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Minerals for Dairy Cows

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Besides adequate protein and energy, dairy cows need certain minerals to produce milk efficiently. Dairy men are well advised to become familiar with the common mineral deficiencies, and to be sure they are supplementing dairy rations properly. This fact sheet discusses minerals most likely to be lacking in usual feed ingredients and how they may be supplied economically.

Minerals Needed in Relatively Large Amounts (Macro Minerals)

Calcium is needed by all animals for development of the skeleton, blood, and milk. It is usually added to poultry and swine rations because cereal grains are low in calcium. Corn silage, too, is low in calcium. Dairy cows are fed a considerable part of their diet as hay and other silage, however, and these may be high in calcium. Legumes such as alfalfa or clover are particularly high, often furnishing several times the animal's requirements. Mineral supplements and dairy grains should not contain added calcium when the forage consists largely of legumes. In fact, additional calcium might be harmful, because it would widen the calcium to phosphorus ratio, a predisposing cause of milk fever.

When corn silage is the chief forage, a calcium supplement should be used. A complete dairy ration should contain a minimum of 0.6 percent calcium. Many good rations contain a higher amount, indicating some excess calcium is tolerated well if phosphorus is adequate.

Phosphorus is deficient in most forages and small grains for dairy cow requirements. Rations low in phosphorus cause low milk production and poor reproduction.

Dairy rations, on a complete basis, should have at least 0.4 percent phosphorus and dairy grain mixes should be supplemented to at least 0.7 percent phosphorus. High protein feeds such as cotton-

seed meal or soybean oil meal are good sources of phosphorus. Also, dicalcium phosphate is a good, economical supplement. Where milk fever is a serious herd problem, sodium phosphate or diammonium phosphate may be helpful by reducing the calcium to phosphorus ratio.

Magnesium is stored in the bones but is poorly mobilized, with the result that a metabolic deficiency can occur in 2 to 18 days on a magnesium-poor diet. Usually legume forages will supply adequate amounts of magnesium, but grass hays, corn silage, cereal grains, and by-products may be borderline or deficient. A magnesium deficiency will result in drastically reducing the digestibility of some ration components.

In some instances rapidly growing, lush grasses may contain sufficient magnesium, but it is not in a chemical form which is available to the animal. In this situation animals come down with grass tetany, an acute disease that causes death unless treated quickly. Extra magnesium is required in feeds during these periods.

Either magnesium sulfate (epsom salts) or magnesium oxide are good supplements. The total air-dried ration should contain 0.2 percent magnesium.

Sodium usually is supplied by salt (sodium chloride). Experiments have shown that sufficient chlorine is furnished by common plant materials, but usually some supplemental sodium is required. The additional chlorine from added salt will not harm the animals. It has been customary to put 1 percent salt in the dairy grain concentrate. In recent years the level of grain feeding has increased so that 0.5 percent salt is sufficient. If a feed contains added sodium phosphate or sodium bisulfate, the salt content can be reduced further.

It is likely that the custom of feeding salt free-choice will continue, as dairy cattle seem to crave it on some diets. The sodium requirement is 0.18 percent (equivalent to 0.45% sodium chloride) of the air-dry ration.



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Minerals Needed in Relatively Small Amounts (Micro Minerals)

Iodine deficiency is associated with goiter, which can be a problem in calves. The deficiency is common everywhere except within a few miles of the coast. The use of iodized salt will meet minimum requirements. However, the use of stabilized organic iodides has become popular, as they may help to prevent foot rot as well as furnish iodine.

Cobalt deficiency in feeds occurs in many areas in the United States. Cattle lacking cobalt do not eat well, so they do not grow or produce well. Cobalt is used in the rumen to make vitamin B-12, an essential vitamin for the animal. Usually cobalt is added to commercial dairy grains and trace mineral salt.

Rations containing .05 milligrams of cobalt per pound of dry matter will meet minimum requirements. Cobalt sulfate or cobalt carbonate are effective forms for supplementing rations.

Copper and molybdenum are inter-related in animal nutrition because molybdenum interferes with copper utilization, causing an apparent deficiency. Excess molybdenum occurs in some areas of Oregon, and some areas also have forages that are low in copper. The deficiency symptoms are diarrhea, poor growth, bleached or graying hair, and anemia. Osteomalacia (fragile bones) and incoordination in newborn calves also are deficiency symptoms.

A ration containing 5 milligrams of copper per pound of ration dry matter is adequate unless molybdenum is involved. Excess copper may raise the copper content of milk and increase its susceptibility to oxidized flavor. Also, the tolerance of the animal to excess copper is fairly low, so copper supplements should be used with caution and only when needed. Copper sulfate is the form most commonly used.

Manganese deficiency has been associated with poor reproduction in heifers and with the production of calves with malformed bones. It has been difficult to produce experimentally and probably occurs rarely in commercial feeding. Rations containing 10 milligrams per pound of dried feed are adequate. Manganese sulfate is used for supplementing rations.

Zinc deficiency is characterized by poor growth, swollen feet, and open, scaly skin lesions or dermatitis. Forage analysis tables indicate many forages are either borderline or low in zinc. The estimated

zinc requirement is 20 milligrams per pound of air-dry ration. Zinc sulfate is a satisfactory, economical product for supplementing the ration.

Sulfur deficiency will not occur if most of the protein equivalent of the ration comes from natural sources. However, many rations today use urea or other sources of non-protein nitrogen to furnish protein equivalent. The literature is conflicting on the value of supplementing urea rations with sulfur, indicating some sulfur deficiency may be occurring. Dry rations containing 0.2 percent sulfur or a nitrogen to sulfur ratio of 10 to 1 are adequate.

Other minerals such as iron, selenium, and potassium are required by the dairy cow, but a deficiency of these nutrients is unlikely to occur in mature ruminants on a normal ration.

One should also be aware that there is an inter-relationship between minerals. An example is that molybdenum increases the copper requirement. Nutritionists have shown many other mineral inter-relationships. Therefore, the feeder should avoid large excesses of any mineral, as it may disturb the interrelationship and change the requirements of other minerals.

Until a few years ago, it was considered adequate nutrition to use trace mineralized salt as insurance against borderline deficiencies. Today, however, we have more cattle in dry lot, fed for high production. Their forage intake may be limited and the grain ration may have urea or other non-protein nitrogen sources. Large herd size plus intensive production make the dairyman's income particularly dependent on avoiding animal nutritional deficiencies.

Sophisticated equipment is necessary to determine mineral content of feeds quickly and economically. Your Extension office can tell you where to obtain this service. The conscientious dairyman will formulate rations as precisely as possible.

Minimum Mineral Requirements of a Dairy Cow

MACRO MINERALS (% of air-dried feed)	
Calcium	0.6
Phosphorus	0.4
Magnesium	0.2
Sulfur	0.2
Sodium	0.18 or 0.45% salt
MICRO MINERALS (mg/lb air-dried feed)	
Iodine	Not established
Cobalt05
Copper	5
Manganese	10
Zinc	20