Southeast Dairy Producer's Check-Off Program

Research Summary

Determining the optimal dietary cation-anion difference (DCAD) in diets fed to prepartum nulliparous cows

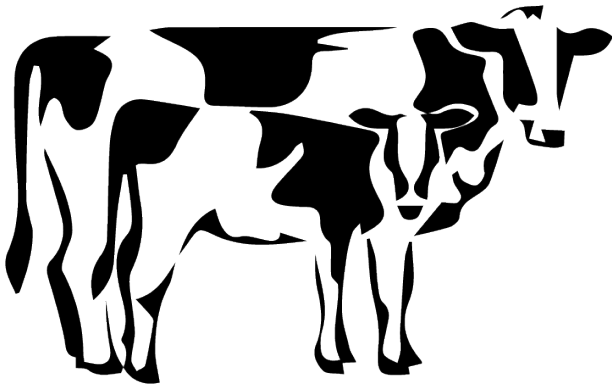
José Eduardo P. Santos, University of Florida

Funding Year: 2021 **Amount Awarded:** $41,736

UF IFAS UNIVERSITY of FLORIDA

Implications

Reducing the DCAD of nulliparous dams up to -150 mEq/kg has no implications to offspring health or growth. Feeding a diet with -50 mEq/kg resulted in reduced morbidity with benefits to reproduction, although no production response was observed. Nulliparous cows should not be fed acidogenic diets with DCAD inferior to -50 mEq/kg.



Methods

The objectives were to evaluate the effects of 3 levels of dietary cation anion difference (**DCAD**) fed prepartum to nulliparous cows on mineral metabolism, production, health, and reproduction of dams, and on offspring acid-base balance, metabolism, growth, and health preweaning. We enrolled 132 pregnant nulliparous Holstein cows at 250 (248–253) d of gestation in a randomized block design with diets varying in DCAD: +200 (**P200**, n = 43), –50 (**N50**, n = 45), or –150 (**N150**, n = 44) mEq/kg of dry matter (**DM**). Cows were followed from 22 d prepartum to 100 d postpartum for production and health, whereas reproduction and survival were evaluated until 300 d postpartum. Newborn calves (15 males and 28 females in P200, 22 males and 23 females in N50, and 18 males and 26 females in N150) were followed for the first 7 or 56 d of age if males or females, respectively.

Results

In *dams*, reducing the level of DCAD induced a state of compensated metabolic acidosis that increased concentrations of ionized calcium (**iCa**) and total Ca prepartum and on the day of calving, and serum Mg in the first days postpartum, but it reduced DM intake prepartum. Reducing the DCAD altered whole body Ca flux with increased gastrointestinal absorption and urinary excretion, but no effect on Ca retention. Treatment did not affect yields of milk, energy-corrected milk, milk components, or postpartum DM intake. Treatment did not affect the incidence or prevalence of subclinical hypocalcemia, hepatic composition, or the prevalence of fatty liver. Reducing the DCAD had a quadratic effect on morbidity with the least morbidity observed in cows fed N50. Similarly, reducing the DCAD increased the proportion of cows pregnant by 305 d postpartum.

In newborns, dam treatment did not affect acid-base balance. Calves were born with metabolic and respiratory acidosis, which reversed by 1 d of age. Maternal DCAD did not affect colostrum yield, nutrient composition, IgG content, or apparent efficiency of IgG absorption. Maternal DCAD did not affect birth weight, daily weight gain in the first 56 d of life. Treatment did not affect intake of milk or starter grain DM. Morbidity did not differ among treatments.

Determining the optimal dietary cation-anion difference (DCAD) in diets fed to prepartum nulliparous cows

132 nulliparous cows

Prepartum
-22 to -1 d relative to calving

+200 mEq/kg of DM

-50 mEq/kg of DM

-150 mEq/kg of DM

Postpartum
0 to 100 DIM

Common postpartum diet

Mineral metabolism, intake, colostrum yield and quality, production, reproduction, and health

132 newborn calves

Preweaning period
0 to 56 d of life

Mineral metabolism, passive transfer, intake, growth, and health

References of Published Work

Zimpel et al. (2021). Prepartum level of dietary cation-anion difference fed to nulliparous cows: Lactation and reproductive responses. J. Dairy Sci. 104: https://doi.org/10.3168/jds.2021-20485

Zimpel et al. (2021). Prepartum level of dietary cation-anion difference fed to nulliparous cows: Acid-base balance, metabolism, and health. J. Dairy Sci. 104: https://doi.org/10.3168/jds.2021-20486

Zimpel et al. (2021). Effects of maternal level of dietary cation-anion difference fed to prepartum nulliparous cows on offspring acid-base balance, metabolism, and growth. J. Dairy Sci. 104: https://doi.org/10.3168/jds.2021-20483