

Mineral Requirements of Livestock, Part II

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A frequently ask question is “Do I need to supplement my animals with minerals?”. My answer to that question is often “It Depends.”.

To answer this question there are two items of information needed:

1. The mineral content of the hay, pasture forage or other feed.
2. The mineral requirements of the animal in questions.

The mineral content of hay and other feeds can be obtained only by **proper sampling and sending the samples to an accredited laboratory for analysis.**

The **mineral requirements** of animals can be expressed in two ways:

1. As mineral concentrations in the diet: %, ppm, mg/kg, mg/lb., etc.
2. As the absolute amount of mineral required per animal per day: lbs./day, grams/day, mg/day, etc.

It is my opinion that the most precise method of expressing mineral requirements of livestock is on an **Amount/day Basis**. Mineral requirements expressed on a dietary concentration basis work fairly well for animals being fed a total mixed ration (TMR) such as dairy cattle, feedlot cattle, swine and poultry. Mineral requirements expressed on an **amount/day basis** work best for beef cow herds or sheep and goat flocks. As an example, the magnesium requirement of a 1200 lb. lactating beef cow can be expressed as **.20% of diet dry matter (DM)** or $(.002 \times 26.4 \text{ lbs. dry matter intake/day})$ **.053 lbs./day (24.1 grams/day)**. If the laboratory analysis of a hay indicated magnesium was .20% of the DM, **adequacy would be assumed**. However, if the maximum intake of the hay was only 24.0 lbs. DM/day, magnesium intake would be only $(24.0 \times .002)$ **.048 lbs./day (21.8 grams/day)**. **The cows would be deficient in magnesium**. The cows would be required to consume 26.4 lbs. DM of this hay to meet their magnesium requirement $(26.4 \times .002 = .053)$, otherwise supplementation would be required.

Equations have been developed to estimate the **calcium and phosphorus requirements** of beef cows and other livestock on an amount per day basis. The following table depicts the method used for beef cows; all units are metric, BW=body weight in kg (lbs. \div 2.2), CBW= calf birth weight in kg, milk in kg/day, gestation is for the last 90 days:

Mineral	Body maintenance	Lactation	Gestation, last 90 days
Calcium	$(.0154 \times BW) \div .50$	$(\text{milk} \times 1.23) \div .50$	$(CBW \times .1522) \div .50$
Phosphorus	$(.016 \times BW) \div .68$	$(\text{milk} \times .95) \div .68$	$(CBW \times .0844) \div .68$

Using the table above, the **calcium requirement** for a 1200 lb. lactating, second term beef cow producing 12.0 lbs. of milk/day would be estimated to be $((.154 \times 546) \div .50) + (5.5 \times 1.23) \div .50 = 30.35$ **grams/day** or $(30.35 \div 454)$ **.0669 lbs./day**. The .50 and .68 indicate dietary digestibility adjustments.

To determine the amount per day requirements of **other minerals** an estimate of dry matter intake must be made. The following is an example of a table that can be used to estimate dry matter (DM) intake for the purpose of estimating the requirements of other minerals in beef cow:

Cow, production state	DM Intake as a % of Body Weight
Dry, pregnant, 2 nd term	1.90
Dry, pregnant, 3 rd term	2.00
Lactating, peak milk 10 lbs./day	2.10
Lactating, peak milk 20 lbs./day	2.20
Lactating, peak milk 30 lbs./day	2.30

The following table shows the suggested concentration of the other minerals in the dietary dry matter of beef cows (Nutrient Requirements of Beef Cattle, 8th Revised Edition, National Research Council, 2016):

Mineral	Units	Gestation	Early Lactation
Magnesium	% of DM	.12	.20
Potassium	% of DM	.60	.70
Sodium	% of DM	.08	.10
Sulfur	% of DM	.15	.15
Cobalt	mg/lb. DM	.0454	.0454
Copper	mg/lb. DM	4.5454	4.5454
Iodine	mg/lb. DM	.2273	.2273
Iron	mg/lb. DM	22.7273	22.7273
Manganese	mg/lb. DM	18.1818	18.1818
Selenium	mg/lb. DM	.0454	.0454
Zinc	mg/lb. DM	13.6364	13.6364

As an example of using the two previous tables together, the following is an estimate of some mineral requirements of a 1200 lb. lactating beef cow expected to peak in milk production at about 20 lbs./day:

Dry Matter Intake Estimate: 1200 lb. cow X .022 (2.20%) = **26.4 lbs. DM/day**

Magnesium Requirement: .002 (.20% of DM) X 26.4 lbs. DM/day = **.053 lbs. Magnesium/day**

The Sulfur Requirement for the same cow would be:

Sulfur Requirement: .0015 (.15% of DM) X 26.4 lbs. DM/day = **.0396 lbs. Sulfur/day**

The Selenium Requirement for the same cow would be:

Selenium Requirement: .0454 mg/lb. DM x 26.4 lbs. DM/day = **1.20 mg Selenium/day**

The Zinc Requirement for the same cow would be:

Zinc Requirement: 13.6364 mg/lb. DM X 26.4 lbs. DM/day = **360.00 mg Zinc/day**