



Cattle Producer's Handbook

Animal Health Section

628

White Muscle Disease and Other Selenium-Responsive Diseases of Livestock

John Maas, Extension Veterinarian, University of California, Davis

*Ronald Hathaway, Extension Agent, and
J. E. Oldfield, Director, Nutrition Research Institute,
Oregon State University*

The discovery, in 1958, at Oregon State University that the cause of white muscle disease was selenium deficiency began our understanding of the importance this trace element has in cattle nutrition and health. Today, our understanding of selenium (Se) deficiency is much more comprehensive, yet far from complete.

The fact that Se deficiency occurs because of low soil concentrations of Se is modified by many factors. Since the original soil Se maps of the western U.S. were completed in the early 1960s, Se deficiency has been recognized in many additional areas of the West. Reasons for the increasing areas of Se deficiency include:

1. Increased use of fertilizers,
2. More intensive irrigation methods,
3. Modern plant breeding (cultivars that grow more rapidly), and
4. Improved genetics in cattle, resulting in increased growth rates.

Plants, which do not require Se as a nutrient, incorporate Se into plant tissues as a function of time and speed of plant growth. The more production per unit (e.g., through irrigation, plant genetics, and fertilization) the less the Se concentration is in the plants. Also, sulfur (S) in fertilizers directly competes with Se for uptake by plants. Plants with lower Se concentrations cause the resulting Se deficiency in cattle because the concentration of Se is too low to meet nutrient requirements.

Additionally, as cattle grow faster and are more feed efficient because of improved cattle genetics, the Se deficient plants in their diet create a greater deficit. Cattle on most cow-calf operations consume forage from a small geographic area. If the forage is Se deficient, Se may be the limiting nutrient for the herd.

Clinical Signs of Selenium Deficiency

Muscular Damage (Myopathy)

The classic symptoms of Se deficiency were referred to as white muscle disease because of the white appearance of diseased muscles. This problem most often occurs in calves 1 to 3 months of age, affects the muscles of the hind legs, back, and shoulders, and causes lameness and progressive weakness with death occurring within 72 hours.

If the disease occurs in younger calves (1 to 4 weeks of age) it causes more damage to the heart muscle and the muscles of respiration. These younger calves appear to have pneumonia, with elevated respiratory rates, rapid heart rate, and increased body temperature.

The muscle damage can occur in calves before birth and may result in late-term abortions. This condition is basically white muscle disease occurring before birth. Severe muscle damage can also occur in yearling and adult cattle. In these cases, red urine results from the release of muscle pigment (myoglobin) into the urine.

Diarrhea and Weight Loss

This Se deficiency problem is often referred to as "Ill Thrift." Both young cattle and adults can be affected. Many will develop profuse, watery diarrhea, appear unthrifty, and the hair becomes light in color, dry, and doesn't shed. These cattle have decreased weight gains and experience decreased feed efficiency. This aspect of Se deficiency is by far the most economically important and has become the commonly recognized problem with Se deficiency.

Selenium deficiency can cause large economic losses without a single calf dying. Weight loss, diarrhea, poor gains, and an unthrifty appearance have many other causes. Some of these other problems in-