

Monday, June 26th. ADSA-Graduate Student Competition: Production – Poster (PhD)

Feeding rumen-protected methionine and calcium salts enriched in omega-3 fatty acids modify plasma and liver phosphatidylcholine and phosphatidylethanolamine concentrations of periparturient cows

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The objective of this study was to investigate the effects of feeding rumen-protected (RP)-Met and calcium salts (CS) of fatty acids (FA) enriched without or with eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA; i.e., n3FA) in periparturient cows. In a randomized complete block study design, 75 multiparous Holstein cows were assigned to 1 of 4 treatments (n = 18-19/diet): 1) Met deficient (-Met) with CS not enriched in n3FA (-n3FA; 0% n3FA; EnerGII; Virtus Nutrition, USA), 2) Met adequate (+Met; Smartamine M; Adisseo Inc., France) with -n3FA, 3) -Met with CS enriched in n3FA (+n3FA; 4% n3FA; EnerG-3; Virtus Nutrition), or 4) +Met with +n3FA from wk -3 prior to expected calving through wk 4 of lactation. Cows were fed corn silage-based total mixed rations, pre- and postpartum, which were formulated to provide Met at ≤ 0.96 or ≥ 1.13 g per Mcal metabolizable energy (ME) for -Met and +Met, respectively. CS were fed at 1.5% ration dry matter pre- and postpartum. Plasma and liver samples collected on d 21 relative to parturition were analyzed for phosphatidylcholine (PC), phosphatidylethanolamine (PE), and lysophosphatidylcholine (LPC) by LC-MS. Data were analyzed using PROC MIXED of SASv9.4. Planned contrasts included: 1) effect of Met (-Met vs. +Met), 2) effect of n3FA (-n3FA vs. +n3FA), and 3) effect of co-supplementation (+Met/+n3FA vs. +Met/-n3FA and -Met/+n3FA). Liver LPC-20:5 and -22:6 concentrations were greater in +n3FA, relative to -n3FA ($P < 0.01$). We observed greater plasma LPC-22:6 in +Met/+n3FA, relative to +Met/-n3FA and -Met/+n3FA ($P < 0.001$). Liver PC-38:6 concentrations were greatest in +n3FA, relative to -n3FA ($P < 0.001$), which were negatively correlated with liver triglyceride concentrations ($r = -0.25$; $P = 0.04$). Liver PE-38:6 concentrations were greater in +Met/+n3FA, relative to +Met/-n3FA and -Met/+n3FA ($P < 0.001$). A lower liver PC-38:6:PE-38:6 was observed in +Met/+n3FA, relative to +Met/-n3FA and -Met/+n3FA ($P < 0.001$).

Feeding adequate methionine and omega-3 FA in the transition period modified plasma and liver PC and PE profiles.

Keywords: methionine, omega-3, transition

Adisseo Message:

Feeding methionine during the peripartum period has been observed to have beneficial effects on liver metabolism. Omega-3 fatty acids (n3FA) have also been documented to alter metabolism. However, no work has investigated the effects of supplying both n3FA and methionine during the peripartum period.

Even though there are not known requirements for polyunsaturated fatty acids by dairy cows, feeding them in conjunction with rumen-protected (RP) methionine resulted in changes in phosphatidylcholine and phosphatidylethanolamine in plasma and liver, reinforcing the beneficial effects reported previously on DMI, milk production and composition, and liver health.

The results from this trial underscore the importance of feeding eicosapentaenoic acid and docosahexaenoic acid along with a RP-source of methionine to high producing dairy cows during the peripartum period.