Trace Mineral Supplements

Enhance Calf Health and Cow Reproductive Performance

by ***Heather Smith Thomas***

Reproductive performance in cattle, skeletal development in young animals, optimum health and strong immunity all depend on adequate nutrition, which includes important trace minerals. Some soils and plants, however, are short on various minerals, leaving feeds deficient.

Ever since the 1950s, for instance, cow-calf producers have been aware of problems caused by selenium deficiencies — white muscle disease in young calves, retained placenta and infertility in cows, abortions, premature or weak newborn calves. In most geographic areas of the U.S., soils are deficient in selenium.

Later, researchers found that copper deficiencies were also widespread, resulting in poor hair pigmentation, fragile bones, impaired reproductive performance, poor growth rates and reduced immunity. Copper supplementation has improved conception rates and immune responses to vaccinations.

The most recent forage and cattle studies have indicated that zinc may be the most widely deficient trace mineral. Zinc is important in many body systems including production of certain enzymes (particularly for synthesis of DNA and proteins), carbohydrate metabolism, hoof structure and soundness, and male fertility (deficient animals have smaller testicles and reduced semen quality).

Zinc-deficient calves may have swollen feet, scaly skin with open lesions, wounds that take longer to heal, loss of hair, excessive salivation, reduced appetite, reduced feed efficiency and growth rates, and impaired immune systems. Moderate deficiencies are not so readily recognized but take an economic toll through decreased growth rate and impaired immunity and fertility. Calves born to zinc-deficient dams have lower levels of immunity even when fed adequate amounts of zinc.

Manganese, another important trace mineral, is important for proper bone and cartilage formation — which directly affects bone growth in young animals. It is also crucial for optimum fertility in cows. Signs of deficiency in calves include skeletal deformities, swollen joints and stiffness.

During the past two decades, U.S. Department of Agriculture (USDA) studies of blood levels for trace minerals in cattle herds around the country found numerous animals deficient in these four important minerals. Many livestock producers use supplemental minerals to augment cattle diets. These minerals are often supplied in salt/mineral mixes, provided free choice.

Consumption is varied, however, with some animals consuming too much while others eat inadequate amounts or none at all. Also, other aspects of diet (including certain minerals that may negatively interact with the supplement during digestion) may hinder absorption by the body. Because of this variability, some stockmen resort to individually dosing their animals by drench, bolus or injection to make sure the cattle directly receive the necessary minerals. In recent years, the value of injected trace minerals has been recognized as a reliable way to ensure that cattle receive them.

Lourens Havenga, Multimin USA Inc. chief executive officer, says the USDA conducted three surveys during the 1990s on selenium, copper and zinc blood levels in cattle.

"When they did their most recent survey, they found there was actually a higher number of individual animals and herds deficient in zinc than either copper or selenium," Havenga says. "When we created our injectable mineral product for the U.S., we based it on the 2001 NRC (National Research Council) requirements and actual absorption of minerals, recognizing proper ratios of copper, zinc, manganese and selenium."

Havenga points to several university studies that have shown the benefits of injected trace mineral products that looked at how rapidly the minerals are absorbed and how long they are stored in the liver. Other studies have evaluated the effects on calf health and reproductive performance when cows were injected before and after calving.

Researching response

"After launching our new product, I had a lot of questions from veterinarians and producers, asking how it actually works. For instance, after injection how quickly is it absorbed, how quickly does it go into the liver, how quickly do we see the different enzymes (that rely on these minerals) start showing response. So I contacted researchers at Iowa State University to do some studies," Havenga says.

"I met with Stephanie Hansen, who has done a lot of trace mineral research, and she agreed to do the research on these questions. So we sponsored this research at Iowa State, and she provided us with an elaborate and detailed trial report and presented her research findings at the animal science meeting in Denver in mid-July 2010."

Hansen found that the injected product is absorbed rapidly. "Once you've injected the animal, mineral levels in the bloodstream increase and reach a peak within eight to 10 hours. Most of the mineral that the animal doesn't utilize is stored in the liver, while some is excreted by the kidneys. The high blood level is maintained for about 24 hours and then drops. Then the body stores the excess in the liver or gets rid of it in the urine or feces," says Havenga.

"We only ran this study for 15 days and found that the storage levels were high for the full 15 days. We later had other studies done at Texas A&M that showed the product actually lasts (stored in the liver) for about two to three months, depending on mineral status prior to injection," he says.

The third part of the research project at Iowa State looked at enzyme responses. "It (enzyme response) starts immediately," Havenga says, "but by 14 days after injection significant changes were confirmed. This is why we recommend that producers use this product a little bit in advance of stresses, calving or breeding, especially for enhancing reproductive performance. It's best if you can inject cows about a month before they'd be breeding or about a month before calving (at a minimum) for optimum benefit. You can use it earlier than that, such as at preg checking, but shouldn't use it much closer to these events because cattle might not get full benefit."

Other studies

A Texas A&M study in beef cattle came up with additional data regarding differences in cattle performance when injected with trace minerals. An experiment was conducted to determine the effects of providing pre-calving and pre-breeding injections of Multimin and vitamin E on reproductive performance of beef cows and on health and survival of their calves.

In this study, 67 crossbred cows were randomly assigned to control or Multimin/vitamin E treatments. Treated cows were given injections 30 days prior to the start of calving and again 21 days prior to start of breeding. The trace mineral injections effectively improved copper levels (liver) and selenium (blood levels), compared to the non-treated cows. The treated cows had significantly higher liver concentrations of copper than the controls, remaining higher for 161 days after the last injection.

Previous research had shown that cattle have improved performance and/or immune function with trace mineral supplementation when they are marginal to deficient in copper, zinc and selenium, but differences may not be seen when cattle have adequate levels to begin with. In the Texas study, more cows became pregnant in the treated group; cows in the control group were 2.4 times more likely to be open.

"Researchers injected the product before the cows calved and again before they bred the cows. This showed that if you use the product strategically, these two injections can keep liver levels elevated in the cow for almost a full year (one production cycle). We stopped that trial at 256 days just before the cows started calving again the next season," says Havenga.

"The producer benefit in the Texas A&M study was that we increased calving percentage, and those cows also calved earlier. The Multimin-treated cows bred back quicker and calved six days earlier, on average than the untreated cows. This gives us a better understanding about how this product works," he says.

Making sure cows have adequate levels of trace minerals during pregnancy also ensures normal bone formation and immune system development in the growing fetus and also enables the fetus to have adequate stores of these important minerals in its liver. Deficiencies in the calf cannot be made up through supplementing the dam after calving since these minerals do not transfer very well through the milk.

Some stockmen cover their bases by giving young calves injections during the first days or weeks of life or at branding time. Ideally, you need to make sure the calf has peak levels (and is not deficient) at the time of vaccinations, in order to be able to mount strong immunities. Unless a calf has adequate trace mineral status, vaccination may not be able to protect him against disease. **HW**