

Protein turnover and heat production of sows varies at day 30, 45 and 105 of gestation

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Pregnancy presents unique metabolic challenges to the maternal body. The increased requirements of energy and protein over maintenance must be met in order to sustain pregnancy. These additional requirements were traditionally provided by a constant diet but growing evidence suggests significant changes to metabolism occur throughout gestation. Because maternal tissue can be mobilized to reduce the effects of dietary challenges to the developing pregnancy, negative litter effects may not be observed. However, there are short-term and long-term effects on total sow productivity.

Gravid sows (n=4) were fed 2.4 ± 0.1 kg of a barley-wheat-SBM diet of 12.5 MJ ME/kg, 0.65% total lysine, and 15% crude protein twice daily throughout gestation. Heat production was measured by indirect calorimetry and a primed-constant infusion of L-[1-¹³C]leucine (1.0 mg/kg/h) was simultaneously delivered intravenously over 24 h. All measurements were made at d 30, 45, and 105 of gestation. Respiratory quotient (RQ) was calculated to determine nutrient utilization. Energy retention (intake minus heat production) (MJ/d) was greatest ($P < 0.01$) on d 45 (6.1 ± 0.9) compared to d 30 (3.7 ± 0.9) or d 105 (1.4 ± 1.5) of gestation. The RQ was greater than 1 and highest on d 45 indicating lipogenesis. Leucine flux, appearance from breakdown, and incorporation into protein were highest ($P < 0.0001$) on d 45 compared to days 30 or 105 of gestation. However, as a result of the significant increase in protein breakdown (9.3 vs. 1.0 g/d) protein gain was lower ($P < 0.05$) for sows on d 45 (165.2 g/d) compared to d 30 (172.4 g/d and). Therefore, energy was preferentially stored by these sows on d 45 at the expense of protein.

Implications: Understanding the dynamic needs of the sow and the products of conception can be used to develop phase feeding programs for sow nutrition. The correct utilization of phase feeding would improve productivity and provide positive economic returns. (Supported by ALIDF, CARC, Alberta Pork, Ontario Pork and Ajinomoto Heartland LLC).