Research Now

Availa®4 trace mineral supplementation improves early embryonic survival in beef replacement heifers

Introduction:
The majority of total pregnancy loss occurs in the first 30 to 60 d post-conception, making early embryonic survival a crucial factor in overall reproductive success. Embryonic survival and proper implantation depend on the maternal uterine environment providing optimum combinations of enzymes, growth factors, cytokines, lymphokines, hormones, and macronutrients for homeostasis, cell signaling, and pregnancy maintenance. Trace minerals are also important for early embryonic development and survival. Particularly Zn, Mn, Cu, I, Fe, and Se are trace minerals known to influence embryonic and fetal survival, growth, and overall reproductive performance.

The objective of this research was to evaluate the effects of supplemental trace minerals from Availa®4 or inorganic sources on heifer reproductive performance and embryo survival.

Experimental Design:
Over two consecutive years, 130 beef heifers (n = 60 and 70, year 1 and 2, respectively) were assigned randomly to one of two mineral sources based on age, breed (Angus and Angus x Simental) and BW:

1. **Inorganic:** 20 ppm Mn from manganese hydroxychloride, 36 ppm Zn from zinc hydroxychloride, 12.5 ppm Cu from basic copper chloride, and 1.25 ppm Co from cobalt carbonate
2. **Availa-4:** 20 ppm Mn from manganese amino acid complex, 36 ppm Zn from zinc amino acid complex, 12.5 ppm Cu from copper amino acid complex, and 1.25 ppm Co from cobalt glucoheptonate

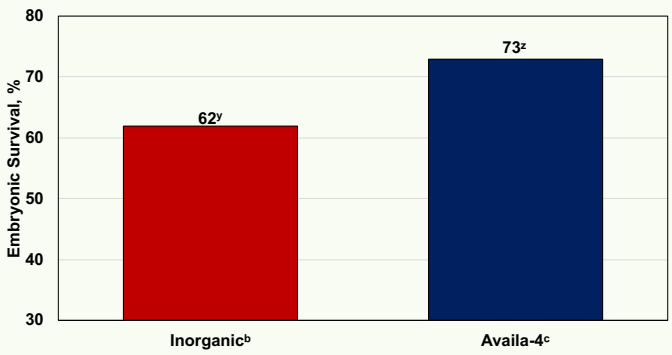
Heifers were housed in one of two pens equipped with individual intake recording bunks (Insentec® Hokofarm, Marknesse, Netherlands) and fed common heifer development diets with the respective mineral supplement from weaning through breeding.

Age at puberty was determined via circulating concentrations of progesterone. Heifers were synchronized, artificially inseminated once or twice as necessary, and then exposed to natural service via a herd bull.

Pregnancy status was determined by lymphocyte gene expression on d 17, 19, and 21; by circulating concentrations of pregnancy associated glycoproteins (PAGs) on days 22 through 28; and by transrectal ultrasonography on d 30 and 60 post-insemination.

Results:
- Puberty, pelvic area, repro tract score, and estrus expression were not influenced by mineral source; $P > 0.44$
- Heifers fed Availa-4 had lower incidence of embryonic loss; $P = 0.13$
- There was no treatment*year effect ($P = 0.22$), indicating Availa-4 improved embryo survivability in heifers similarly in both years

Feeding Availa-4 To Beef Heifers Increases Embryonic Survival[a]



[a] Embryonic loss determined from pregnancy assessments made on day 60 versus day 17 post-insemination; embryonic survival defined as 100 percent minus percent embryonic loss
[b] Inorganic = 20 ppm Mn from manganese hydroxychloride, 36 ppm Zn from zinc hydroxychloride, 12.5 ppm Cu from basic copper chloride, and 1.25 ppm Co from cobalt carbonate
[c] Availa-4 = 20 ppm Mn from manganese amino acid complex, 36 ppm Zn from zinc amino acid complex, 12.5 ppm Cu from copper amino acid complex, and 1.25 ppm Co from cobalt glucoheptonate
[yz] LSmeans with uncommon superscripts differ, $P = 0.13$

Implication:
- When fed to heifers maintained on an excellent plane of nutrition, Availa-4 mineral supplementation improved embryonic survival rates over inorganic sources

Abstract

Effect of trace mineral source on heifer reproductive performance.

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Trace minerals are known to play important roles in early embryo development. The study objective was to determine effects of trace mineral source on heifer reproductive performance. Over two years, beef heifers (n=130) were randomly assigned to two pens and two treatments, within each pen, based on breed, age, and BW. From weaning through the breeding season, all heifers were individually fed a basal diet of grass hay, corn silage, and a supplement pellet (soybean hulls, dried distiller's grains plus solubles, minerals, vitamins and monensin). Cobalt, Cu, Mn, and Zn were supplemented with either complexed sources (Availa-4) or inorganic sources (Cu, Mn, and Zn hydroxychlorides; Intellibond C, M, and Z) and Co as $CoCO_3$. Blood samples were collected bi-weekly, and a reproductive tract score (RTS) was collected 30 d prior to breeding to determine pubertal status. All animals were synchronized and artificially inseminated (AI). Pregnancy status was determined by lymphocyte gene expression on d 17, 19, and 21; by circulating concentrations of pregnancy associated glycoproteins (PAGs) on d 22, 23, 24, 25, 26, 27, and 28; and by transrectal ultrasonography on d 30 and 60 after AI. Embryonic loss was defined as when a previously pregnant animal was subsequently diagnosed not pregnant. Data were analyzed using the MIXED procedure in SAS. Puberty (P =0.44), pelvic area (P =0.74), RTS (P =0.49), and estrus expression (P =0.82) were not influenced by treatment. There was no effect of treatment (P =0.37) or treatment by time (P =0.19) on pregnancy, but there was a weak tendency (P =0.13) for decreased embryonic loss among heifers supplemented with complexed trace minerals (27±6%) compared to inorganic minerals (38±6%). In summary, source of trace mineral did not affect puberty, RTS, pelvic area, or overall pregnancy success, but feeding complexed trace minerals tended to increase embryo survival from d 17 to 60.

Key Words: Reproductive performance, Embryo loss, Trace mineral

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