Abstract Summary

Title: Increasing dose of prepartum rumen protected choline: Effects on energy and nitrogen metabolism in Holstein dairy cows

Authors: H.T. Holdorf[1], K.E. Ruh[1], S.J. Erb[1], S.J. Henisz[1], G.J. Combs[1], T. Bresolin[1], R.E.P. Ferreira[1], W.E. Brown[1], S.M. Edwards[1], J.C. Rule[3], F.P. Zhou[1], M.J. Martin[1], K.A. Estes[2], J.R.R. Dorea[1], H.M. White[1]
[1]*University of Wisconsin-Madison, Madison, WI*
[2]*Balchem Corp., New Hampton, NY*
[3]*University of Wisconsin-Platteville, Platteville, WI*

Objective: Investigate the effect of prepartum rumen protected choline (RPC) dose on nitrogen and energy metabolism in peripartum dairy cows

Treatments:

- Pregnant multiparous Holstein cows (n=106) 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
- Postpartum, cows were fed a CTL lactating diet or diet with RD of the respective RPC for 21 days followed by a common lactating diet (0 g RPC) until 100 days.

Results:

1. No treatment differences were observed for maximum BW, BCS loss, or transition cow health disorders.
2. At +3 days relative to calving, $RPC2_{RD}$ increased blood FA compared to CTL.
3. Either RPC supplied at the RD:
   a. increased average blood BHB
   b. tended to increase maximum blood BHB
   c. reduced postpartum BUN

Take Home Message: Taken together with the improvements in peak ECM production observed, increases in FA and BHB and reduced BUN during early lactation with $RPC2_{RD}$ may have shifted nutrient partitioning to support production while preserving animal health.

Full Abstract

Increasing dose of prepartum rumen protected choline: Effects on energy and nitrogen metabolism in Holstein dairy cows

H.T. Holdorf[1], K.E. Ruh[1], S.J. Erb[1], S.J. Henisz[1], G.J. Combs[1], T. Bresolin[1], R.E.P. Ferreira[1], W.E. Brown[1], S.M. Edwards[1], J.C. Rule[3], F.P. Zhou[1], M.J. Martin[1], K.A. Estes[2], J.R.R. Dorea[1], H.M. White[1]
[1]*University of Wisconsin-Madison, Madison, WI*
[2]*Balchem Corp., New Hampton, NY*
[3]*University of Wisconsin-Platteville, Platteville, WI*

In vivo and in vitro supplementation of choline has been demonstrated to modulate hepatic lipid, glucose, and methyl donor metabolism. The objective of this study was to investigate the effect of prepartum rumen protected choline (RPC) dose on nitrogen and energy metabolism in peripartum dairy cows. Pregnant multiparous Holstein cows (n=106) 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 for the quantification of individual intake. Postpartum, cows were fed a CTL lactating diet or diet with the RD of their respective RPC product for 21d and a common lactating diet (0g RPC) thereafter until 100d (post-supplementation). Weekly BW and BCS were determined. Blood samples were obtained via tail vessel upon enrollment, approximately every other day from -7 to +21, and at +56 and +100 days relative to calving (DRTC). Mixed models analyzing categorical trt effects and continuous effects of actual RPC2 intake were performed in PROC MIXED, SAS 9.4. Differences were significant at $P<0.05$, and tendencies at $0.05<P<0.1$. Upon enrollment, cows were 3.78 BCS units and weighed 843.4 kg on average. No trt differences ($P>0.16$) were observed for maximum BW, BCS loss, or transition cow health disorders. At +3 DRTC, RPC2RD increased ($P<0.01$) blood FA compared to CTL. Either RPC supplied at the RD increased ($P=0.04$) average blood BHB and tended to increase ($P=0.09$) maximum blood BHB (0.88, 1.02, 1.03mM; CTL, RPC1, RPC2). Feeding either RPC at RD also reduced ($P=0.02$) postpartum BUN. Taken together with the observed improvements in post-supplementation energy-corrected milk production, increases in FA and BHB and reduced BUN during early lactation with RPC2RD may have shifted nutrient partitioning to support production while preserving animal health.

Keywords: Fatty acids, beta-hydroxybutyrate, blood urea nitrogen