



Abstract Summary

Title: Increasing dose of prepartum rumen protected choline: Effects of *in utero* exposure on Angus x Holstein beef calves

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Objective: Investigate the effect of late gestation rumen protected choline (RPC) dose on growth and health in beef x dairy calves

Treatments:

- Multiparous Holstein cows pregnant with Angus x Holstein beef calves (n=17 male, 30 female) were randomly assigned to receive one of the following treatments prepartum:
 - 0 g RPC (control; **CTL**)
 - 15 g of choline ion from RPC2 (recommended dose; **RD**)
 - 22 g of choline ion from RPC2 (high dose; **HD**)
 - recommended dose of choline ion from ReaShure
- Calves were fed one gallon of colostrum after birth from dams within the same treatment and thereafter fed a traditional milk replacer program and offered ad libitum access to calf starter.

Results:

1. Birth weight was greater and 56-day BW tended to be greater in male vs. female calves.
2. In male calves, increasing RPC2 linearly increased ADG and tended to linearly increase 56-day BW.
3. Across sexes, increasing RPC2 tended to linearly increase feed efficiency.
4. Male calves with *in utero* exposure to RPC had a greater proportion of methylated DNA in whole blood.

Take Home Message: Supplementation of RPC in late gestation cows increased growth and feed efficiency in male beef x dairy calves born to those cows which may be a result of increased DNA methylation.



Full Abstract

Increasing dose of prepartum rumen protected choline: Effects of in utero exposure on Angus x Holstein beef calves

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Feeding pregnant cows rumen protected choline (**RPC**) has potential to impact the growth and health of offspring. The objective of this study was to investigate the effect of late gestation RPC dose on growth and health in beef x dairy calves. Multiparous Holstein cows pregnant with Angus x Holstein beef calves (n=17 male, 30 female) were randomly assigned to 0g (control; **CTL**), 15g (recommended dose; **RD**), or 22g (high dose; **HD**) of choline ion from a concentrated RPC prototype (**RPC2**; Balchem Corp.) or the RD of choline ion from an established product (**RPC1**; ReaShure, Balchem Corp.; positive control). Treatments (**trt**) were mixed into the TMR and cows had ad libitum access via Insentec feeders (Hokofarm Group; 4 feeders/trt) which allowed quantification of individual intake. Calves were fed one gallon of colostrum after birth from dams within the same trt and thereafter fed a traditional milk replacer program and offered ad libitum access to calf starter. Jugular vein blood samples were collected and BW was measured at 7, 14, 28, 42, and 56d. Whole blood DNA methylation at 7d and metabolites at all d were quantified. Feed efficiency (**FE**) was calculated as (56d BW – birth weight) / total study Mcal intake. Mixed models analyzing categorical trt effects and continuous effects of actual dam RPC2 intake were performed in PROC MIXED, SAS 9.4. Differences were significant at $P \leq 0.05$, and tendencies at $0.05 < P \leq 0.1$. Birth weight was greater ($P < 0.01$; 45.6 vs. 40.3kg) and 56d BW tended to be greater ($P = 0.08$; 90.4 vs. 86.3kg) in male vs. female calves. Increasing RPC2 linearly increased ($P < 0.01$) average daily gain and tended to linearly increase ($P = 0.07$) 56d BW in male, but not female, calves. Across sexes, increasing RPC2 tended to linearly increase ($P = 0.1$) FE. Male, but not female, calves with RPC exposure in utero had a greater ($P = 0.04$) proportion of methylated whole blood DNA. In utero RPC2 supplementation increased growth and FE in male calves which may be modulated through increased DNA methylation. The sex-specific influence of in utero choline exposure on methylation and growth warrants further investigation.

Keywords: Beef cross, methylation, feed efficiency