Abstract Summary

Title: Effects of dietary rumen-protected choline supplementation during an intramammary lipopolysaccharide challenge in periparturient dairy cattle

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Objective: Examine the effects of supplementation and dose of rumen-protected choline (RPC) on metabolism, inflammation, and performance during an intramammary lipopolysaccharide (LPS) challenge

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. Before the LPS challenge, cows receiving RPC produced approximately 3.5 ± 1.3 kg/d (7.7 lb/d) more milk than control cows.
2. From 17 to 21 DIM (after LPS challenge), treatment did not affect milk yield.
3. Cows receiving RPC produced approximately 3 ± 1.5 kg/d (6.6 lb/d) more milk than CON in the carry-over period (22 to 84 DIM).
4. Treatment did not impact somatic cell score (SCS) prior to challenge; however, during the LPS challenge, treatment interacted with the PTA for SCS such that RPC supplementation reduced SCS in cows with poorer genetics.
5. Cows receiving RPC had greater BHB concentrations than control cows pre-challenge, but no difference was found post-challenge.
6. NEFA concentrations were not different pre-challenge; however, RPC supplementation mitigated the drop in NEFA concentrations post-challenge (both $P \leq 0.03$).

Take Home Messages: RPC supplementation during the transition period reduced SCS, altered metabolism, and enhanced milk yield following an LPS challenge.

Full Abstract

Effects of dietary rumen-protected choline supplementation during an intramammary lipopolysaccharide challenge in periparturient dairy cattle

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The objective of this study was to examine the effects of supplementation and dose of rumen-protected choline (RPC) on metabolism, inflammation, and performance during an intramammary lipopolysaccharide (LPS) challenge. Parous Holstein cows were blocked by calving month and randomly assigned within block to receive either 45 g/d of RPC (CHOL45, n = 18), 30 g/d of RPC (CHOL30, n = 21), or no RPC (CON, n = 19) as a top-dress starting 24 d before expected calving until 21 d postpartum. Cows were alternatively assigned within treatment group to either receive an intramammary LPS challenge (200 µg in each rear quarter) or not at 17 DIM. Blood samples were taken on d −24, −17, −10, 0, 7, 14, and 21 relative to calving. During the LPS challenge, blood and milk samples were taken at 0, 4, 8, 24, and 48 h post-challenge. Data were analyzed using linear mixed models (PROC GLIMMIX) including the dam's genetic parameters as covariates. Before the challenge, cows receiving CHOL45 ($P = 0.03$) and CHOL30 ($P < 0.01$) produced approximately 3.5 ± 1.3 kg/d more milk than CON. From 17 to 21 DIM (after LPS challenge), treatment did not affect milk yield; however, CHOL45 ($P = 0.03$) and CHOL30 ($P = 0.01$) cows produced approximately 3 ± 1.5 kg/d more milk than CON in the carry-over period (22 to 84 DIM). Treatment did not affect somatic cell score (SCS) before challenge; however, during the LPS challenge, treatment interacted with the PTA for SCS such that CHOL supplementation reduced SCS in cows with inferior genetics. Cows receiving CHOL45 ($P < 0.01$) and CHOL30 ($P = 0.05$) had greater plasma BHB concentrations than CON pre-challenge, but no difference was found post-challenge. Conversely, plasma NEFA concentrations were not different pre-challenge; however, CHOL supplementation mitigated the drop in NEFA concentrations post-challenge (both $P \leq 0.03$). In conclusion, RPC supplementation during the peripartum period reduced SCS, altered metabolism, and enhanced milk yield following an LPS challenge; however, some of these effects are dependent on the genetic propensity for mastitis.

Keywords: methyl donor, inflammation, mastitis