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August 2021

Supplementing Organic-Complexed or Inorganic Co, Cu, Mn, and Zn to Beef Cows during Gestation: Post-weaning Responses of Offspring Reared as Replacement Heifers or Feeder cattle

The bovine fetus is completely dependent on the dam for its supply of trace minerals which are essential for fetal developmental processes, such as protein synthesis, bone formation, and lipid metabolism. Previous research in this area has demonstrated that supplementation of organic cobalt (Co), copper (Cu), manganese (Mn), and zinc (Zn) complexes to pregnant cows improved calf growth and reduced the incidence of bovine respiratory disease compared with calves from both non-supplemented and inorganic-supplemented cows.[1] Researchers at Texas A&M University evaluated the effects of supplementing organic-complexed or sulfate sources of Co, Cu, Mn, and Zn to beef cows during the second and third trimesters of gestation on productive and physiological responses of the cow and their offspring until weaning.[2] This experiment also evaluated the postweaning responses of the female offspring reared as replacement heifers, and the male offspring reared as feeder cattle for slaughter.[3] The authors hypothesized that prolonged maternal supplementation of organic complexed trace minerals during gestation would improve calf performance.

This experiment used 191 non-lactating, pregnant beef cows fed a supplement containing either sulfate sourced or organic complexed forms of Cu, Co, Mn, and Zn in the final two trimesters of gestation (assigned to the experiment on day 117 of gestation (day 0 of experiment). The organic-complexed source of these trace mineral was Availa 4 (Zinpro Corporation, Eden Prairie, MN). Both treatments provided the same daily amount of Cu, Co, Mn, and Zn. From day 0 to calving, cows were maintained in a single pasture dominated by bermudagrass and were segregated three times weekly into 1 of 24 individual feeding pens to receive treatments. After calving, all cow-calf pairs were maintained in a single pasture dominated by perennial ryegrass and free-choice fed a mineral containing inorganic trace minerals. This mineral supplement was the same fed to cows prior to the beginning of this experiment.

The calves were weaned on day 367 (~200 days of age), managed as a single group for a 45-day preconditioning period (days 367 to 412), and transferred to a single oat pasture on day 412. The heifer calves were moved to an adjacent oat pasture on day 437, where they remained until day 620. Heifer puberty status was verified weekly (days 437 to 619) based on plasma progesterone concentrations. The steer calves were shipped to a commercial feedlot on day 493, where they were managed as a single group until slaughter (day 724).

These researchers reported that that supplementing Co, Cu, Zn, and Mn as organic-complexed or sulfate sources to beef cows during the last 5 months of gestation yielded similar cow-calf productive responses until weaning. In addition, no differences in calf performance were observed during the 45-day preconditioning period. There were no statistical differences observed in growth or carcass characteristics between steers from cows fed organic-complexed or inorganic sources of trace minerals. Daily gains for heifers were also similar ($P = 0.39$) between treatments from days 412 to 620. However, a treatment × day interaction was detected ($P < 0.01$) for puberty attainment, as heifers from cows fed the organic complexed trace minerals reached puberty earlier in the experiment compared with heifers from cows fed inorganic sources of trace minerals (Figure 1). Heifers from cows fed the organic complexed trace minerals were younger at puberty, despite having similar growth rates as their inorganic-conditioned cohorts (399 vs. 418 days of age; $P = 0.04$). These results suggest that supplementing an organic-complexed source of Co, Cu, Zn, and Mn to gestating beef cows enhances reproductive development of their female offspring raised as replacement heifers.

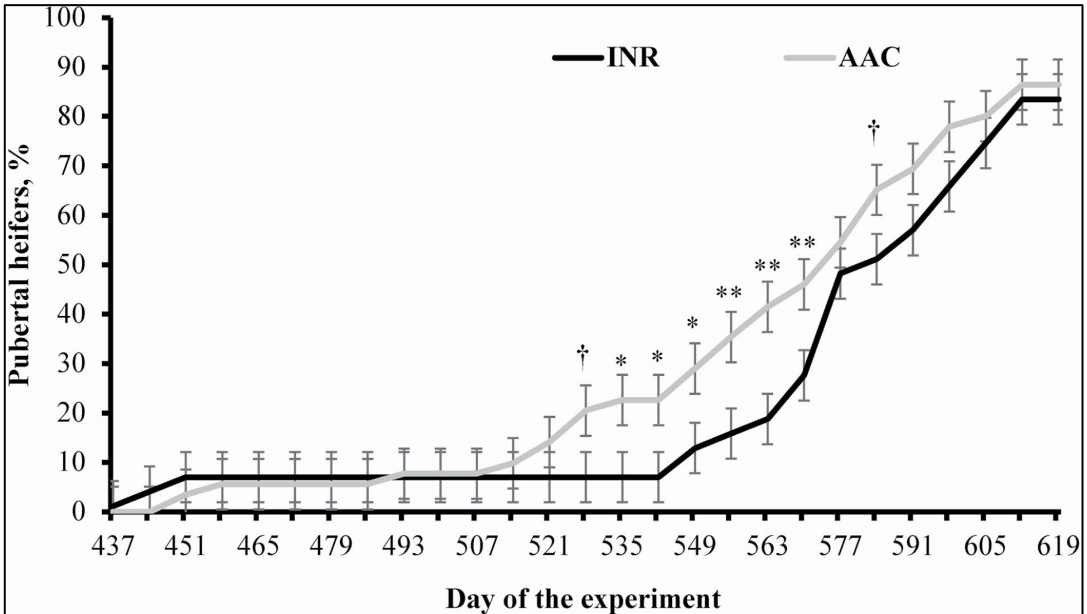

Figure 1. Puberty attainment of replacement heifers from beef cows supplemented with sulfate sources (INR) or organic complexed sources of Co, Cu, Mn, and Zn during gestation. Puberty was evaluated according to plasma progesterone concentrations in samples collected weekly from days 437 to 619. A treatment × day interaction was detected ($P < 0.01$). Within days: † $0.05 \le P \le 0.10$; * $P \le 0.05$; ** $P < 0.01$.

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[3] Harvey, K. M., R. F. Cooke, E. A. Colombo, B. Rett, O. A. de Sousa, L. M. Harvey, J. R. Russell, K. G. Pohler and A. P. Brandão. 2021. Supplementing organic-complexed or inorganic Co, Cu, Mn, and Zn to beef cows during gestation: post-weaning responses of offspring reared as replacement heifers or feeder cattle. J. Anim. Sci. 99(6). https://doi.org/10.1093/jas/skab082