



Jim Sprinkle

Graduate student obtains a liver sample form a cow to assess trace mineral levels.

Trace Minerals for Cattle

*Supplement boosts selenium,
copper and zinc*

by Joanne Littlefield

University of Arizona animal scientists have noticed for years that Arizona cattle held in feedlots seem to contract more diseases. Some scientists linked the increases to overcrowding or to stress during transport. Recently, however, researchers began to look at the nutrient deficiency of range forage as a potential culprit, zeroing in on its lack of the trace minerals selenium, copper and zinc. Jim Sprinkle, College of Agriculture and Life Sciences (CALS) animal sciences area extension agent, led the research team that learned not only how cattle health is affected when their diet lacks these critical minerals, but also figured out a more efficient way to get cattle to consume them.

“It appears that a lot of the early days of feedlot losses for weaned calves can be traced to (a lack of) trace minerals,” Sprinkle says. “Trace minerals, which are essential to health in small amounts, are needed not only for cellular integrity but also for immunity from diseases.” Sprinkle also knew from his own previous research with a cooperator in the Globe area that cows had greater reproductive efficiency, called “breedback,” when supplied regularly with trace minerals. According to cattle industry standards, cows demonstrate breedback when they are able to reproduce at least once a year. That has been a problem in Arizona.

“We’re always fighting to get our cows to reproduce in 365 day intervals because we have such harsh conditions, such unpredictable rainfalls, and this is just another factor. If we can control one particular factor, that may influence the reproductive rate.” Sprinkle says. His study demonstrated that 14 percent of the cows treated with trace minerals conceived 30 to 120 days earlier than the untreated group.

It turns out that when selenium, copper and zinc are at low levels in Arizona’s volcanic and granite-derived soils, the plants that grow there are lacking in them as well. Research from the 1960s showed that a large area of central Arizona from Roosevelt Lake eastward to New Mexico was deficient in selenium. Additional recent sampling revealed that most of the areas along the Mogollon Rim in north central Arizona were not only selenium deficient, but also copper deficient at certain times.

Ranchers have compensated for this by adding the minerals to salt blocks placed across the range, but the rugged terrain over much of the rangeland in Arizona, along with difficult access through wilderness areas and high fuel costs can make getting the minerals to the animals difficult.

"We originally thought that if you had a real nice growing season, copper levels would be higher as well as calcium, phosphorus and some of the macro minerals," Sprinkle notes. Yet contrary to what the team originally supposed, they found that during a wet year, copper levels in forage actually decreased with increased moisture.

In studies conducted from 2000-2002 at the UA's V Bar V Ranch in Yavapai and Coconino counties, the scientists decided to focus their efforts on other ways to introduce the trace minerals directly into the cows. They knew that because the fetus draws extensively from maternal liver storage of selenium, getting the minerals to cows early in the pregnancy could lead to better health for both the cow and calf. Sprinkle wanted to see if getting the cow to carry its own trace mineral supplement would not only lead to improved health, but also prove economically feasible for the rancher. He wondered, "Why not let her haul it wherever she is?"

In January 2000 the study group of 90 cattle was rounded up, weighed and examined for overall body condition.

Blood samples were taken to establish a baseline level of selenium, copper and zinc for each cow. The cows received two doses of a trace mineral mix administered in bolus form with a pill gun. A bolus is a compact packaging for a drug—in this case it was the trace mineral. It measures about three inches in length and 3/4 inch in diameter, about the same size as other cattle medication. The bolus gun has a plunger to send the pill down the cow's throat where it lodges in the reticulum (one of the stomachs) and slowly releases the minerals for five to six months.

In addition to testing whether this process could elevate trace mineral levels in the cattle, Sprinkle also hoped to find the ages and breeds of cows that exhibited the greatest mineral absorption. Cattle on the V Bar V ranch are currently divided among four breed groups: registered and commercial Hereford, Brahman crosses and two composite breeds. The breed composition of the first composite is 1/4 Angus, 1/4 Hereford, 1/4 Senepol or Barzona, and 1/4 Gelbvieh. The second composite was not included in the study.

The study group included 15 cows of each breed in both the treatment and control group. The research team followed the cows through a standard grazing rotation schedule from low elevation at about 3200 feet, up to 7200 feet. They were re-examined in May and again in September—this pattern

continued throughout both years of the study.

The main findings showed the bolus was effective in raising cow liver copper and blood selenium and that it also raised blood selenium in the calves. For comparison, trace mineral levels in the forage were also sampled four times a year.

"Obviously, what we sampled in the forage may not have been exactly what the cow selected, but we needed to follow it as much as we could," Sprinkle says. "There are always some trace minerals present in forage. It is never totally devoid, just deficient. Otherwise, all cattle would experience severe health problems."

The liver copper present in the control group reflected their diet from forage alone, while the level present in the livers of the treatment group reflected their diet plus what they got from the bolus. The levels of copper in the forage changed each year and were reflected by rising or falling liver copper levels, with control cattle being deficient at times.

"We also found that cows that were between five and ten years of age had greater selenium uptake than younger cows less than three years old, and old cows more than 15 years old," Sprinkle said. Another significant finding was that Brahman cross cattle absorbed selenium more efficiently than did the other two breeds studied.

Sprinkle admits that whether or not the cattle respond positively to the bolus treatment, a rancher probably won't adopt the technique if it's not economically feasible. "It would add two or three dollars if the rancher is already using a formulated trace mineral mix," he notes. However, research has shown that not all animals consume an oral supplement. "By administering the boluses, we can be confident that the cow is actually receiving her daily requirements of copper and selenium." In some years when forage levels are particularly deficient in copper and selenium, the health of the cow can be maintained through its use. ✂



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When Arizona rangeland soils carry low levels of trace minerals, the forage plants are deficient in these minerals as well.

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