

CATTLEMEN'S COLLEGE
National Cattlemen's Beef Association
Nashville, TN
January 2007

Selenium Deficiency in Cattle

John Maas, DVM, MS, DACVN, DACVIM
Extension Veterinarian
School of Veterinary Medicine
University of California, Davis

Selenium (Se) is an essential trace mineral for cattle and humans alike. It is essential because it is a component of several enzymes that are important antioxidants. It is a trace mineral because it is needed in very small (trace) amounts. We usually talk about Se requirements in terms of tenths of parts per million (ppm)—remembering a part per million is 1 inch in 15.8 miles—we are talking about a tenth of an inch in 15.8 miles. Selenium deficiency is common in many parts of the United States—such as the northwest, Great Lakes region, the west coast, intermountain west, eastern seaboard, and the southeastern U.S. As we have become better farmers the amount of Se in the feeds and hays has decreased markedly. Areas that used to be adequate or marginal in terms of forage Se have now been recognized as being deficient. The reason for this is that plants do not require Se, it is not necessary for plant growth or plant health. To plants Se looks just like sulphur (S) and thus with low Se in soils it is not absorbed into the plant roots. So our good agronomic practices like irrigation, higher production cultivars, legume production (higher in S than grasses), fertilization (particularly sulphate fertilizers), and intensive grazing all decrease the concentration of Se in feeds. Additionally, our cattle have been selected to grow faster and mature quicker so their requirements for Se and other nutrients have increased. Bottom line: we are seeing more Se deficiency problems in beef cattle than in previous decades.

What does Se deficiency look like in cattle? The answer is not simple or predictable; however, there are a number of recognizable syndromes that are caused by Se deficiency. A short list of common problems include:

White Muscle Disease: also called *nutritional myodegeneration*. This condition affects calves from a few days old to a few weeks old. The muscles of the rear legs and/or the front legs will rapidly degenerate leaving the calf unable to walk and these calves will die unless treated with injectable Se. A more severe form first affects the heart muscle and respiratory muscles and the calves cannot breathe or their heart will not pump normally and they die fairly rapidly.

Abortion: Some calves develop nutritional myodegeneration just before they are due to be born and will be stillborn or aborted. This occurs in late term fetuses.

Chronic diarrhea (loose stool): This is common in adult cattle and calves and can mimic many parasitic or infectious diseases such as coccidiosis, intestinal parasites, BVD, Johne's disease, salmonellosis, etc. The cattle have normal appetites but their manure is watery and copious in amount. Often associated with the diarrhea is weight loss in the adults and/or poor weight gains in the calves.

Retained placenta: The afterbirth does not clean rapidly after calving in some herds with Se deficiency. This of course leads to sick cows and decreased reproductive performance.

Infertility: Both the cows and bulls in a Se deficient herd can have decreased fertility due to Se deficiency. This can be extremely costly and can mimic diseases such as Trichomonosis.

Decreased immune response: Se deficient cattle are more susceptible to infectious diseases and do not respond normally to vaccinations. These cattle have higher incidences of common diseases such as pinkeye or foot rot. This problem creates additional costs in terms of disease occurrences and treatment costs.

It is common for Se deficient cattle to have a dull, light hair coat and to look "unthrifty". Also, because Se deficiency can mimic many parasitic or infectious diseases it can be difficult to diagnose. Additionally, usually only one or two of the above problems will be common in a Se deficient herd and the reasons for this are not known. However, once the Se deficiency is recognized and corrected the problem(s) will resolve.

How do I diagnose Se deficiency? It is relatively simple nowadays. Necropsy results of white muscle disease calves is fairly indicative of a Se (or vitamin E) problem. And even easier is the use of blood samples. The diagnostic labs have developed many new tests over the last several years to accurately pinpoint the Se status of cattle. Your veterinarian can submit a blood sample to the diagnostic laboratory will quickly and cheaply determine the selenium status of the herd or animal in question. Serum samples are not appropriate samples for determining selenium status, however.

How do I treat a case of White Muscle Disease? Selenium injections (Mu-Se®, Bo-Se®, or Multimin®) can all work quickly and effectively if administered in time. Also, quite a bit of nursing care may be required to successfully cure a calf that is affected. Of course, time is of the essence in successfully treating sick calves.

How do I prevent Se deficiency? The selenium injection products (Mu-Se®, Bo-Se®, Multimin®) have been used for many years to treat white muscle disease or other selenium deficiency syndromes. The injections provide selenium supplementation very rapidly and are very effective for therapy. However, they provide only partial supplementation for 28 days. Thus, if injectable selenium is the sole means of supplementation, injections would have to be repeated 8 to 12 times per year just to achieve partial supplementation. A more practical method is to add Se to salt mineral mixes at concentrations up to 120 ppm. This method can be very effective at maintaining adequate selenium in the cattle if consumption is adequate. Consumption of the salt mixes at about one ounce per head per day will provide 3 mg selenium per day, which is the legal limit. Selenium can also be added to molasses products and other

supplements. Again, the maximum legal amount is 3 mg selenium per animal per day. I do not recommend 50 pound pressed salt blocks as a reliable means of supplementing selenium or other trace minerals to cattle. The minerals (Se, iodine, copper) appear to leach from the blocks faster than the cattle can ingest the minerals. Currently, in California, there is a Se bolus that releases Se for 1 year and is very effective in supplementing Se to grazing cattle. This Se bolus may become available everywhere in the U.S. over the next few years.

Selenium deficiency is becoming more widespread as a problem in grazing beef cattle. It has also become easier to diagnose and it is important to consider this issue in planning your herd health procedures with your veterinarian.