WHAT'S NEW WITH SELENIUM …….FERTILIZING OREGON PASTURES

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Nearly 50 years ago, it was practically impossible to raise livestock profitably in many parts of Oregon. The problem was called "white muscle disease" and it affected heart and skeletal (leg and back) muscles of young calves and lambs. If the skeletal muscles were affected, the young animal's legs became stiff and they had trouble getting up to nurse, or to follow herds around. If the heart muscle was involved, the young animals often died from sudden heart failure if they were subjected to strenuous exercise. Losses as high as 80 percent of an annual calf crop were noted on some ranches and this forced some ranchers out of business. The name "white muscle disease" comes from the characteristic, bleached out color of the affected muscles which is related to two causes: (1) the muscles become inactive and their content of myoglobin, the red pigment in normal muscle is reduced, and (2) calcium salts, which are white, are deposited in the damaged muscle.

In 1958, a team of scientists at Oregon State University was able to pinpoint the cause of the trouble. They brought clover hay from known "white muscle" areas to Corvallis and fed it to ewes whose lambs subsequently developed the lesions of white muscle disease. This proved that the problem was nutritional and the investigators tried adding a number of nutrients to the feed, including selenium, to see if they could prevent the disease.

The remedy, when it was discovered, was simple. Since the problem was caused by a deficiency of selenium, it could be prevented or cured by supplemental administration of the trace mineral. White Muscle disease occurs wherever there are volcanic soils. In the heat of volcanic eruption the selenium became a gas and drifted away, leaving the soil residue deficient. Most of the Cascade Mountains and the surrounding soils are known to be of volcanic origin.

The work at OSU proved that selenium deficiency was the cause of white muscle disease and it is now recognized as a dietary essential for both animals and humans. After the demonstration that white muscle disease could be prevented by supplementing livestock feeds with selenium, a number of other "selenium responsive" diseases were identified in the United States and in other countries. Selenium supplementation is now an accepted animal production practice to achieve normal growth and reproduction and has been practiced for nearly 40 years.
An obvious question is whether, after all of these years, continued supplementation is necessary. One might expect that selenium excreted by supplemented animals might build up in the soil and prevent further deficiency. This apparently has not happened and in New Zealand, where selenium deficiency has been known for at least 40 years, continued supplementation still gives positive results.

Different chemical forms of selenium are used in different situations. The selenium given in feed has usually been sodium selenite; although recent research shows that organic selenium preparations like selenized yeast may be more easily available to animals. When selenium is added to fertilizers, it is usually in the form of sodium selenate, which is shown to be more available than selenite. The addition of selenate to fertilizers has a couple of advantages: it is cheaper than the organic forms of selenium and the plants convert the inorganic selenate to selenoproteins, which increases it's availability to animals.

Since the discovery of selenium deficiency as the cause of White Muscle disease, there are a number of ways it can be made available to your animals. There are several preparations on the market that provide selenium by injection, often with vitamin E added which is thought to improve selenium's availability. For ruminants, there are some ingenious heavy pellets containing selenium, which are given to animals as a bolus. Because of their weight, these pellets don't pass along the digestive tract with the rest of the feed, but stay in the fore-stomach, where they gradually give off selenium to the animal's

system. Selenium can also be added to feed, mineral or protein supplements. In such cases, the needed amounts of selenium must be carefully measured and thoroughly mixed to ensure that animals get enough of it, but not too much.

Another method of administering selenium is to add it to fertilizers, which when applied to range or pastureland will bring up the plant selenium to normal, healthy levels. This has been done successfully in Finland and New Zealand. Currently, a selenium fertilization project is underway in Oregon. If successful, the addition of selenium to fertilizer may be the most effective way to insure that all animals in a herd receive an adequate dose of selenium. This will also provide livestock producers with an economical way to prevent one of the most devastating diseases to young calves and lambs.

During the past 5 years, OSU Extension faculty, along with several retired animal science department faculty, have investigated the feasibility and effectiveness of adding selenium to fertilizers that are used in various parts of the state. This work, in the form of field trials, has measured the selenium content of plants that have been fertilized with selenium and compared against plants that have not been exposed to supplementary selenium. The studies have been done at various locations in the state, where selenium is adequate or deficient and under different conditions of soil pH and rainfall.

The research work so far has shown that very small amounts of selenium (5 grams actual selenium per acre) applied to pastures can result in adequate selenium levels in the feed and subsequently higher blood levels in the animals grazing the pastures or eating hay or silage from these selenium fertilized pastures. Work done at OSU's Soap Creek Ranch near Corvallis three years ago showed that blood selenium levels were dramatically increased when treated grass silage was fed to beef cows as compared to salt supplemented cows.

This research work has paved the way for the Oregon Department of Agriculture to approve the use of a commercial selenium containing product mixed with fertilizer material. The fertilizer mixes with selenium are now available from several Oregon fertilizer dealers.

A trial was initiated in the spring of 2002 to look at several different selenium materials. This research work will continue through 2005. We now know that the use of sodium selenate on pastures in early spring can raise selenium levels in plants. The major difficulty is that the life span of the results is pretty short, being only a couple of months. Applying too much sodium selenate may result in toxic levels in the plant. Sodium selenite, another form of selenium is being investigated to see if adequate plant selenium levels can be sustained over a longer period of time without the danger of toxicity.
A word of caution to anyone thinking about fertilizing with selenium. While a little is necessary, putting on too much can result in forage that is toxic to livestock. Rates of use must be carefully noted and the amount of selenium applied per acre needs to be precise or losses can result.

There is a great deal more known about the effects of adequate selenium on animals and humans than was known a few years ago. If the research and demonstration efforts of OSU's Animal Sciences and Range Extension faculty prove to be successful, Oregon beef and lamb producers will have another tool available to maintain and improve the health and productivity of their herds.