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Minerals for the Beef Cow

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Normally, only six mineral elements need to be considered as supplements to beef cow rations in Indiana — calcium, phosphorus, sodium, chlorine, cobalt and iodine. Where "grass tetany" is a problem, however, the addition of magnesium is necessary. Also, there are areas in the southern part of Indiana where copper and zinc may be deficient under natural grazing conditions.

Minerals other than those contained in natural feedstuffs are essential for maximum reproductive performance, for milk production, and for normal development of the unborn and newborn calf. Following is a brief discussion of each of the mineral elements needed by the beef cow, the level she needs and how it can best be supplied.

CALCIUM AND PHOSPHORUS

Calcium and phosphorus have a close interrelationship in animal metabolism and need to be present in the ration at a ratio varying from 1:1 to 2:1. Wider ratios can be tolerated; but in such cases, each element is utilized less efficiently and may result in a deficiency. The closer the calcium-phosphorus ratio can be brought, the better the chances for normal calcification of the bone, reproduction and lactation.

A mature cow requires about 0.25% calcium and 0.20% phosphorus in the total ration. In general, grains, grain by-products and plant protein concentrates are low in calcium but are good sources of phosphorus. Roughages, on the other hand, are fair to good sources of calcium but low or deficient in phosphorus. Therefore, the best way to protect beef cows against a deficiency of either element is to give them continuous access to a free-choice mineral mixture composed of 2 parts of dicalcium phosphate or bonemeal and 1 part iodized or trace mineral salt. Some good sources of calcium and phosphorus are given in Table 1.

SALT (SODIUM AND CHLORINE)

Salt is universally deficient in the common feedstuffs used for animal feeding. All beef cow rations must be fortified with salt either as a part of the diet or on a free-choice basis. There is no danger of salt poisoning in cattle.

Cattle require about 1.5 ounces of salt daily. Block salt should not be relied upon as the only source of salt for cattle but can serve as a supplementary source. Salt requirements of cattle vary with type of feed and climatic conditions. Therefore, it's a good practice always to feed free-choice mineral with salt, even though some salt is being supplied in the protein supplement or grain mixture.

Protein supplement intake of beef cows can be regulated by mixing 25% to 33% of salt with the protein concentrate.

COBALT

Indiana has been identified as being potentially deficient in the trace element cobalt. Cobalt is essential for the synthesis of vitamin B12 by microorganisms in the cow's rumen. Cobalt-deficient cows become anemic, thin and lose their appetite.

The minimum cobalt requirement for beef cows has not been determined. However, we do know that feeding 1.0 mg. of cobalt daily will correct or prevent a deficiency. Adding 30 to 50 grams of cobalt sulfate or 20 to 25 grams of cobalt carbonate to 100 pounds of salt will insure that your cow herd is receiving this 1.0 mg. amount. Trace mineralized salt is also usually fortified with cobalt.

IODINE

Iodine deficiency can occur in pregnant cows raised in Indiana. A lack of iodine will result in weak or dead calves with an enlarged thyroid gland. Deficiency can be corrected or prevented by feeding iodized salt or trace mineral salt fortified with iodine.
Table 1. Calcium and Phosphorus Supplements for Beef Cows.

<table>
<thead>
<tr>
<th>Source</th>
<th>Calcium percent</th>
<th>Phosphorus percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonemeal, steamed</td>
<td>30.0</td>
<td>13.9</td>
</tr>
<tr>
<td>Defluorinated phosphate</td>
<td>33.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>26.5</td>
<td>20.5</td>
</tr>
<tr>
<td>Monosodium phosphate</td>
<td>22.4</td>
<td></td>
</tr>
<tr>
<td>Limestone, ground</td>
<td>38.0</td>
<td></td>
</tr>
</tbody>
</table>

COPPER
Symptoms of a copper deficiency in beef cows include reduced appetite, loss of condition, stunted growth, rough hair coat, anemia and diarrhea. Prolonged copper deficiency causes the hair to lose color and sudden death of the animal (falling disease).

Normally, the copper requirement of beef cattle is met with rations containing 4.0 p.p.m. of copper (on a dry matter basis). However, in areas of the United States where feedstuffs contain high levels of molybdenum and sulfate, the copper requirement may be increased two- or three-fold.

ZINC
Severe zinc deficiency in young calves results in a scaly, rough skin (parakeratosis) and a loss of hair in patches. Growing cattle deficient in zinc are unthrifty, their hair coat is rough, and their joints become stiff.

The zinc requirement for beef cattle has not been clearly established, but rations containing 30 to 40 p.p.m. of zinc should be adequate for beef cows for reproduction. Cows can be further protected from a zinc deficiency by adding 2.0% zinc oxide to salt or feeding trace mineral salt fortified with zinc.

MAGNESIUM
A magnesium deficiency is associated with "grass tetany" or hypomagnesemia, which is a metabolic disorder in cattle. It may be caused either by insufficient intake of the element or by certain factors which may tie up the magnesium and prevent its absorption. In other words, the symptoms of magnesium deficiency may not always be due to low levels in the natural feedstuffs.

Symptoms of magnesium deficiency are: low levels of the element in the blood (1.0 to 1.5 mg./100 ml.), unusual excitement, incoordination, loss of appetite, viciousness, staggering, muscular twitching, grinding of the teeth and excessive salivation. Unless treated, coma and death follow. Affected cattle usually recover if they receive an intravenous or intraperitoneal injection of calcium-magnesium gluconate in the first few hours after symptoms occur.

Prevent magnesium deficiency and the occurrence of "grass tetany" either by force-feeding 0.5 to 1.0 ounce of magnesium oxide daily in a protein supplement or grain mix, or by providing free access to a high-magnesium mineral mixture (Table 2). In severe cases, 2.0 ounces of magnesium oxide daily may be required.

In some cases, cattle will not consume enough of the high-magnesium mineral mixture to prevent "grass tetany." Therefore, Table 2 shows another mineral mixture which is more palatable and will also supply some energy. This one should be used where magnesium deficiency occurs frequently and is a serious problem. Cows should consume 0.5 pound daily to assure adequate intake of magnesium to prevent "grass tetany."

FEEDING MINERALS
Even though beef cows receive minerals in a protein supplement or grain mix, it is still good practice to give them free access to a mineral mixture. Cows vary in their need for minerals depending on the type of feed, age, and stage of pregnancy or lactation. And feeding them free-choice is the simplest way to meet each animal's requirements under a wide variety of conditions.

If you want to include minerals in a protein supplement, add 5.0% dicalcium phosphate or bonemeal and 2.0% trace mineral salt. In a grain mixture, add 1.0% dicalcium phosphate or bonemeal and 0.5% trace mineral salt.

Table 2. High-Magnesium and Purdue Magnesium Mineral Mixtures for Beef Cows.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>High-magnesium mix</th>
<th>Purdue magnesium mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium oxide</td>
<td>40</td>
<td>Ground corn**</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>40</td>
<td>Magnesium oxide</td>
</tr>
<tr>
<td>Trace mineral salt</td>
<td>20</td>
<td>Dicalcium phosphate</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Trace mineral salt</td>
</tr>
</tbody>
</table>

* Do not give the cows free access to any other source of salt.
** On mature grass or cornstalks where protein is a limiting factor, replace corn with soybean or cottonseed meal.
A good all-purpose mineral mixture which will insure against mineral deficiency under most conditions is given in Table 3. Provide this mixture in a suitable mineral feeder (protected from the weather), and give cows free access to it the year-round. Usually cows will consume from 1.0 to 2.0 ounces a day.

### Table 3. All-Purpose Mineral Mixture for Beef Cows.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicalcium phosphate or bonemeal</td>
<td>200</td>
</tr>
<tr>
<td>Trace mineral salt</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>

**RELATED PUBLICATIONS**

Single copies of the following Cooperative Extension Service publications dealing with beef cow herd management are available free of charge to Indiana residents from their county Extension office or by writing to the CES Mailing Room, AGAD Building, Purdue University, West Lafayette, Indiana 47907.

- Beef Herd Management Calendar — Spring Calving Program (AS-414)
- Health Programming in the Beef Cow Herd (VY-47)
- Infectious Reproductive Problems of Cattle (VY-21)
- Indiana Cow-Calf Record Book (AS-412)
- Reducing Calving Difficulties in Beef Cattle (AS-405)
- Selection and Management of the Cow Herd (AS-396)
- Twenty Ways to Wean More Pounds of Beef (AS-406)