1243

Energy source and amino acids additively stimulate milk fat production but interact on the regulation of milk protein synthesis.

K. E. Ruh*[1], L. A. C. Ribeiro[1], A Negreiro[1], V. L. Pszczolkowski[1], D. N. Coleman[2], S. I. A. Apelo[1]. [1]University of Wisconsin–Madison Madison, WI, [2]Adisseo Paris, France.

Insulin and AA synergistically stimulate mammary mTORC1 activity. We hypothesized that glucogenic energy, by stimulating insulin secretion, may potentiate the effect of AA on milk components production. To test our hypothesis, 36 peak-lactation Holstein cows were used in a 4x4 repeated Latin square design with 4 28-d periods and 4 treatments arranged as a 2x2 factorial. The 2 treatment factors were energy source (ES): glucogenic (GE, 27.5% starch, 3.2% fat) or ketogenic (KE, 20% starch, 5.8% fat); and total metabolizable AA: 10% deficient (DAA) or sufficient (BAA) and balanced for Leu, Met, and Lys with corn gluten meal and Smartamine ML. Cows were housed in tie stalls, fed once daily, and milked twice daily. Milk samples were collected over 8 milkings. Urine samples were collected 12 times over 3 d, staggered to represent every 2 h collection in a 24 h period. Data were analyzed with a mixed model, containing ES, AA, ESxAA interaction, and period as fixed effects and cow as random effect. Dry matter intake was greater ($P < 0.01$) for BAA compared with DAA (34 vs 31 + 0.5 kg/d). There were no interactions between ES and metabolizable AA level for milk or milk components ($P > 0.23$). Milk yield was greater ($P < 0.01$) for KE compared with GE (45.4 vs 43.5 + 0.8 kg/d) and for BAA compared with DAA (46.0 vs 42.9 + 0.8 kg/d). Fat yield was greater ($P < 0.01$) for KE than GE (1.62 vs 1.57 + 0.03 kg/d), and for BAA than DAA (1.71 vs 1.62 + 0.03 kg/d). Protein yield was greater ($P = 0.03$) for KE than GE diets (1.31 vs 1.27 + 0.02 kg/d), and for BAA than DAA (1.37 vs 1.21 + 0.02 kg/d). Nitrogen efficiency was greater ($P < 0.01$) for KE than GE diets (26.3 vs 25.1+ 0.004 %), and for BAA than DAA (26.6 vs 24.7 + 0.004%). There was an interaction ($P < 0.01$) for milk urea N (MUN) and a trend ($P = 0.07$) for urinary N excretion, in which the response to BAA was smaller under GE as compared with KE. Overall, balanced AA supplementation stimulated milk components production independently of ES. However, the response in MUN and urinary N excretion suggest that cows used N more efficiently under glucogenic diets.

Keywords: mTOR, amino acids, energy source.