

Feeding frequency alters protein and energy metabolism of sows fed at and twice the energy requirement for maintenance

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A long term research program is currently underway to redefine energy, protein and amino acid requirements in modern, high producing sows. Although sows are typically fed once daily, frequent feeding is more desirable during amino acid oxidation and calorimetry studies. Two distinct feeding frequencies and feeding levels were investigated during simultaneous measurement of protein and energy metabolism in sows.

Non-pregnant sows (n=5, 174 ± 11 kg) were fed a standard barley-wheat-SBM gestation diet at 1.0 and 2.0 times the energy maintenance requirement (ME_m, 458 kJ ME/kg^{0.75}, ARC 1981). Half the daily ration was offered in 16, ½-hourly meals (nibbling) followed by the remaining half in a single meal (full fed). Indirect calorimetry was performed for 24 h with simultaneous measurement of amino acid oxidation using continuously infused L-[1-¹³C]leucine as tracer. Sows fed at 1.0 * ME_m had a greater heat production (HP, 25.1 MJ/d) than energy intake (23.1 kJ/d ME) and lost weight (-198 g/d). Sows fed at 2.0 * ME_m (46.4 MJ ME/d) gained on average 1292 g/d. Total HP at 2.0 * ME_m was greater (p<0.05) at 30.9 MJ/d than at 1.0 * ME_m. The respiratory quotient (RQ) of sows fed at 2.0 * ME_m was greater than 1, indicating fat deposition, and greater than for sows fed at 1.0 * ME_m (p<0.01). The HP during nibbling (32.7 MJ/d) was greater (p<0.05) than when fasting (25.5 MJ/d) or full fed (24.6 MJ/d). Amino acid oxidation was greater for 2.0 * ME_m (17.6% of dose) than for 1.0 * ME_m (11.4%), and decreased (p<0.05) during nibbling (12.4%) as compared to the period following a single large meal (16.9%).

Implications: Feeding frequency impacts protein and energy metabolism in opposite directions. Dietary amino acids were used more efficiently for protein synthesis by increasing feeding frequency. Increasing feeding frequency increases energy expenditure. 485 kJ ME/kg^{0.75} was insufficient to maintain bodyweight. (Supported by ALIDF, CARC, Alberta Pork and Degussa AG)