



## Pay Attention to Beef Cattle's Sulfur Intake

Dr. Jeff Lehmkhuler, Extension Beef Cattle Specialist

Mineral requirements for beef cattle are often overlooked by many producers. This may be partially due to the ease of supplementation using trace mineral packages and other mineral products. It is complicated by the mineral interactions that can occur and limited research that has been conducted in the mineral area.

The recent version of the National Research Council (NRC) Nutrient Requirements of Beef Cattle list a recommended dietary sulfur content of 0.15% for all phases of production. This publication also lists that the maximum tolerable level for sulfur is 0.4% in diets. Excessive dietary sulfur can be detrimental to animal health as well as inducing mineral deficiencies as a result of forming insoluble mineral complexes. Copper for instance has been shown to bind with sulfur and iron in the rumen.

It is widely known that dry matter intake is impacted by water consumption in cattle. Water containing high concentrations of sulfur can be problematic reducing intake and animal performance. Research conducted in 1971 illustrated heifers receiving water with 5,000 ppm of sulfates from sodium sulfate lost more weight due to lower water and feed intakes. More recent research conducted in South Dakota further illustrated the detrimental impacts of high sulfate containing water on performance. Additionally, polioencephalomalacia (PEM) or brainers can be induced by the consumption of high levels of sulfate.

The Merck Veterinary Manual lists PEM as being caused by both thiamin status and excessive sulfur consumption. Brainers were associated with a thiamin deficiency as a result of low tissue thiamin levels. Diets containing high levels of grain can favor environments for microorganisms that produce thiaminase destroying thiamin resulting in an increased risk of a deficiency. Cattle suffering from PEM may respond to thiamin supplementation. Recent findings have revealed that PEM can be a result of hydrogen sulfide gas inhalation independent of thiamin status.

Within the rumen, the microorganism ferment sulfur containing substrates producing hydrogen sulfide gas. The animal eructates (belches) the gas from the rumen and may then subsequently inhale this gas. Hydrogen sulfide interferes with energy metabolism of the central nervous system. Researchers at Oklahoma observed PEM symptoms in 100% of cattle consuming experimental diets containing 0.55% and 0.71% sulfur. Polioencephalomalacia was observed in animals beginning on day 13 and continued through day 37 indicating that the cattle did adjust to the excessive dietary sulfur intake. Though PEM was not detected in cattle consuming diets containing 0.39% sulfur, all were found to have microscopic brain lesions. Others have observed PEM in cattle consuming diets containing sulfur levels of 0.26%.

When utilizing alternative feedstuffs and co-products, it is highly recommended that a feed test be conducted which includes a mineral assay. Recently, it appears that the sulfur content of corn-based co-products vary and may contain high levels of sulfur. This is due to the use of sulfuric acid to control the pH as well as the inclusion of ammonium sulfate to aid fermentation. It is recommended that producers work with their nutritionist or county agent to reduce the risk of inducing PEM.