Efficacy of Copper Oxide Needles in Preventing Copper Deficiency in Cattle

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Soils with characteristics that lead to high concentrations of molybdenum in pastures are common in the western United States and molybdenum-conditioned copper deficiency is a problem in many regions. Prevention by injection with copper glycinate can require repeated injections throughout the grazing season, which is not convenient to management of range cattle. Supplementation via a salt mineral mix has a variable response as influenced by individual animal salt intake.

The purpose of this study was to evaluate the hypothesis that a single dose of copper oxide needles administered to cattle at the beginning of the grazing period would sustain plasma copper concentrations and prevent growth depression associated with copper deficiency for the duration of the grazing period. Comparisons of efficacy were made against the traditional treatment methods of copper glycinate injection and copper supplementation in salt in two trials involving age groups most at risk for clinical copper deficiency calves and replacement heifers. High pasture molybdenum concentrations with Cu:Mo ratios below 5:1 were present at both trial locations .

Trial 1 was conducted in replacement heifers in Stevens County, Washington. Cattle were stratified according to weight and randomly assigned to one of four treatment groups. Group 1, (n=20) received 120 mg of copper as copper glycinate administered subcutaneously every 5 weeks; group 2, (n=20) received 25g copper oxide needles administered orally as a single dose at the start of the trial; group 3 (n=20) received 50g copper oxide needles administered orally as a single dose at the start of the trial; group 4 (n=10) received no copper supplementation. The trial commenced in May and continued through the summer grazing period to the end of September. Cattle were weighed and sampled at 5-week intervals during the trial period.

The blood copper concentrations of cattle that received copper oxide needles remained in the normal range throughout the trial period and were equivalent to those of cattle that received repeated injections of copper glycinate. In contrast the blood copper concentrations of the control group fell precipitously to deficiency levels within 5 weeks of the onset of the trial. The average daily gain (lbs/day) for the trial period were 1.44, 1.51, 1.53 and 1.10 for groups 1 to 4 respectively. There was no significant difference in the weight gains between copper oxide and copper glycinate treatments but all three were significantly higher than that of the control group.

Trial 2 was conducted in cow-calf pairs in Pacific County Washington. Copper oxide needles at a single dose level were compared with copper glycinate injection and with the inclusion of copper sulfate in the salt mineral mix for their ability to sustain blood copper concentrations and sustain growth rate. Treatment groups were as follows:

Group 1, 15 cow calf pairs, both cows and calves received 120mg of copper as copper glycinate administered subcutaneously every 5 weeks; group 2, 15 cow calf pairs, calves received 20g copper oxide needles and cows 25g administered as a single dose at the beginning of the trial; group 3, 15 cow calf pairs, copper sulfate added to the salt mineral mix to provide a final concentration of 1% copper. The trial commenced in June and was terminated in October. Calves were weighed and sampled at 5 week intervals throughout the trial period. Group 3 animals were grazed in a pasture immediately adjacent to the pasture of the cattle in groups 1 and 2 and with the same soil type and pasture species.

The blood copper concentrations of calves that received copper oxide needles remained in the normal range throughout the trial period and were equivalent to those of calves that received repeated injections of copper glycinate. Blood copper concentrations of the salt supplemented group were significantly lower than those of the copper oxide and copper glycinate treated groups by the end of the trial period. Average daily gain (lbs/day) for the trial period were 2.35, 2.48 and 2.01 for groups 1 to 3 respectively. There was no significant difference between the growth rates of copper oxide needle and copper glycinate treatments but both were significantly higher than the salt supplement treatment.

Summary

A single dose of copper oxide needles administered at the beginning of the grazing period sustained blood copper concentrations within the normal range in cattle grazing pastures with high molybdenum concentrations and known to induce copper deficiency. Blood concentrations and weight gain of cattle that received a single dose of copper oxide needles were equivalent to those achieved by the injection of copper glycinate at 5-week intervals and superior to those achieved by copper supplementation in the salt. These trials indicate that copper oxide needles administered at the start of the grazing season provide protection against copper deficiency for the duration of the grazing season. Copper oxide needles provide a convenient and efficacious method for prevention of copper deficiency in range cattle.

CVM Update

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Tolerances Established for Tetracyclines in Milk

The Food and Drug Administration (FDA) is amending the animal drug regulations to reflect approval of a supplemental new animal drug application (NADA) 113-232 filed by Pfizer Animal Health. The supplemental NADA provides for use of Liquamycin LA-200 (oxytetracycline) injection in lactating dairy cattle. Previously, Liquamycin LA-200 was approved for treatment of beef cattle, non-lactating dairy cattle, calves including pre-ruminating (veal) calves, and swine. The supplemental application for use in lactating dairy cattle was approved by FDA on July 23, 1998.

With this supplementary approval, Liquamycin LA-200 now is labeled for administration to beef cattle, dairy cattle (including lactating dairy cattle), and calves, including pre-ruminating (veal) calves, for the treatment of pneumonia and shipping fever complex associated with *Pasteurella spp.* and *Haemophilus spp.*, bovine keratoconjunctivitis (pink eye) caused by *Moraxella bovis*; foot-rot and diphtheria caused by *Fusobacterium necrophorum*; bacterial enteritis (scours) caused by *Escherichia coli*; wooden tongue caused by *Actinobacillus ligniersii*; leptospirosis caused by *Leptospira pomona*; and wound infections and acute metritis caused by strains of staphylococci and streptococci organisms sensitive to oxytetracycline.

Milk taken from animals during treatment with Liquamycin LA-200 and for 96 hours after the last treatment must not be used for food.

The tolerance for tetracyclines including oxytetracycline, chlortetracycline, and tetracycline are amended to provide for an acceptable daily intake (ADI) and for a tolerance for residue in milk. The Center for Veterinary Medicine (CVM) conducted a reevaluation of the toxicology and metabolism data that were used to support the original tolerance for oxytetracycline in edible tissues. The ADI for total residues of tetracyclines including chlortetracycline, oxytetracycline, and tetracycline, is 25 micrograms per kilogram of body weight per day. Sixty percent (60%) of the ADI is reserved for milk and 40% for edible tissues. Based on the ADI, a tolerance of 300 ppb is established for the sum of residues of the tetracyclines including chlortetracycline, oxytetracycline, and tetracycline in milk. With the establishment of a tolerance of 300 ppb for the sum of residues of tetracyclines, a tolerance of 300 ppb for each of the three tetracyclines is also established. This tolerance becomes effective when the approval notice for Liquamycin LA-200 publishes in the Federal Register.

The previously accepted safe levels for oxytetracycline, chlortetracycline, and tetracycline in milk were 30, 30, and 80 ppb respectively for a sum of residues of 140 ppb. The FDA, States, and the dairy industry have regulated milk at these levels since 1991. With the change in tolerance to 300 ppb in milk, there are no longer any FDA accepted rapid screening tests for tetracyclines in raw comingled bovine milk. The FDA is currently working with Charm Sciences to modify their Charm II Tetracyclines Drug Test (Competitive) to detect residues at the new tolerance level. FDA encourages other sponsors of tetracyclines kits to submit performance data on the detection of residues of tetracyclines in milk to CVM for evaluation.

Further information about milk screening tests is available from Dr. Norris E. Alderson, FDA/Center for Veterinary Medicine (HFV-500), Office of Research, 8401 Muirkirk Road, Laurel, MD 20708, 301-827-8010. Further information about the tolerances for tetracyclines in milk is available from Dr. Margaret Miller, Center for Veterinary Medicine (HFV-100), Food and Drug Administration, 7500 Standish Pl., Rockville, MD 20855, 301-827-5282.

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