



The World Leader in Organic Trace Minerals

COMPLEXED TRACE MINERALS IMPROVE REPRODUCTIVE PERFORMANCE OF DAIRY CATTLE

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Reproductive efficiency is critical to profitability of dairy producers. Each day beyond, 90 days of lactation, that a dairy cow fails to conceive, costs between US \$0.50 and \$4.00 per day. Improving nutrition of the cow, including optimizing trace mineral nutrition, can positively impact reproductive performance of your dairy herd.

Zinc

Zinc plays a critical role in the repair and maintenance of the uterine lining following calving, speeding the return to normal reproductive function and estrus. In bulls, a zinc deficiency results in poor semen quality and reduced testicular size and libido. Improved zinc status also improves fertility by reducing lameness, resulting in cows more willing to show heat and bulls with improved mobility and performance. Research at the University of Tennessee found that feeding complexed zinc prior to calving reduced days to first estrus and tended to reduce the number of days to conception. California researchers found that supplementing dairy cows with complexed zinc significantly reduced spontaneous abortions.

Manganese

Manganese is required for synthesis of estrogen, progesterone and testosterone's precursor, cholesterol. Insufficient levels of these hormones result in abnormal sperm development in bulls and irregular estrus cycles in cows. Furthermore, a manganese deficiency is associated with "silent heats," cystic ovaries and reduced conception rates. High dietary levels of calcium, iron, potassium, magnesium and phosphorus reduce the availability of manganese. North Carolina research found that replacing zinc and manganese oxide with complexed zinc and manganese increased pregnancy rates by 15.7% at the end of the planned artificial insemination period.

Copper

Reproductive problems related to a copper deficiency include early embryonic death, increased incidence of retained placentas and inhibited conception even though estrus may be normal. Copper absorption (bioavailability) is reduced by sulfur, molybdenum, zinc, calcium, soil and iron. An awareness of these antagonists is important when formulating dairy rations and often will require an adjustment of copper supplementation levels as well as copper source.

Cobalt

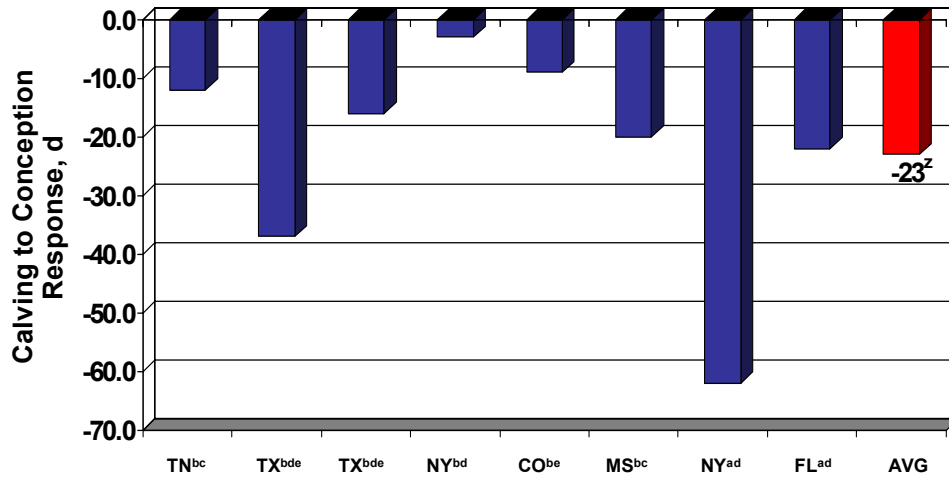
Cobalt is a required element for vitamin B₁₂ synthesis in the rumen. Vitamin B₁₂ is required for the conversion of propionate to glucose and for folic acid metabolism. Lactation depletes cobalt and vitamin B₁₂ as both milk and colostrum are high in vitamin B₁₂. Reduced fertility and sub-optimal conditioning of offspring are noted in a cobalt deficiency. Manganese, zinc, iodine, and monensin may reduce cobalt's availability.

Complexed Trace Minerals Improve Reproduction

Feeding amino acid complexed trace minerals helps insure cows attain adequate trace mineral status even when cows are consuming diets high in antagonists. Antagonists have minimal effect on the bioavailability of complexed trace minerals due to the amino acid attached to the metal which forms the trace mineral complex. This amino acid prevents the antagonists from binding to the metal and also eliminates the need to compete for ligands or escorts for absorption of the metal in the small intestine.

Thus it is not surprising that in an summary of dairy trials conducted under varying conditions, including varying levels of antagonists, feeding a combination of complexed zinc, manganese, copper and cobalt reduced the interval from calving to conception by 23 days and reduced services per conception by 0.3 services (Fig 1).

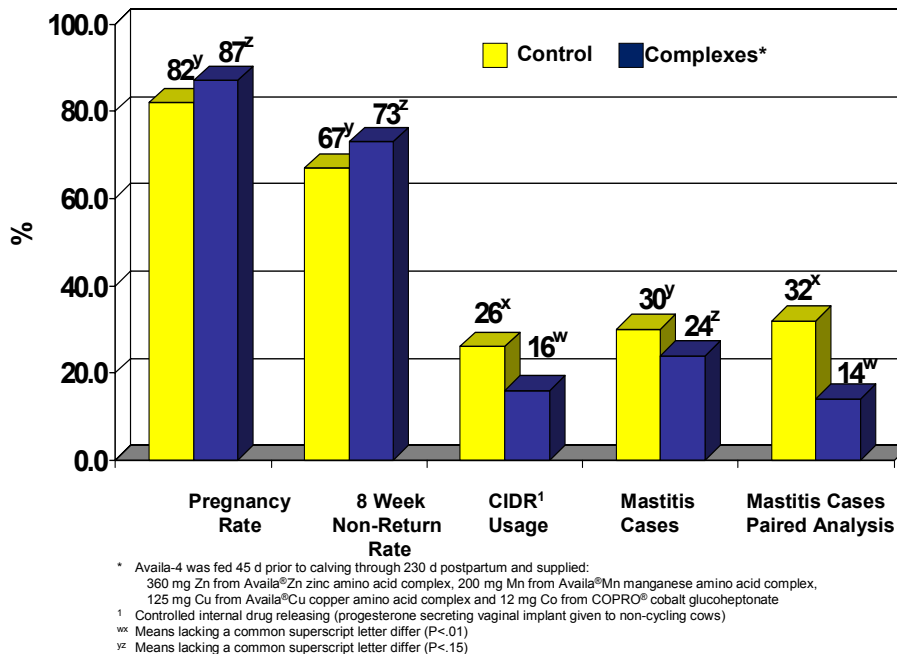
Fig. 1. Summary of trials examining the effect of complexed trace minerals on calving to conception interval



- ^a Availa^{®4}: Availa[®]Zn zinc amino acid complex, Availa[®]Mn manganese amino acid complex, Availa[®]Cu copper amino acid complex and COPRO[®] cobalt glucoheptonate
- ^b 4-Plex: ZINPRO[®] zinc methionine, MANPRO[®] manganese methionine, CuPLEX[®] copper lysine and COPRO[®] cobalt glucoheptonate
- ^c Diet that contained Zinpro complexes supplied an additional 360 mg Zn/hd/d, 200 mg Mn/hd/d, 125 mg Cu/hd/d and 12 or 25 mg Co/hd/d
- ^d Diets contained similar concentrations of Zn, Mn, Cu and Co
- ^e Diets supplied 360 mg Zn/hd/d from ZINPRO zinc methionine
- ^z Treatment effect (P_≤0.01)

Improved reproduction due to feeding a combination of complexed trace minerals can be attributed to several factors. First, cows fed complexed trace minerals such as Availa-4, cycle sooner after calving. Montana State University research found that 44.6% more cows fed Availa-4 had ovarian structures at 45 d postpartum than control cows, 9.5% more than cows fed sulfate trace minerals. In New Zealand, cows fed Availa-4 pre and postcalving returned to normal ovarian function faster as noted in a 38.5% reduction in CIDR usage (progesterone secreting vaginal implant given to noncycling cows, Ref. Fig 2).

Fig 2. Effect of complexed trace minerals on reproduction and incidence of mastitis.



University of Tennessee research found that feeding complexed trace minerals during the last 3 weeks of pregnancy numerically decreased retained placentas and reduced the number of days to first estrus and conception if cows did retain their placenta. At Miner Institute, feeding Availa-4 increased cows pregnant by 150 days postpartum from 61% to 95%. Another trial at University of Tennessee indicates feeding a combination of complexed trace minerals postcalving reduced days to first luteal activity by 17.7% and days to first estrus by 30.6%. Response to complexed trace minerals was magnified if cows retained the placenta, indicating that stress magnifies the response to complexed trace minerals.

In addition to cycling sooner after calving, North Carolina State research indicates that feeding complexed zinc, copper and cobalt reduces uterine infections. In New York, feeding a combination of complexed zinc, manganese, copper and cobalt prior to calving reduced incidence of retained placentas, cystic ovaries and mastitis/metritis. Recently, Florida researchers found that cows supplemented with Availa-4 had tended to have higher first service pregnancy rates and a higher percentage of cows confirmed pregnant after 150 days of lactation.

Trace minerals also impact fertility through reduced lameness. Cornell and British research indicates that lame cows have between 28 and 30 additional days open. Research at the Universities of Illinois State, Kansas State, Missouri and de Sao Paulo indicates that feeding complexed zinc reduces incidence of foot rot, laminitis and claw (hoof) lesions. In New York and Florida, research indicates that feeding a combination of complexed trace minerals such as Availa-4, reduces not only incidence of claw lesions, but also severity of claw lesions.

Finally, complexed trace minerals improve reproduction by reducing mastitis incidents. University of Tennessee research indicates cows that develop mastitis within 150 days after calving have more days to first service and conception and more services per conception. University of Florida researchers reported a 2.7 time higher risk of abortion in cows that develop mastitis within 45 days after calving. In 12 trials, feeding complexed zinc reduced somatic cell count (SCC) by 33%. In a study conducted at Texas A&M, copper depleted beef cows fed Zinpro's complexed copper had lower SCC levels in colostrum.

Summary

Increasing trace mineral status by feeding highly bioavailable sources improves reproduction. Feeding complexed sources of trace minerals such as Availa-4 helps insure that the trace mineral requirements of dairy cattle are met.