REPRO TRACKS

by Cliff Lamb, Texas A&M University

Making it with Minerals

Assess the mineral status of your herd to positively affect reproduction.

Understanding the nutritional status of the herd is essential to reproductive success. Producers have the opportunity to affect reproduction in their operation through the supplementation of trace minerals.

In some cases, producers may neglect or undersupplement their herds for key minerals, resulting in a deficiency. Alternatively, some producers spend significant resources on mineral supplementation and, at times, may be oversupplementing their herd.

The primary minerals most likely to be deficient and that producers should focus on in grazing herds are copper (Cu), zinc (Zn), selenium (Se), manganese (Mn), iodine (I), iron (Fe) and cobalt (Co).

Prior to simply supplementing a mineral, it is important to determine what minerals may be deficient in the diet. Since forage is the most significant contributor to the trace mineral nutrition of grazing beef cattle, it is important to consider a forage analysis to determine what mineral deficits may be present and how they may affect the performance of the cattle. Once the mineral status of the forage or hay is determined, then supplementation that accounts for the deficiencies should be employed.

Trace mineral supplementation may occur through a variety of means, including free-choice loose mineral mixes, trace mineral blocks, fortified energy and/or protein supplements, injections, boluses and forage biofortification.

If a trace mineral deficiency is suspected, a producer may wish to conduct an evaluation of herd trace mineral status. With today's technologies, this task is fairly simple and cost effective.

As described by John Arthington at the University of Florida, the following steps should be considered when a producer is attempting to evaluate herd trace mineral status and the effectiveness of the trace mineral supplementation program.

Table 1: ***Indicators of trace mineral status (Arthington, 2017)***

Copper (Cu)	Liver is the best indicator. Blood is a very poor indicator and should not be used. Ceruloplasmin enzyme activity can be used, but will be misleading in stressed animals.
Zinc (Zn)	Zinc status is difficult to assess in living animals. Liver is a relatively poor indicator. Plasma or serum is the most commonly used indicator, but is reliable only for very recent dietary intake. Reduced feed intake is a common indicator of Zn status.
Selenium (Se)	Liver is the best indicator. Whole blood is a good indicator and better than plasma or serum. Glutathione peroxidase enzyme activity in red blood cells is a fair to good indicator.
Manganese (Mn)	Similar to Zn, Mn is also difficult to assess in living animals. Blood plasma or serum are poor indicators, both representing the Mn concentration of the most recent meal. Liver and hair Mn concentrations are fair indicators of deficiency and toxicity, respectively.
Iodine (I)	Presence of goiter is a primary indicator of severe I deficiency. Diagnosis of subclinical iodine deficiency is difficult. Some reports indicate that milk iodine concentrations may be of some benefit.
Iron (Fe)	Blood hemoglobin concentration is a good indicator of Fe status. Liver Fe concentration is also a good indicator.
Cobalt (Co)	In ruminants, functional Co appears in the form of vitamin B12. Therefore, blood and tissue vitamin B12 concentrations are a good indictor of Co status in ruminants. Liver Co concentrations are fair indicators of Co status.

Step 1: Rule out other influential factors. The first step in identifying trace mineral deficiencies is to attempt to rule out other more directly contributing factors. For instance, if average cow body condition score (BCS) is less than 4.5, chances are far greater that decreases in reproductive performance and/or immune function are a result of energy/protein deficiency vs. trace mineral deficiency.

Also be sure to evaluate the basics of your current supplementation program. Does the product provide a balanced mineral profile using quality ingredients? Are the cattle being provided with a consistent supply of fresh, dry mineral? Are the cattle consuming the mineral at an appropriate level? This includes knowing whether you are oversupplementing trace minerals, since excessive supplementation can also have negative effects on performance.

Step 2: Forage trace mineral concentrations. When collecting forage samples for trace mineral analysis, it is important to collect the sample from areas where animals are grazing (selecting). Do not collect from nonselected forage areas, and be careful to not contaminate your sample with weeds or dirt.

Prior to collection, find a laboratory that will test forage for trace mineral levels. Many commercial laboratories offer an analysis package containing a group of trace minerals for $25 to $50 per sample. The laboratory will provide directions for collection, handling and shipping. It is important to test for Cu, Zn, Se, Co and Mn. It is also important to consider including antagonistic trace minerals, which may interfere with the normal absorption of other minerals. Three commonly recognized antagonists in forages are molybdenum (Mo), Fe and sulfur (S).

Step 3: Herd trace mineral status. If steps 1 and 2 are unable to provide the necessary herd trace mineral status sufficiently, it may be important to further explore a potential trace mineral deficiency by examining animal blood and/or liver mineral status (Table 1).

For two of the most commonly deficient trace minerals, Cu and Se, liver samples provide the most reliable indicator of actual animal stores. Blood samples are an unreliable approach for the measurement of these elements unless the cattle are severely deficient. Modern laboratory technology allows for the use of very small tissue samples for the analysis of multiple trace elements. Today's liver biopsy collection technique is simple, inferring very little stress to the animal.

A summary of common indicators of trace mineral status for cattle is provided. These will vary depending on the laboratory technique, moisture content of the sample and sample preparation processes. It is important to visit with your diagnostic laboratory prior to sample collection for information on how to handle and ship the sample. This laboratory should also be able to share their ranges of deficiency to sufficiency for the samples and minerals being tested. AJ

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