Factsheet BC Ministry of Agriculture, Food and Fisheries

Minerals…for Beef Cattle

Also see "Trace Minerals…for Beef Cattle"

Minerals are essential for the proper functioning of the animal. A problem arises when the feed does not supply enough to meet the animal's requirements. This may occur because the feed is low in minerals, the availability of the mineral is low, or another nutrient is interfering with the ability of the animal to absorb or utilize the mineral.

A time factor is usually involved. It may take from weeks to several months of a mineral deficient diet before any negative effects occur. The animal may have sufficient body stores of the mineral to withstand a short period on a mineral deficient diet. Also, the efficiency of extraction or utilisation of the deficient mineral may improve when the mineral is in short supply in the food.

Macro-Elements

Macro-elements are those that are required in relatively large amounts. This group consists of calcium, phosphorus, magnesium, sulphur, potassium and salt (sodium chloride). Table 1 shows the average levels of several of these minerals in some common feedstuffs produced in BC. Look at the averages, but most importantly, note the wide variability as indicated by the ranges.

Calcium

Most forages are good sources of calcium, although some, like oat forages and corn silage, are marginal to low in this mineral. Grain, on the other hand, is a poor source of calcium.

Calcium deficiency is not very common in animals on mostly forage diets. Deficiency can result in bone abnormalities and reduced milk production, rates of gain or feed efficiency. Cases of milk fever in beef cows are not as prevalent as they are among dairy cattle. However, more cases are being reported every year.

Low levels of Vitamin D or high levels of phosphorus in the diet may also cause apparent deficiency of calcium. The calcium-phosphorus ration is important and should never be less than 1:1 (i.e. equal parts of calcium to phosphorus) nor larger than 7:1 (7 parts calcium to 1 part phosphorus).

Phosphorus

Most forages are marginal in phosphorus content, whereas grain is a good source of this element. Phosphorus deficiency can cause poor reproductive performance, which shows up as irregular heat cycles and reduced fertility.

Other symptoms are reduced feed intake, depraved appetites and, in severe cases, bone fractures. Proper utilization of phosphorus depends on an adequate supply of Vitamin D. Excesses of calcium increase the requirement for phosphorus

Table 1: Average Macro-Mineral Analyses of Some BC Feedstuffs

	Calcium ***%***	***Phosphorus*** ***%***	***Magnesium*** ***%***	***Potassium*** ***%***
Grass Hay				
Average	0.46	0.25	0.19	1.8
Range	0.07 – 1.24	0.05 – 0.62	0..04 – 0.61	0.30 – 6.50
Grass Legume Hay				
Average	0.93	0.24	0.23	2.05
Range	0.22 – 2.44	0.05 – 0.73	0.01 – 0.66	0.62 – 3.85
Alfalfa Hay				
Average	1.33	0.25	0.27	2.59
Range	0.31 – 2.45	0.09 – 0.49	0.11 – 0.55	0.91 – 3.95
Barley Grain				
Average	0.08	0.37	0.16	0.44
Range	0.01 – 0.29	0.10 – 0.52	0.05 – 0.37	0.30 – 0.70

Table 2: The Effect of Phosphorus Supplementation on Reproduction in Range *Cows* *(from the Effect of Free-Choice Phosphorus Feeding on Reproduction of Range Cows, L.M. Bezeau et al, BC* Ministry of Agriculture, Fisheries and Food, 1974)

	No Phosphorus	**Phosphorus**
% Calf Crop	**79**	**97**
Adj. 200 day weight (lbs.)	**440**	**461**

Reproductive disturbances may be the most costly effect of phosphorus deficiency. Reduced conception rates and delays in return to heat after calving translates into reduce call crops and weaning weights (Table 2).

Magnesium

Most of the feed we produce appears to be adequate in magnesium. High intakes of calcium and phosphorus reduce the availability of this element. High levels of potassium may interfere with proper utilization of magnesium.

Grass tetany, the most common form of a magnesium deficiency, is not a major problem in beef cattle although some cases are reported every year. Grass tetany is characterized by nervousness, incoordination, and muscle twitching. The animal may not be able to get up. If not treated promptly, the animal may die. The condition is most likely to occur in cows in early lactation. This condition usually occurs when cattle are grazing lush, rapidly growing pasture and is more likely to occur in older animals.

Potassium

Forages grown in BC normally contain adequate levels of potassium. Grain, on the other hand, is borderline to low in this mineral. A deficiency is not likely to occur in diets high in forages. Potassium supplementation will likely be warranted only on high grain, feedlot type rations.

Salt

Feeds do not contain enough salt (sodium chloride) to meet the needs of livestock. An adequate supply must be available at all times. A prolonged deficiency can result in loss of appetite, unthriftiness, and a drop in milk production.

Choosing a Mineral

Feed analysis is the easiest method for determining which minerals the feed is low in, and is invaluable in helping to determine which mineral mixes will best meet your needs. It may be necessary to test all classes of feed that make up a ration, and testing at several intervals over time may be important in determining an appropriate mineral supplement that would be suitable year to year. Mineral supplements can be classified into three basic categories (Table 3).

Choose a mineral based on what the ration is low in. Feed test to determine this. Once you have found minerals that meet the need for major elements, check the trace element content. Part II of this series will help with this consideration. When comparing mineral supplements, cost per ton is not the only thing to look for. Phosphorus is the nutrient that usually contributes most to the cost of a mineral. As a general rule of thumb, cost per pound of phosphorus can be used to compare minerals that vary in phosphorus content.

Do not be intimidated by the cost of phosphorus minerals. If, for example, we look at the results in Table 2 and assume that this was a 100 cow herd, the benefit of providing phosphorus amounts to 9957 pounds of extra weaned calf (i.e. 97 calves X 461 lbs. – 79 calves X 440 lbs.). The cows consumed 36 lbs. of mineral per cow per year. At $100/cwt for calves, mineral feeding would have increased gross income by $ 9,957 and the cows would have consumed 3600 lbs. of mineral (1.8 tons). At this rate, the cost of the mineral could have been as high as $5,500/ton, and we would still breakeven. Mineral supplements are no where near this expensive.

Table 3: Types of Minerals and Their Application

Basic Mineral Types	Uses
No calcium/high phosphorus (0:1)	Contains no calcium or very low levels.
Primarily used with legume forage and grass-legume mixtures. Much of the grass forage could be supplemented with this type of mineral.	
Equal parts calcium and phosphorus (1:1)	Contains equal amounts of these elements.
Used primarily with grass and cereal forage and corn silage based diets.	
High calcium/low phosphorus	Contains high levels of calcium and low levels of phosphorus.
Most appropriate for high grain rations. May also be needed in rations using medium quantities of grains with cereal forage or corn silage.	

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Methods of Feeding

Free-choice feeding is by far the most widespread practice. Although it is not as good a method as force feeding or top dressing, it can do the job. When free-choice feeding, mix the salt and minerals together and feed as the only source of salt. Since most cattle will eat the salt and do not always consume minerals, this should force the cattle to eat the mixture to get the salt. Keep track of the amount of salt-minerals the cattle are consuming. This is the only way you have of knowing how close you are coming to meeting the animals requirements. If there are problems getting cattle to consume adequate amounts of mineral, the salt level in the mix may have to be increased.

Conversely, if the intake of mineral is excessive, the addition of more salt may rectify the problem. Clean, fresh mineral is important in ensuring free choice consumption levels are consistent.

Requirements

The requirements for macro-minerals vary depending on the class of animal, the level and state of production. Table 4 is adapted from the National Research Council's Nutrient Requirement Tables. In some cases, a margin of safety is included to ensure minimum requirements are met under a wide range of field conditions.

Table 4: Suggested Macro-Mineral Allowance for Beef Cattle

	Calcium		***Phosphorus***		***Magnesium***		***Potassium***	
	%	g/day	%	g/day	%	g/day	%	g/day
Dry Pregnant Cows*	0.38	38	0.25	25	0.16	17	0.80	87
Lactating Cows*								
Average Milking Ability	0.34	42	0.23	28	0.20	24	0.80	98
Superior Milking Ability	0.40	54	0.26	36	0.20	27	0.80	108
Growing Calves								
400 lbs Steer Calves								
15 ADG	0.42	27	0.23	15	0.16	10	0.80	51
25 ADG	0.59	38	0.29	19	0.16	10	0.80	51
600 lbs Steer Calves								
15 ADG	0.38	28	0.21	15	0.16	12	0.80	58
25 ADG	0.53	38	0.26	19	0.16	12	0.80	58
*Based on 1200 lb cow								

Adapted from "NRC Nutrient Requirements of Beef Cattle", 1984

This publications was originally prepared by Rick Corbett, then nutritionist with the BC Ministry of Agriculture, Food and Fisheries, and was updated by M.Malmberg, G.Strachan, and R. France of the BC Ministry of Agriculture, Food and Fisheries; in consultation with R. Corbett of Alberta Agriculture.