral from each of the sources listed.

Organic minerals are often classified as chelates or proteinate. These trace elements are bound to amino acids or pieces of protein. Researchers have hypothesized that they are absorbed in the intestines by a different mechanism which may increase their bioavailability and make them useful in situations where other minerals are decreasing the availability of a particular mineral.

Table 2. Relative bioavailability of some commonly used sources of trace minerals.

Trace mineral	Source Compound	% of element in compound	Bioavailability
Cobalt	Cobalt carbonate	46.0-55.0	?
	Cobalt sulfate	21.0	?
	Cobalt chloride	24.7	?
Copper	Copper sulfate	25.0	High
	Copper carbonate	53.0	Intermediate
	Copper chloride	37.2	Intermediate
	Copper oxide	80.0	Very low
Iodine	Calcium iodate	63.5	High
	Ethylenediamine dihydroiodide (EDDI)	80.0	High
	Potassium Iodine, stabilized	69.0	High
Iron	Iron oxide	46.0-60.0	Unavailable
	Ferrous carbonate	36.0-42.0	Low
	Ferrous sulfate	20.0-30.0	High
Manganese	Manganous sulfate	27.0	High
	Manganous oxide	52.0-62.0	Intermediate
Selenium	Sodium selenate	40.0	High
	Sodium selenite	45.6	High
Zinc	Zinc carbonate	52.0	High
	Zinc chloride	48.0	Intermediate
	Zinc sulfate	22.0-36.0	High
	Zinc oxide	46.0-73.0	Intermediate

(Adapted from Hemken, 1994 KY Ruminant Nutrition Workshop Proceedings)

Bottom Line

Feeding the proper amounts of all minerals and vitamins is very important for profitable milk production from healthy cows. To accomplish this objective, take time to review your current mineral/vitamin feeding program. Items to review include:

- All minerals and vitamins should be included in the grain mix whenever possible.
- If you mix your own feed, add the correct number of bags of mineral to the mix. If the appropriate amount of mineral is not added, performance and disease resistance of your heifers, dry cows, and milking cows may be compromised.
- If dry cows and heifers are fed free-choice mineral, make sure they always have mineral available. Grain mixes formulated for milking cows and then fed to bred heifers and dry cows do not contain enough trace minerals and vitamins. To provide heifers and dry cows the proper amounts of minerals and vitamins, a grain mix must be formulated with their needs in mind.
- Trace mineralized salt often does not provide adequate amounts of minerals and vitamins. Complete mineral mixes are necessary to provide adequate amounts of minerals and vitamins.
- If you are feeding a commercial grain mix or protein supplement to a milking herd, check the ingredient listing and make sure it contains all of the needed minerals and vitamins. Feed tags are now required to list the concentration of calcium, phosphorus, and selenium. Pelleted grain mixes with 16 to 20% crude protein can contain at least 0.9% calcium and 0.6 ppm of selenium. High protein supplements should contain more calcium and selenium.
- If you want to review your current feeding program, contact your local extension agricultural agent and we can help you interpret if your cows and heifers are getting the appropriate amount of trace minerals and vitamins.