



CATTLE SENSE

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Dr. Cathy Bandyk

QLF, Dodgeville, WI 53533

/// MINERALS: An Important Piece in the Nutrition Puzzle

When developing feeding programs for cowherds, we typically focus first on the levels of protein and energy needed to maintain performance levels. But in order to achieve these production goals, the diet must also meet animal requirements for vitamins and minerals. Minerals, in particular, play a significant role in maintaining herd health, reproductive efficiency, and calf performance.

Nutritionists and producers have begun increasing their focus on mineral nutrition for a number of reasons. Ongoing research has improved our knowledge of the essential functions of various minerals, and helped refine requirements. It has also been shown that optimal health may require higher levels of some minerals than are necessary for normal growth. Modern cattle, with the genetic potential for high performance levels, need additional mineral nutrients to help drive increased production. Breed differences have been identified; for example, Simmental, Maine Anjou, Limousin and Charolais cattle appear to need as much as 1.5 times as much copper as other common breeds. And as crop yields have been boosted with nitrogen, phosphorus, and potassium fertilizers, plants have pulled increased levels of trace minerals out of the soil in conjunction with increased growth. In many places, soil mineral concentrations have been reduced to the point that plant trace mineral contents are now lowered as well, meaning cattle are able to meet fewer of their requirements from forages.

Dietary minerals are classed as macro and micro, or trace, minerals. The macro minerals are not more important nutritionally; they are simply needed in much larger amounts. This category includes calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), sulfur (S), and the components of salt – sodium and chloride.

In grazing animals, the trace minerals we are most often concerned with are copper (Cu), zinc (Zn), cobalt (Co), selenium (Se), and manganese (Mn). Iron (Fe) and molybdenum (Mb) may also receive attention, due to their ability to decrease availability of other essential minerals. An extensive survey of forages fed to beef cattle (Corah and Dargatz, 1996) analyzed 352 forage samples from 18 states, and categorized them as being adequate, deficient, marginal, or excessive for these 7 compounds. Their results (see table) clearly illustrated the importance of proper trace mineral supplementation for forage-based diets.

Each of the minerals required in cattle diets is involved in multiple biologic processes. Various deficiencies have been linked to depressed immune responses, reduced and delayed conception, abortions and stillbirths, reduced milk and colostrum yield (and lower weaning weights), poor growth, and decreased feed efficiency.

Percentage of forages meeting mineral needs of cattle					
	Content vs. Requirements			Antagonist Levels	
	Adequate	Marginal	Deficient	Marginal	Very High
Copper	36.0	49.7	14.2		
Manganese	76.0	19.3	4.7		
Zinc	2.5	34.1	63.4		
Cobalt	34.1	17.3	48.6		
Selenium	19.7	19.3	44.3	16.7	
Iron	62.8	---	8.4	17.0	11.7
Molybdenum	42.2	---	---	48.6	9.2

Not all of the minerals provided to an animal are available for its use. “Bioavailability” refers to the proportion of the dietary supply that the digestive process can actually release, absorb and retain, and is influenced by chemical structure, and interactions with microbial cells, other minerals, and other forage components in the rumen. These antagonistic relationships are alluded to in the previous table. Key interactions involve:

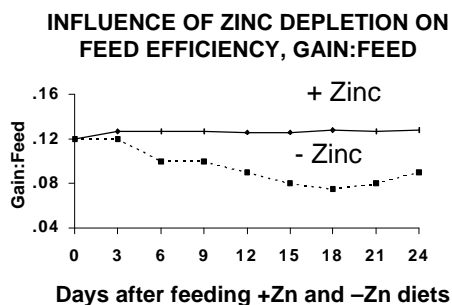
<u>A high level of:</u>	<u>Causing reduced absorption of:</u>
Zn	copper
Fe	copper, zinc, and manganese
Mo and/or S	copper

Minerals are supplied to the animal through forage, water, and supplements. Supplemental minerals are provided in different forms, which vary greatly in bioavailability. Generally, oxides are least available. Mineral carbonates are less available than sulfate forms, which tend to be equal to chlorides. Organic minerals, which also come in multiple forms, are most available, and may offer extra benefit to cattle under nutritional, disease, or production stress.

Salt is a unique feedstuff in that cattle will not overconsume it; salt should be available to cattle at all times. As cattle self-limit their intake of salt, intake of other feedstuffs (i.e., minerals) mixed with salt will also be effectively limited. Salt, then, becomes an excellent carrier for other dry minerals – especially other relatively high-intake macro minerals, such as phosphorus. However, for the essential trace minerals, there is also value in force-feeding at least some of the herd’s requirement. Inclusion of mineral sources in the protein supplement can help ensure some desired level of consumption. Liquid feeds, either offered in a lick tank or topdressed on forage, are well suited to this function.

All QLF beef and pasture cattle supplements include phosphoric acid, a highly available source of dietary phosphorus. Most standard QLF supplements contain sulfate forms of copper, manganese, zinc, cobalt, and iron, with optional organics available for stressed or high-demand cattle. Iodine is supplied in organic (EDDI) form, and selenium as sodium selenite. Fed in conjunction with a quality dry Ca:P mineral, these supplements can help optimize cowherd production.

Keep in mind that trace mineral deficiencies aren’t always obvious. The cattle don’t stop producing – but they may grow slower, be less efficient, and succumb to more disease organisms. The following chart, for example, shows the difference appropriate zinc supplementation made in feed efficiency.



If you suspect a trace mineral deficiency, or simply wish to evaluate the mineral status of your herd and feeding program, the first step is forage evaluation. Sampling is key to any feed analysis, and having a representative sample is critical. Mineral status of a few representative animals may be appraised using a serum (blood) sample taken by your veterinarian, but be aware of the fact that blood levels are not always a good measure of total body reserves. This is especially true in the case of copper. Liver concentrations are probably the best measure of mineral supply, and a veterinarian can actually assess these via liver biopsy. This may be a worthwhile investment if you truly have cause to

suspect production losses due to a deficiency.

Good feeding management involves every piece of the nutritional puzzle – protein, energy, and vitamins and minerals. When all are provided in the needed balance, the net result is cattle with an increased ability to withstand stress, increased antibody titres, reduced mortality and morbidity, and increased performance: earlier rebreeding, higher pregnancy rates, more milk production, and heavier weaning weights.