*Part I: Trace minerals*

# Essential Minerals Aid Reproduction Efficiency

*by Teresa Spivey*

*It is estimated that $975 million could be saved each year by maximizing reproductive efficiency in beef cattle herds."*

Although this startling figure was presented 10 years ago at the 1980 Boyne Mountain Symposium on Agriculture: Research to Meet Human Needs for the 21st Century, the fact remains that reproductive inefficiency is a costly and production limiting problem.

A number of factors can contribute to a cow's reproductive problems, but nutrition plays a significant role in reducing reproductive failures. Good nutrition goes beyond a female's intake of required grains and forages, to an often underrated part of the diet — trace minerals, and more importantly, trace mineral bioavailability.

Fifteen elements are recognized as essential in the diets of animals. Of these, various university studies show that manganese (Mn), copper (Cu), iodine (I), selenium (Se), and zinc (Zn) seem to be the main trace minerals connected to reproduction problems. Although these minerals may be available to a cow on a free choice basis 365-days a year, she may not be getting the proper balance of bioavailability trace minerals to meet herd individual requirements.

A prime example of this is cited by Bob Kropp, animal scientist at Oklahoma State University, Stillwater. Four years ago, he began to look for possible reasons for reproductive problems within the OSU Beef Cattle Center herd. Despite having the cattle on the standard OSU salt and mineral program (consisting of dicalcium phosphate and inorganic trace minerals) and feeding protein and energy above the required amounts, fertility was still relatively low.

"We originally thought our problem was in the feed," Kropp says. 'We were feeding our large-framed cows 15 to 20 pounds of grain per day before breeding and we still ended up with a 75 percent pregnancy rate 90 days after the breeding season."

In addition to the fertility problems, Kropp also noticed that some cattle breeds had signs of hair coat depigmentation, calves were not shedding right, there were feet and leg problems, and the calves weren't growing as well as expected.

"We were using the same sires as everyone else," Kropp says, "but our weaning weights were lower than they were five to six years ago when the cattle were smaller framed."

After analyzing soil, feed, forage, blood and liver samples, it was confirmed, mainly by the blood and liver tests, that the OSU herd had a copper deficiency. Low levels of calcium, phosphorus, manganese, selenium and zinc also were found.

Copper deficiency has been recognized as having a major role in reproductive disorders. Reduced conception rates, embryonic and fetal mortality, anestrus, and depressed libido and testicular degeneration in bulls are signs of a copper deficiency.

Research conducted in the early 1980s at Texas A&M University's Agricultural Experiment Station by B.J. Herd and P.G. Lemieux, showed that dietary copper appears to be required for normal reproductive function. However, the research indicated that the required level depends upon the molybdenum and sulfer levels of the diet. When antagonistic factors such as these compromise copper availability, copper sources that are less vulnerable to tie-up should be considered.

The Texas researchers also noted that a copper deficiency may result in lack of hair pigmentation, nervous disorders and abnormal bone structure. These symptoms were found in the OSU herd.

Zinc deficiency, which also was found in the OSU herd, may result in cystic ovaries and abnormal estrus in females, and delayed testicular development, reduced testicular size and testicular atrophy in bulls.

These symptoms were found in research conducted by Underwood in 1977 and by Pugh in 1985. They found the metabolic causes of these forms of reproductive failure include impaired DNA and cell division, reduced follicle stimulating hormone (FSH), and luteinizing hormone (LH) production.

In addition, the researchers found that zinc deficiencies may effect skeletal growth rate, skin lesions, wound healing time and resistance to infection.

Deficiencies of calcium and phosphorus are also linked to reproductive disorders. Pugh found that calcium deficiency may result in delayed uterine involution, small corpora lutea, cystic ovaries and retained placenta. Excess calcium may decrease breeding efficiency and cause testicular degeneration. Cattle with a lack of phosphorus in their diets will show signs of anestrus, weak or stillborn calves, delayed puberty, and depressed fertility. In addition, the deficiency can cause decreased breeding efficiency, testicular degeneration, decreased ovarian activity and small corpora lutea.

Mineral abnormalities of manganese, iodine and selenium, the other trace minerals directly related to reproductive disorders, cause many of the problems. Signs of manganese deficiency include anestrus, infertility, abortion, calves born with contracted tendons, and small ovaries. Impaired ovarian activity, anestrus, infertility, retained placenta, embryonic mortality, birth of hairless and/or weak calves, stillbirths, and depressed libido in bulls are all signs of an iodine deficiency. A selenium deficiency causes retained placenta, abortion, and the birth of dead or weak calves.

Kropp identified the problem in the OSU herd and found the proper mineral combination, which in his case, was Albion's Breeder Pac. This product contains metal amino acid chelate (pronounced kelat). After adding this trace mineral supplement to the herd's ration, OSU was able to dramatically increase weaning weights, reproductive efficiency and income.

Although most herds will have a small number of females with reproductive problems at some time, a breeder needs to be concerned if the problems begin to increase. There are many factors that need to be checked in determining an individual cow's or herd's specific problem. One factor that should not be overlooked is their trace mineral intake.

If you, as a cattle breeder, see any of these symptoms relating to trace mineral deficiencies in your herd, you should take the opportunity to act now. Trace mineral problems are neither created nor remedied overnight.

***Editor's Note:*** *In the next article of this three-part series we will feature purebred operations that have been able to solve their trace mineral problems.*

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