

Energy Metabolism and Leucine Oxidation in Early and Late Lactation in Sows

R.S. Samuel¹, S. Moehn¹, P.B. Pencharz² and Ronald O. Ball¹

¹Swine Research and Technology Centre, 4-10 Agriculture/Forestry Centre, University of Alberta, Edmonton, AB T6G 2P5, ²Research Institute, Hospital for Sick Children, Toronto, ON.
Email: ron.ball@ualberta.ca

Energy metabolism and leucine oxidation were measured in lactating sows as part of a long-term research program designed to redefine the protein, amino acid, and energy requirements of modern, high producing sows. Leucine oxidation was used to estimate the catabolism of dietary and body protein for energy.

Lactating sows (n=6) were fed *ad libitum* a diet of 14 MJ DE/kg, 20.7% crude protein, and 1.02 % total lysine. On d 7 and d 17 of lactation, 24 h energy expenditure was measured by indirect calorimetry simultaneously with amino acid oxidation, using IV L-[1-¹³C]leucine as the tracer at a hourly dose of 1.0 mg/kg BW. Between d7 and d17 of lactation, sows lost 6.1 kg BW (208.5 kg vs. 202.4 kg). Backfat tended (p<0.10) to decrease from d7 (19.1 mm) to d17 of lactation (17.1 mm), indicating that most of the weight loss was fat, while loin area was not different (P=0.29). Sow plus litter (n=10) heat production was greater (P<0.001) on d 17 than d7 of lactation (90.9 MJ/d vs. 64.9 MJ/d). Respiratory quotients, indicating nutrient utilization, were highest in the very early morning (1.032±0.007) and lowest during the day (0.943±0.012). These data show that sows actively stored energy through lipogenesis during the overnight period, but were forced to utilize those reserves during the day when piglets were most actively suckling. Leucine oxidation was greater (P<0.0001) on d 17 than d 7 (28.8% vs. 21.8% of dose). Milk (5.4 kJ/g; 5.2% crude protein) production per piglet (656 g/d vs. 940 g/d) increased (p<0.05) while feed intake (kg/d) tended (P<0.10) to increase from early to late lactation.

Implications: Feed intake during lactation was insufficient to meet energy requirements of these sows, based on measurements of energy metabolism. Amino acid oxidation increased between early and late lactation, indicating that more protein was being catabolized, probably to provide additional energy. Therefore, the amino acid intake of these sows in late lactation was insufficient to meet the demands for both protein synthesis and energy utilization. (Supported by ALIDF, CARC, Alberta Pork, Degussa AG)