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Monday June 26th: Ruminant Nutrition 2 | Protein and Amino Acids

Production responses of dairy cows receiving jugular infusion of methionine and lysine or leucine and isoleucine.

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ORAL PRESENTATION 2203: Shaw Center 212 10:45 AM

Previous studies showed that essential amino acids (EAA) affect *de novo* fatty acid (FA) synthesis, especially Lys, Met, Leu, and Ile. We aimed to assess production responses in cows supplemented with 2 groups of EAA. Twelve Holstein cows (117±29 DIM and 41±5.3 kg/d of milk production) were randomly assigned to Lys/Met or Ile/Leu groups and subsequently assigned to treatment sequences within 2 orthogonally replicated 4 x 3 Youden squares (6 repetitions per treatment). Treatments were with or without Lys (37.6 g/d) or Met (12.0 g/d), and with or without Ile (28.6 g/d) or Leu (41.0 g/d) arranged as 2 x 2 factorials. Treatments were administered through jugular infusion for 10 days. Cows were fed a basal diet (1.77 Mcal of NEL/kg and 9.55 % of MP). On the last day of each period, 2-^[13C]-acetate was infused for 24 h as a tracer for *de novo* FA synthesis. Data were analyzed at R software, using EAA as fixed effects and period, cow, and square as random effects. Tukey test was used for multiple comparisons ($P < 0.05$). Leucine or Ile infusion does not affect DMI (18.7 kg/d SEM=0.42). Leucine infusion reduced ($P = 0.04$ and $P = 0.05$) energy-corrected milk (2.6 kg/d, SEM=0.92) and milk protein production (40 g/d, SEM=0.03). Isoleucine infusion did not change milk production, but it reduced ($P = 0.01$) milk protein concentration (0.16 percentual units, SEM = 0.04) and increased ($P = 0.01$) 0.08 percentual units milk lactose (SEM=0.02). No effect on milk protein was observed from the combination of Ile+Leu. Milk fat concentration, milk fat production (g/d), and milk mixed FA (palmitic and palmitoleic) proportion tended to increase ($P = 0.06$, $P = 0.09$, and $P = 0.07$) for Ile+Leu infusion. On the other hand, Ile+Leu tended to reduce ($P = 0.06$) *de novo* milk FA proportion. Methionine infusion tend to decrease ($P = 0.08$) DMI (from 19.7 to 18.6 kg/d, SEM=0.42). However, infusion of Lys/Met did not affect milk production and composition responses, except by a tendency to decrease ($P = 0.07$) milk lactose concentration by infused Met. Isoleucine and Leu additively affected milk fat synthesis and independently affected ECM, milk protein, and milk lactose. Under the conditions of the study, Met and

Lys did not independently or additively affect milk production and composition responses in dairy cows.

Keywords: amino acids, essential amino acid, milk fat synthesis

Adisseo Message:

The response of feeding some amino acids to dairy cows has been studied for over 60 years. It is thoroughly documented that cows supplemented with methionine show an increase in milk protein production. More recently, it has been reported that supplementing diets with essential amino acids not only increases milk protein synthesis via the mechanistic target of rapamycin (mTOR) signaling pathway but also de novo fatty acid synthesis through mTOR and the transcription factor sterol-regulatory-element-binding protein 1 (SREBP1).

This trial was designed to evaluate the impact of some mTOR-signaling amino acids on de novo milk fatty acid production. Diets in the trial were formulated to meet the requirements at the predicted dry matter intake of the cows. However, the lower-than-expected dry matter intake, therefore, the lower-than expected intake of essential amino acids, may have prevented the cows from responding to the treatments.

Despite the results of this trial do not support the original hypothesis, there was a tendency for an increase in milk fat concentration and production from the cows supplemented with Ile + Leu highlighting the potential of the BCAA on the cows' ECM production outcome.