

Protein turnover in non-pregnant sows at inadequate and more than adequate feed intake

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Protein turnover is a balance between protein synthesis and breakdown and is affected by both energy and protein intake. Energy and protein metabolism was studied in non-pregnant sows at two feed intakes to determine the effect of energy intake on use of dietary amino acids for protein deposition.

Non-pregnant sows (n=3) were fed a barley-wheat-SBM diet of 12.5 MJ ME/kg, 0.65% total lysine, and 15% crude protein for one week each at 1.88 and 3.69 kg/d to represent approximately 1.0 and 2.0 times maintenance energy requirement (ME_m), respectively. Heat production was measured by indirect calorimetry and a primed-constant infusion of L-[1-¹³C]leucine (1.0 mg/kg/h) was delivered intravenously over 24 h to measure rates of protein synthesis and breakdown. Actual daily energy intakes were 473 and 925 kJ/BW^{0.75}, for 1.0 and 2.0*ME_m respectively. Sows fed 1.0*ME_m lost a small but not significant amount of weight while sows fed 2.0*ME_m gained on average 1292 g/d. Leucine flux was different between intakes (P<0.05). Protein synthesis represented 80% and 90% of flux for sows fed 1.0 and 2.0*ME_m, respectively. Leucine appearance from body protein breakdown was much greater in sows fed 1.0*ME_m (75 vs. 17 % of flux). Therefore, energy intake was inadequate at 473 kJ/BW^{0.75} and body protein was being catabolized for energy, resulting in lower protein gain (107.7 vs. 257.3 g/d). Sows fed the higher energy intake therefore used dietary protein for protein synthesis with much greater efficiency (83 vs. 25 % of flux).

Implications: Sows fed adequate energy and protein reduced body protein breakdown and incorporated dietary amino acids more efficiently into body protein. Sows fed the lower energy intake had increased body protein breakdown and amino acids were oxidized for energy, demonstrating the significant impact that dietary energy intake has on amino acid requirements of sows. (Supported by ALIDF, ACAA Alberta Pork, Ontario Pork and Ajinomoto Heartland LLC).