



Abstract Summary

Title: Effects of maternal dietary rumen-protected choline supplementation during late gestation on calf growth and metabolism

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Objective: Examine the effects of maternal supplementation and dose of rumen-protected choline (RPC) on neonatal calf growth, metabolism, and oxidant status.

Treatments:

- Parous Holstein cows were assigned to receive one of the following treatments 24 d prior to expected calving until 21 d postpartum:
 - 0 g/d RPC (n = 19)
 - 30 g/d of RPC providing 12.9 g/d of choline ion (n = 21)
 - 45 g/d of RPC providing 19.3 g/d of choline ion (n = 18)

Results:

1. Calf body weights, BHB, and glucose did not differ between treatment groups.
2. Calves born from dams fed 45 g/d of RPC had greater ADG than calves born from dams fed 30 g/d of RPC; however, no difference in ADG was seen between calves born from RPC supplemented dams versus control.
3. Treatment only numerically impacted calf ROS and AOP; however, calves born from dams fed 30 g/d of RPC had a lesser oxidative stress index (ROS/AOP) than calves born from control dams.
4. Haptoglobin was lesser in heifer calves from dams fed 45 g/d of RPC as compared to heifers from control dams.
5. When dam NEFA was minimal, calves born from dams fed 45 g/d of RPC and 30 g/d RPC had greater or tended to have greater NEFA than calves born from control dams, respectively.
6. When dam NEFA was greater, calves born from dams fed 30 g/d of RPC and 45 g/d of RPC had lesser or tended to have lesser NEFA, respectively.

Take Home Message: RPC supplementation during late gestation impacted neonatal calf metabolism and oxidative stress markers, but this did not translate into substantial improvements in calf growth in the first 3 weeks of life.



Full Abstract

Effects of maternal dietary rumen-protected choline supplementation during late gestation on calf growth and metabolism

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The objective of this study was to examine the effects of maternal supplementation and dose of rumen-protected choline (RPC) on neonatal calf growth, metabolism, and oxidant status. Parous Holstein cows were blocked by calving month and randomly assigned within block to receive either 45 g/d of RPC (CHOL45, n = 19), 30 g/d of RPC (CHOL30, n = 22), or no RPC (CON, n = 19) as a top-dress starting 24 d before expected calving. Calf body weights were recorded for the first 3 wk and average daily gain (ADG) was calculated. On d 1, 7, 14, and 21, blood samples were taken to quantify plasma reactive oxygen species (ROS), antioxidant potential (AOP), haptoglobin, nonesterified fatty acids (NEFA), β -hydroxybutyrate (BHB), and glucose. Data were analyzed using linear mixed models including the fixed effects of treatment, time, calf sex, and prepartum dam data (-24 d) as covariates, as well as interactions. Calf body weights, BHB, and glucose did not differ between treatment groups. Calves born from CHOL45 dams had greater ADG than calves born from CHOL30 dams ($P = 0.03$); however, no difference in ADG was seen between calves born from RPC supplemented dams versus CON. Treatment only numerically impacted calf ROS and AOP; however, calves born from CHOL30 dams had a lesser oxidative stress index (ROS/AOP) than calves born from CON dams ($P < 0.01$). Moreover, haptoglobin was lesser in heifer calves from CHOL45 dams as compared with heifers from CON dams ($P < 0.01$). The dam's NEFA concentration interacted with treatment to affect calf NEFA concentration (interaction, $P = 0.02$). When dam NEFA was minimal, calves born from CHOL45 and CHOL30 dams had greater or tended to have greater NEFA than calves born from CON dams, respectively. Conversely, when dam NEFA was greater, calves born from CHOL30 and CHOL45 dams had lesser or tended to have lesser NEFA, respectively. In conclusion, RPC supplementation during late gestation impacted neonatal calf metabolism and oxidative stress markers with some effects related to dose, but this did not translate into improvements in calf growth in the first 3 wk of life.

Keywords: methyl donor, nutritional programming, epigenetics