

# Protein turnover in lactating sows

R.S. Samuel<sup>1</sup>, S. Moehn<sup>1</sup>, P.B. Pencharz<sup>2</sup> & R.O. Ball<sup>1,2</sup>

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

Lactation demands a very high input of energy and protein for the production of milk. It is difficult for sows to consume enough dietary energy to support lactation and, thus, sows are forced use body tissue reserves. However, excess catabolism of body protein for energy and amino acids is undesirable for the productivity and longevity of sows. Protein turnover and energy metabolism was simultaneously measured in sows on d 7 and 17 of lactation.

Sows were fed a lactation diet *ad libitum* (14 MJ DE/kg, 20.7% crude protein, 1.02 % total lysine). On days 7 and 17 of lactation, 24 h energy expenditure was measured by indirect calorimetry while a primed-constant infusion of L-[1-<sup>13</sup>C]leucine (1.0 mg/kg/h) was delivered intravenously over 24 h to measure rates of protein synthesis and breakdown. Milk yield and composition were also measured. Leucine intake varied due to differences in feed intake, but leucine flux was not significantly different between days of lactation. Protein synthesis and leucine appearance from body protein breakdown, as % of flux, were higher ( $P < .001$ ) on d 7 than d 17 (81.1 vs. 76.9 % and 25 vs. -10 %), respectively. The protein and leucine content of milk were also higher on d 7 than d 17 (5.3% vs. 5.1% CP and 3.0 vs. 2.0 g/kg), respectively. Negative protein breakdown on d 17 indicates utilization of leucine by the mammary gland that was neither oxidation or protein synthesis. The higher dietary intake of energy and protein on d 17 reduced both whole body protein breakdown and protein synthesis. The higher dietary energy intake on d 17 (13.4 MJ/d) was entirely accounted for by milk energy output (13.8 MJ/d)

**Implications:** This is the first report of protein turnover in lactating sows. These data indicate that sows were in greater protein deficit during early lactation than late lactation; therefore diets higher protein, or with a better balance of amino acids, are required in early lactation to reduce the loss of body protein. As energy and protein intake increased in these sows, it was used almost exclusively for milk production. Milk energy production on d 17 was supported almost entirely by dietary energy intake. Nearly 100% of the dietary protein intake was utilized for milk production in late lactation. (Supported by ALIDF, CARC, Alberta Pork and Ajinomoto Heartland LLC)