



Reducing Selenium Risks

Tiny nutritional details can cause the most impact.

by *Jaclyn Krymowski*

Vitamins and minerals are some of the trickiest nutritional considerations to pinpoint and feed accurately. Not only are many of them incredibly intricate in function, but their impacts are dependent on other aspects of the diet and lack of them can limit other metabolic functions.

In the case of selenium (Se), an essential micronutrient, beef cattle requirements are extremely small. Cattle require a mere 0.10 parts per million (ppm) of selenium in their entire diet. If this requirement goes unmet, however, the impacts can be detrimental, especially for young calves and vulnerable individuals. Even if not life-threatening, inadequate dietary selenium levels can lead to other impacts in growing and mature animals, including poor reproductive performance, lack of growth and chronic infections.

Selenium sources and requirements

Selenium is a particularly difficult mineral to deal with as it can easily become toxic or deficient depending on the animal's diet and soil type of the region. Understanding its role is essential for cattle producers to avoid either scenario.

still be offered according to Tara Felix, Pennsylvania State University assistant professor and beef Extension specialist.

"Given the shift in forage and soil micronutrient concentrations by region and even by paddock, providing regularly supplied minerals is the only way to be certain that animals are being provided their daily requirements of micronutrients," Felix says.

She notes there are 21 different elements cattle require for proper physiological function.

"To choose not to supply minerals to cattle is a gamble with reproduction and growth. [It is one] that most cattle producers cannot afford to take," she says.

While less common, selenium toxicity can also occur in some regions due to grazing conditions. Felix says this can happen when animals graze seleniferous plants in soils that are already especially high in the mineral.

"Seleniferous plants are those that readily accumulate or take up soil selenium," Felix says. "Typically, when provided adequate grazing, cattle will avoid grazing seleniferous plants."

To prevent this issue, she recommends not overgrazing in selenium-rich regions. The threat of toxicity can occur when pastures are overgrazed and cattle are forced to consume plants they otherwise would not.

Balancing selenium for herd health

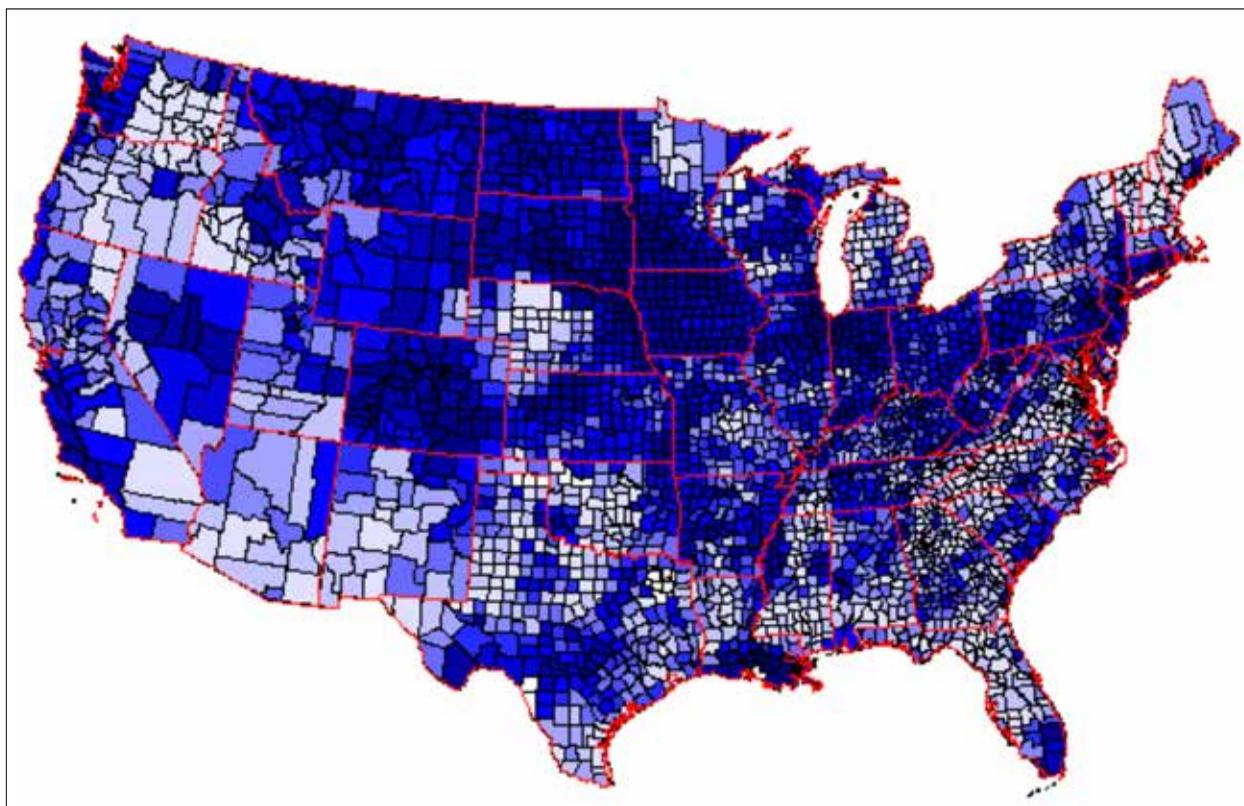
Producers may wonder what exactly deadly excess selenium levels are and whether individual animals have different tolerance levels.

"One of the challenges to answering this is that selenium and Vitamin E have very similar functions in the body and one can act for the other in times of mild deficiencies," Felix says. "The Food and Drug Administration (FDA) states that selenium cannot be included in any animal's diet at more than 0.3 ppm (of the total diet). In fact, selenium is the only FDA-regulated mineral."

An injectable form of selenium supplementation is possible, but it is generally only given to animals who qualify as "at risk," Felix adds. These include calves born to dams who graze low-selenium soils during their late gestation period and/or lactation post-calving. If the dam is deficient, there is no way for her to supply the needed amount of selenium to her calf during gestation or through milk consumption.

The classic issues of selenium and vitamin E deficiency are those related to what's known as white muscle disease. Vitamin E has functions similar to selenium and works with the mineral to help regulate harmful free radicals in the cells.

According to a Washington State University bulletin, this condition is the cell degeneration of the muscles, and it can include the heart. In very young animals, white muscle disease tends to reveal itself when calves are inexplicably weak, stiff and lame. In



The U.S. Geological Survey provides an interactive online map listing mineral and trace mineral levels in soil for each county (see: <https://mrdata.usgs.gov/geochem/doc/averages/se/usa.html>).

Selenium levels vary greatly from region to region. Soil testing is the only way to accurately know selenium levels in a particular geographic area. While higher selenium soil levels are helpful, knowing exactly how much animals are getting in their daily diet is a little trickier as most forages don't contain much available selenium when consumed.

Even in areas where the soil has sufficient amounts of this nutrient, mineral supplementation that includes safe levels of selenium should

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severe cases they can have difficulty breathing or swallowing; in some situations this can lead to inhaling milk into the lungs causing aspiration pneumonia.

Over time these animals will spend more time lying down, often with their chin on the ground as their muscles become too weak to support their heads. Death is usually the outcome in calves if left untreated. While the condition can be progressive, when the heart is affected, death can be very sudden, especially as animals walk or exercise.

Though not as severe as with calves, selenium deficiency can contribute to a host of issues in more mature animals. These range from unthrifty growth to infertility and retained placentas.

Preventing selenium deficiency

Prevention is by far the most effective treatment for white muscle disease and any selenium-related health issues. As with many microminerals, it can be difficult to ensure the herd's diet is sufficient at any given time.

Selenium blood assays exist, but Felix notes they can be challenging to use as a baseline, as they may or may not be indicative of the mineral's true status in the animal's biological system.

"Blood concentrations of many minerals can shift during times of stress, for instance," she says. "In a grazing operation, the best way to determine selenium needs of animals is to test the soil and the forage regularly. Providing a well-balanced trace mineral program will generally ensure that cattle do not suffer selenium deficiency."

Research shows animals that are selenium deficient tend to retain more when given access to the mineral, compared to those receiving adequate levels. One suggested reason for this is because

of increased absorption responding to the animal's needs. As such, caution needs to be taken when giving extra selenium to animals that are deficient.

Trace minerals and complete feed rations should be checked for their selenium levels. Vulnerable animals can also be given additional selenium through injections or even oral pastes. Because it is so easy to overdose, pure selenium should never be supplemented directly into the diet.

Take deliberate action

Dietary selenium plays an important role in each and every herd. Ensuring requirements are met as closely as possible in the diet is essential to the well-being of the herd. Offering quality trace minerals and a complete diet are among the most effective ways to accomplish this. If you are in a region known for selenium deficiency, consult with your veterinarian and/or nutritionist as to the most appropriate remedy for your situation. Likewise, any selenium treatment given to calves should be administered according to recommendations to avoid the risk of overdose.

Mineral nutrition can be frustrating and confusing, especially if it has been a consistent struggle. Awareness is the first step in finding viable and long-lasting solutions for livestock. Voluntary effort and the willingness to take the optimum course of action can go a long way in significantly reducing selenium deficiency issues, if not entirely mitigating them. **HW**

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