Minerals for Beef Cows

Proper mineral nutrition for beef cows contributes to animal performance. Based on analysis the beef industry over feeds minerals.

The most important source of minerals for beef cows comes from the pasture and forages they are grazing since these feeds contribute the highest percentage of the diet. These feeds are, in fact, good sources of most of the required minerals. The values in Table 1 are the requirements (NRC, 1986) of most major minerals for beef cows.

**Table 1. Mineral requirements of beef cows**

<table>
<thead>
<tr>
<th>Mineral</th>
<th>for Lactating Cows</th>
<th>for Pregnant Cows</th>
<th>for Growing Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (%)</td>
<td>0.45</td>
<td>0.30</td>
<td>0.45</td>
</tr>
<tr>
<td>Phosphorus (%)</td>
<td>0.20</td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Potassium (%)</td>
<td>0.70</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>Magnesium (%)</td>
<td>0.20</td>
<td>0.12</td>
<td>0.10</td>
</tr>
<tr>
<td>Sodium (%)</td>
<td>0.10</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Copper (ppm)</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Selenium (ppm)</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

NRC. (1986)

**Table 2. Calcium and phosphorus in a Pennsylvania pasture**

<table>
<thead>
<tr>
<th>Item</th>
<th>Avg. Amount 1</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (%)</td>
<td>0.57</td>
<td>0.35-0.97</td>
</tr>
<tr>
<td>Phosphorus (%)</td>
<td>0.32</td>
<td>0.21-0.44</td>
</tr>
</tbody>
</table>

1 Average of 46 samples from May-October, 2006 in an orchardgrass/alfalfa pasture in Centre County, PA; Comerford et al. (2005).

The results of Table 2 indicate the pasture tested would be a suitable source for both calcium and phosphorus for most classes of cattle. The most important issues for mineral nutrition for grazing cattle are the need for additional sodium in many locations. The
lack of selenium in many soils in the Northeast, and the reduction of magnesium in lush, fast-growing pastures in early spring may require additional supplementation of these necessary nutrients. Many times trace-mineralized salt blocks are an insufficient source of the necessary minerals other than salt.

**Calcium**

Calcium is the most abundant mineral in the body, and is an integral part bone and nerve tissue. Most well-managed pastures will have adequate calcium, and legumes will have more calcium than grasses (alfalfa can contain 1% calcium or more.) Grains and weathered forages will be low in calcium.

The most important feature of calcium nutrition is the ratio of calcium to phosphorus. The ideal Ca:P ratio is 1.5 to 2.0:1.0. If the ration is inverted and phosphorus exceeds calcium, absorption of calcium in the digestive tract is reduced, and the animal will metabolize calcium and phosphorus from bone. This can result in less bone growth, brittle bones, and “water belly” or kidney stones. Given the amounts and ratio of Ca:P for the pasture in Table 2, the amount and the ratio are correct, so no additional calcium is needed. For a more mature, poorly managed pasture, this may not be the case and additional calcium would be needed as part of a mineral mixture. A good source of calcium is limestone.

**Phosphorus**

Phosphorus is found in many parts of the animal’s body, and is an important part of energy transfer. Deficiencies of phosphorus have long been associated with reproductive problems with cattle, and in many cases phosphorus was overfed as a hedge against these problems (Fluharty, 2005). However, recent research with dairy cattle has shown (Wu, 2000; Dou, 2002) that reproduction is not compromised if the adequate amount and ratio of phosphorus is added to the diet. Excess phosphorus in the diet is excreted through feces, and overfeeding has become a major issue for phosphorus-based nutrient management. For beef cows, phosphorus requirements are relatively low, and, like calcium, are met with well-managed pastures. Phosphorus in forages is also depleted with increased maturity of plants, drought conditions, and winter grazing. Because of a higher cost than other macro-nutrients, phosphorus can be fed at varying rates based on forage quality and availability.

**Potassium**

Most forages are adequate to excessive in potassium content, and the needs of grazing cattle are generally met. One possible result of excessive potassium is usually associated with grazing legumes in grass-legume pastures or in grasses in early spring, is a reduction in magnesium intake that results in grass tetany.

**Magnesium**

Magnesium is an important mineral for grazing cattle because of the association with grass tetany. Grass tetany is usually seen in cattle in the early spring when there is lush grass growth and cool, wet weather and is caused by a deficiency of magnesium to the cattle. The disease is characterized by a staggering gait, nervousness, and death of the animal. It usually occurs in older cows, and death can result in a matter of hours after the onset of symptoms. Producers who observe these symptoms should call a vet immediately to administer magnesium intravenously. It is important to provide a magnesium supplement in a free-choice mineral mixture during periods of high potential for grass tetany. Magnesium oxide and Epsom salts are two sources of magnesium for these mixtures, palatability is extremely low therefore for adequate consumption magnesium sources must be mixed with dried molasses, salt, ground corn or water to make sure there is adequate intake. Proper liming of pastures is also a hedge against magnesium deficiency.

**Selenium**

Many soils in the Northeast are deficient in selenium, and this can result in white muscle disease and reductions of disease immunity in calves. Many producers in the region routinely administer selenium injections to newborn calves. Selenium can be a part of a free-choice mineral mixture, but a commercially-prepared mix is probably more desirable. Excessive selenium is dangerous to animals and the environment. The amount of selenium needed in a mixture is so small (0.2 parts per million/cow/day) that proper mixing may not be achieved in small batches made at home. A commercially-available selenium source for home mixes usually contains about 0.06% selenium and can be used to formulate a mineral mixture (see Wahlberg, 1997, "Arithmetic and Minerals", Virginia Tech University.)
Other mineral issues
Distillers grains and corn gluten feeds have high levels of sulfur and this must be accounted for in formulating rations. Sulfur and copper in water is additive with amounts found in feeds. Organic and chelated minerals have been widely tested, but there are no consistent results to indicate these forms of minerals will be more beneficial than the mineralized forms. Additionally sheep are extremely sensitive to copper. If sheep and cattle are managed together in similar fields the copper level in mineral supplement will need to be limited to an acceptable level for sheep.

As mentioned earlier to control mineral costs and overfeeding forage and soil testing along with fecal testing should be completed prior to supplementing minerals. Admittedly liver biopsies provide the most accurate reflection of mineral absorption. However the challenge with collecting samples and the cost of conducting the analysis may be prohibitive to using these sampling techniques.

Originally prepared by Dr. John Comerford, retired professor

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Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

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Code: ART-1405