

## **Free Choice Minerals for Bovine and Small Ruminants**

As we come into the late spring and early summer months, we need to ensure that our livestock are receiving plenty of nutrients. With this transition, livestock will start producing milk and growing offspring, making their nutrient requirements increase. To avoid any deficiencies or metabolic disorders from occurring in our cattle and small ruminants, we must provide good quality supplements such as clean water and free choice mineral mixes. In this article, we will discuss the importance of providing minerals to our livestock and what signs or symptoms they may show if a deficiency occurs.

### **DIETARY METABOLIC DISORDERS / DEFICIENCIES**

Dietary metabolic disorders are often a result of mineral or vitamin deficiencies. A vitamin or mineral deficiency is caused when the animal is not consuming enough of the nutrient to meet their nutrient requirements. The requirements of the animal can vary depending on their age, sex, species, breed, housing, and reproductive cycle. Because of the variations in requirements it is important to know your livestock's needs. Dietary disorders can be detrimental to an animal's health and life. So we want to avoid these from occurring at all cost. We can easily do so through providing enough nutrients in their diet. An easy and cost effective method is to provide plenty of good quality loose minerals.

### **PREVENTION**

Signs of mineral deficiencies / dietary metabolic disorders can vary from a dull/curly coat to low body condition, to even low breeding rates and retained placentas. In order to avoid these nutrient deficiencies from occurring throughout the year, free-choice minerals should be available to all livestock year round. A good quality loose mineral mix is a good choice for supplement. Depending on the time of year and location, a specific mineral mix may be needed opposed to a regular trace mineral; for instance, a high magnesium mineral mix is needed in early spring and winter to avoid grass tetany. Good quality minerals provide enough supplementation to provide the livestock with plenty of nutrients, which enable those animals to adequately perform.

### **CHOOSING THE RIGHT MINERAL**

There are different types mineral that you can provide your livestock. These types can include loose minerals, pelleted, tubs, injections, etc. Many people have different opinions for which way is best. The best suggestion for a variety of operations is mineral supplementation through free-choice loose minerals. The reason behind this is that the loose minerals are typically cheaper and animals will have free access to the mineral, which allows them to regulate their own intake.

Animals are good at only ingesting their needed amounts of nutrients when they are not coaxed to ingest more. When using other methods of supplementation, the methods are typically expensive and animals may ingest more than the needed amount of minerals. For an example, most mineral tubs contain a large amount of molasses that is very palatable to our livestock. Because of the good taste, our livestock eat a lot of the mineral tub and often intake more mineral than needed. This is considered a loss because the extra minerals are wasted and therefore your money is wasted.

There are several brands and types of minerals that are available in loose mineral form. Choosing the correct mineral is important to reaching max performance. The soils and forages are different all over the United States. Some areas are deficient in nutrients, while others are abundant. Because of this we must look at our location and see what we are deficient and/or abundant in. For this area, we are typically low in selenium, zinc, magnesium, and copper. Because of this be sure to purchase minerals that list that they contain trace minerals and that meet the requirements below. There are also options of custom mixed minerals that are made specifically for ruminants in this area. Several of the local feed and seed stores will carry these custom minerals.

When evaluating a loose mineral you need to consider what type of mineral you need and what the expected intake of that mineral is. Minerals not expected to provide magnesium to control grass tetany are generally formulated to be consumed at 2 oz/head daily, while "high-mag" minerals that are used when grass tetany might be a problem are generally formulated to be consumed at 4 oz/head daily.

*Table 1 shows the levels of minerals that would be acceptable in either "regular" or "high-mag" complete mineral supplements. For phosphorus levels, the low end would be for operations that have high phosphorus forages and the high end would be for those with low forage phosphorus.*

Table 1: Mineral levels needed in regular (2 oz/day) or high mag (4 oz/day) mineral supplements

Mineral	Regular, 2 oz/day	High-mag, 4 oz/day
Calcium, %	12-24	6-12
Phosphorus, %	2-12	1-6
Magnesium, %	0-4	10-14
Salt, %	15-30	15-30
Zinc, ppm*	5000	2500
Copper, ppm*	2600	1300
Manganese, ppm	3600	1800
Iodine, ppm	52	26
Selenium, ppm	52	26
Cobalt, ppm	36	18
Vitamin A, IU/lb	200,000	100,000
Vitamin D, IU/lb	24,000	12,000
Vitamin E, IU/lb	300	150

## **MINERAL CONSUMPTION**

It is important to keep plenty of free-choice minerals available for your livestock. To do this it is important that you keep an eye on the consumption to see if the animals are consuming too much or too little mineral. If you see that they are eating too much mineral try adding more salt to the mineral and moving the feeder farther away from the water source. If they are eating too little of the mineral it is most likely because the mineral is not very palatable. If this is the case try moving the feeder closer to the water source and/or adding dried molasses, cottonseed meal, or soybean meal to the minerals. If those tricks do not work, you may have to try another brand of minerals.

## **WATER**

Having plenty of clean fresh water is important to the health of your livestock. Without clean water they are unable to process their foods or properly ingest nutrients. It is suggested that you provide free choice clean water close to where you feed and provide your mixed minerals. This allows the animals to consume their nutrients without having to travel a far distance to consume water to wash the nutrients down. Mixed minerals make our livestock thirsty; because of this, they must have water for them to consume enough of the minerals.

## **MINERALS**

Minerals are one of six essential nutrients that are required for normal bodily functions in livestock. There are two classifications of minerals that take part in an animal's diet. These classes include macrominerals and microminerals. Macrominerals are minerals that are required in higher quantities in an animal's diet, while microminerals are minerals that are required in smaller quantities. Different species of livestock require different amounts of different minerals. For instance, the required amount of Copper in a goat's diet can be a toxic amount in a sheep's diet. It is important to know the needs of your livestock and what they may be lacking. To be able to properly supply your livestock with the appropriate minerals, it is suggested that you have a good understanding of mineral functions and availability.

## **MACROMINERALS**

### **CALCIUM**

Calcium plays several large roles in an animal's body. These roles include bone development, muscle contraction, milk production, nerve conduction, and blood clotting. The requirement of calcium can vary with each animal and the reproductive stage that the animal is in. Since approximately 99 percent of the calcium stored in the body is located in bone, deficiencies can lead to weak and brittle bones. Along with weak bones, deficiency can cause weight loss, muscle weakness, reduced milk production, or even death. The effect of the deficiency depends on the severity. Different illnesses follow calcium deficiency in different animals. These conditions are unwanted and lead to production loss.

## **SOURCES**

Most grasses are adequate in calcium. Legumes such as alfalfa, peanut, clover, and soybean hay are also good sources of calcium. Corn and concentrates are usually low in calcium so animals being fed strictly grain and corn silage biased diets need calcium supplementation.

## **PHOSPHOROUS**

Phosphorous takes part in several functions of the body. It is very important in the calcium to phosphorus ratio. The ratio is needed for proper bone growth and skeletal function. Phosphorous is also essential in energy metabolism and the formation of enzymes and genetic material. 80 percent of phosphorous stored in the body is stored in bone, tissues, and the blood. When deficiencies occur, the animal's skeletal functions will decrease leading to bone weakness and often bone fractures. Along with weakness, deficiency leads to lethargy, decreased growth, undesired appearance, and depraved appetite; all of which cause production loss.

## **SOURCES**

Most all forages are low in phosphorous, especially in the late growing season. Animals are more likely to become deficient in phosphorous in the winter due to the intake of dry forages that contain an insignificant amount of phosphorous. Protein sources such as soybean meal and cottonseed meal contain moderate amounts of phosphorous, while concentrates and by-product feeds contain a high concentration.

## **SODIUM, CHLORINE, POTASSIUM**

Sodium and chlorine (Salt) are responsible for the proper function of the neural and muscular system in an animal. They along with potassium are all electrolytes, meaning they are responsible for regulating the body's pH and water balance. All also are essential for the transmission of nerve impulses. Being that they are responsible for the water balance in an animal's body, they can easily be expelled through diarrhea. Because of this animals can reach deficiency levels. In addition, these minerals are stored in soft tissues and fluids, meaning they have a short storage time and need to be replenished every day. If this requirement is not met animals will have deficiency issues. If an animal consumes a large amount of concentrates they can become deficient in potassium. Potassium deficiency is expressed through poor appetite and body stiffness. Deficiency in chlorine conveys depressed growth, while a deficiency in sodium shows reduced growth and feed efficiency.

## **SOURCES**

Sodium and Chlorine are available in salt supplements. Cattle will consume more salt when forages are young and growing. If cattle are fed a silage-based diet or a high roughage diet they will consume more salt. If cattle are fed a hay-based diet or high-concentrate diet, their salt consumption will decrease. Potassium is plentiful in green lush grass.

## **SULFUR**

Sulfur is a component of the essential amino acids methionine and cysteine, which make up protein. Due to this, sulfur is important in protein synthesis, hair growth, milk production, enzymes, hormones, hemoglobin, and connective tissue formation. It is also a component of the

vitamins biotin and thiamine. Since sulfur is high in feed such as distiller's grains and corn gluten, it is rare that animals will become deficient if they are being fed a well-rationed normal diet. It is actually more common for sulfur to be fed in excess, which can cause some major conditions. Excess sulfur can cause copper deficiency due to interfering with copper metabolism, along with reduced feed intake, and a serious condition called Polioencephalomalacia (PEM). PEM is a result of excess sulfur causing severe lesions on the brain. Deficiency and excess of sulfur both contribute to production loss and potential death for the animal so it is important that animals receive enough sulfur but not excess.

## **SOURCES**

Sulfur can be found in high amounts in most feed mixes. It is suggested that if your animals are being fed distiller's grain or corn gluten that you take into count how much sulfur supplementation you are giving. Sulfur is often included in most loose mineral supplements through sulfate forms in microminerals. It can also be found in your livestock's water. Because of this, it is important to consider the sulfur content in both feed and minerals while selecting your feed and mineral supplements.

## **MAGNESIUM**

Magnesium is needed for the proper functioning of enzymes, carbohydrate metabolism, and the nervous system. Deficiencies are uncommon except in the late winter and early spring when grasses are green and lush. Cattle can present Grass Tetany if they have magnesium deficiency.

## **SOURCES**

Though not very palatable, magnesium oxide is the best source of magnesium in an animal's diet. Magnesium oxide can be found in any loose mineral mix. Providing a "High Mag" mineral mix during early spring and winter will help supplement and prevent Magnesium deficiency.

## **MICROMINERALS**

### **COBALT**

Cobalt acts as component of vitamin B-12, which is synthesized by bacteria in the rumen. A deficiency in cobalt shows symptoms of appetite loss and reduced growth.

### **SOURCES**

Most all forages in the Southeast provide adequate portions of cobalt. Cobalt is still often included in loose mineral mixes to insure that deficiencies do not occur.

### **COPPER**

Being the most common mineral to be deficient in grazing ruminants, it is also a very important component of enzyme systems that are needed for normal growth and development. When a deficiency occurs, ruminants will show signs of reduced fertility, decreased immunity, and diluted coat color. Deficiencies occur most often with the consumption of an antagonist. This means that the animal ingested excess of another nutrient that reduced the absorption of copper into the body.

## **SOURCES**

Copper is only available to livestock through mineral supplementation. A good quality loose mineral mix will contain enough copper to be sufficient.

## **IODINE**

Iodine is needed for the proper function of energy metabolism. The first sign of deficiency is a condition called goiter in newborn calves, where calves are lethargic and weak. Iodine is not often deficient in the cattle in our area.

## **SOURCES**

Iodine is not often supplemented in the diet of ruminants in the South East because it is often located in the soil. If iodine has to be supplemented it is supplemented through Ehtylenediamine dihydroidide (EDDI) which is regulated to 50 mg per head per day.

## **IRON**

Iron is required for the formation of hemoglobin. Iron deficiency can show symptoms of anemia, decreased immunity, and decreased weight. Deficiency is rarely observed in grazing livestock.

## **SOURCES**

Iron is found in most grasses, but iron sulfate is often included in mineral mixes to make the minerals the dark brown/red color. Unfortunately animals do not process iron oxide so if iron supplementation is needed, iron sulfate is needed to supplement.

## **MANGANESE**

Manganese is essential for normal reproduction, and fetal and udder development. Deficiency will show symptoms of infertility and abortion.

## **SOURCES**

Manganese is found in most all grasses so deficiency is rare in our region in grazing livestock. It is however, still included in most mineral mixes as manganese oxide.

## **SELENIUM**

Selenium takes an important role in reproduction and endocrine function. Selenium is often located in grasses, but unfortunately our area tends to be selenium deficient. This means that we have to supplement selenium to avoid deficiency. Selenium deficiency causes a condition called white muscle disease that is similar to muscle dystrophy. It often occurs in newborn calves. Selenium deficiency will also cause calves to be weak at birth, which increases their chances of contracting calfhood diseases like scours. In cows that are selenium deficient you will see higher instances of retained placentas and poor reproductive performance.

## **SOURCES**

Sodium selenite is the most common form of selenium in minerals mixes. The amount of selenium given is very important because excess selenium is toxic. Because of this, selenium should only be supplemented through premixed minerals.

## **ZINC**

Zinc is a component of many enzymes that are crucial for proper immunity, male reproduction, and skin health. Deficiency symptoms include poor hoof growth, infertility, and low immunity. Zinc also does not store for long periods of time in the animal so supplementation is always needed. Zinc absorption is closely related to copper absorption so if one is deficient the other may follow. If the animal ingests high amounts of iron, it can cause zinc absorption to decrease. It is important to keep iron and copper at their appropriate levels to ensure that zinc does not become deficient.

## **SOURCES**

Zinc can be found in forages but is often deficient in the forages in our area. Zinc is often located in mineral mixes to ensure that deficiency does not occur. Since we are deficient in this area, we must supply mineral mixes containing zinc oxide.

## **VITAMINS**

Vitamins are essential to a healthy animal. They are closely linked to mineral metabolism and absorption. If there is a vitamin deficiency, it can lead to several mineral deficiencies. There are two classes of vitamins. These include essential vitamins and non-essential vitamins. Essential vitamins are vitamins that have to be supplemented, while non-essential vitamins are produced in the animals body and do not need to be supplemented. Most all the vitamins are included in most mineral mixes to ensure that deficiencies do not occur.

### **ESSENTIAL VITAMINS**

- **Vitamin A**
- **Vitamin D**
- **Vitamin E**

### **NON-ESSENTIAL VITAMINS**

- **Vitamin K**
- **B Vitamins**

## **VITAMIN A**

Vitamin A is essential for the proper formation and function of epithelial tissue, eyesight, and kidney function. Deficiency shows symptoms of blindness, poor coat, dry skin, decreased appetite, and labored breathing.

## **SOURCES**

Vitamin A is found in lush green grasses and good quality hay, so it is rare to see a deficiency in grazing livestock. To ensure that livestock receive an adequate amount, a stable form of vitamin A that does not oxidize over time is included in most mineral mixes. In certain situations vitamin A can be injected.

## **VITAMIN D**

Vitamin D is important in bone and teeth formation and function. Deficiencies can cause a disorder called rickets in young livestock. This is when the bones of the calves, lambs, or kids are weak and brittle. Deficiency observed in older livestock includes symptoms of bone weakness, lameness, and tooth breakage. Deficiency is typically not present in beef cattle or other livestock that are kept outside and have access to sunlight.

## **SOURCES**

Vitamin D is supplied through sunlight exposure to the animals skin. A component in the UV rays of sunlight is converted to vitamin D through a process in the skin. Vitamin D can also be sourced through sun treated forages like hay.

## **VITAMIN E**

The metabolic function of vitamin E is not entirely clear but it is known to take a huge role in chemical antioxidants that prevents the destruction of other vitamins. Vitamin E has been proven to help with stress relief. Vitamin E deficiency can lead to other deficiencies of minerals and other vitamins. Because of this many resulting symptoms can occur.

## **SOURCES**

Vitamin E can be found in most forages and whole grains. If a selenium deficiency occurs, vitamin E can be decreased and a vitamin E deficiency can occur, which can lead to other vitamin deficiencies.

## **VITAMIN K**

Vitamin K is needed for proper blood clotting and production of prothrombin, which is needed for proper liver function. Deficiency can be observed though decrease appetite or increased bruising.

## **SOURCES**

Vitamin K is a non-essential vitamin because it is produced by healthy microflora in the rumen of the animal. A deficiency can occur if the animal is or has ingested moldy clover or silage. There is a component in the mold that enables the production of prothrombin. Vitamin K may need to be given to newborn calves that have not established good rumen microflora if deficiency signs are noted or mother is not giving good milk.

## **B VITAMINS**

B vitamins are needed for many metabolic functions such as fat mobilization, hoof production, enzyme function, and brain function. Deficiencies are rare but can be observed through poor hair or hoof production, odd behavior, and excessive weight loss or weight gain.

## **SOURCES**

B vitamins are also non-essential vitamins because they too are formed by the healthy rumen microflora. Calves receive these vitamins through their mother's milk until they form enough microflora of their own. Deficiencies are rare but can occur when animals have low nutrition and forage intake. The rumen needs a lot of forage to properly produce the vitamins.

If you have any questions regarding minerals or making a feeder please feel free to contact me.

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# MINERAL FEEDER

## STEP 1: Gather all needed material and tools

### TOOLS:

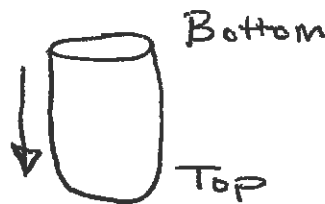
- (2) 3/4" wrenches (if using 1/2" bolts)
- (1) Sawzall with sharp blade
- (1) Electric Drill
- (1) 1/2" Drill Bit
- Permanent Marker
- Measuring tape

### MATERIALS:

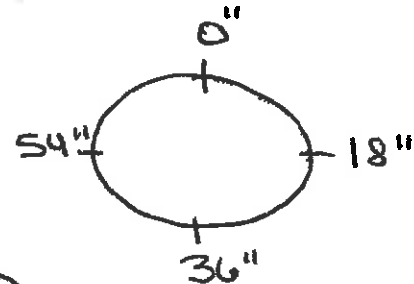
- 55 Gallon Barrel with solid top (No Lid)
- 24.5 inch tractor & trailer tire
- (4) 8 - 10" 1/2 inch full threaded carriage or hex head bolts
- (4) 1/2 inch Nuts
- (8) 1/2 inch Washers
- 30 - 36" chain
- Carabiner or clip for chain

## STEP 2: Mark Barrel

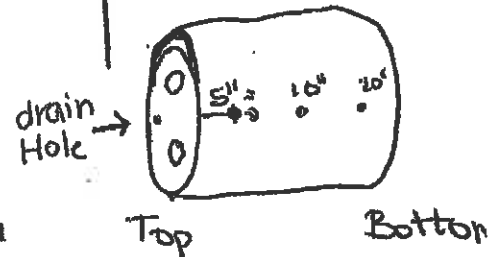
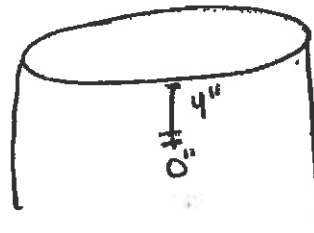
- Flip Barrel on top



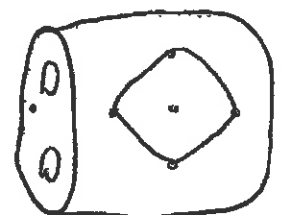
- Wrap measuring tape around bottom of barrel and mark
  - o 0", 18", 36", and 54"
- Measure 4" down from bottom and mark on each 0", 18", 36" and 54" marks



- Lay Barrel on Side
- Find hole in top rim of barrel
- Role barrel until hole in top rim is on bottom

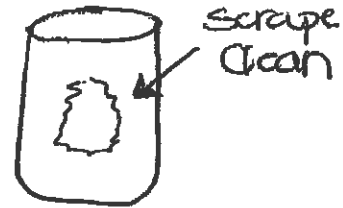


- Measure 5" down from top of barrel and make a mark
- From that mark, measure and make a mark at 10" down (middle Mark), then another mark at 20"
- Place measuring tape on middle mark with 9" on mark perpendicular to the other marks
- Mark 0" and 18" from the middle
- Draw a line linking the outside marks (making a oval)
- Drill three 1/2 inch holes side by side on the oval at the top. (Makes opening to put sawzall blade through)



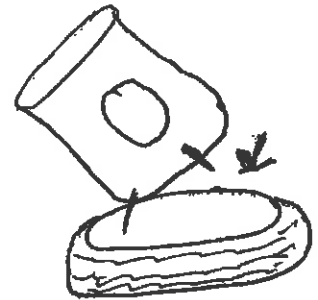
### STEP 3: Cut and drill barrel

- Drill  $\frac{1}{2}$ " holes at each mark on bottom of barrel
- Place sawzall blade inside hole on oval
- Cut out oval
- Once cut out, scrape excess shavings from barrel opening with a knife



### STEP 4: Place barrel in tire

- Insert two bolts side by side through barrel and place washer and nut
- Hand tighten
- Maneuver barrel with bolts into middle of tire
- Once inserted, insert bolts through barrel and place washer and nut on tire side.
- Tighten thoroughly
- Once tightened, pick up barrel and move around to ensure that placement is correct



### STEP 5: Place in field and use

- Move to field and fill with mineral
- Can attach chain around tire to make pulling easier

