

Tryptophan requirement of pregnant sows

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Amino acid (AA) requirements of sows may change from early (EG) to late (LG) gestation due to the accelerated growth of products of conceptus after d 70 of pregnancy. Because Tryptophan (Trp) is a co-limiting AA in corn-soy diets, this study was conducted to determine the Trp requirement in EG and LG using the indicator AA oxidation method.

The same 6 2nd parity sows were studied in EG (d 35 to 53) and in LG (d 92 to 111) at a constant feed amount of 2.4 kg/d. Each sow received 6 diets based on corn, corn starch and sugar in both EG and LG. Diets in EG contained Trp at 20, 40, 60, 80, 100 and 120 % of the Trp requirement (2.5 g/d) in EG, for sows of similar body weight, maternal gain and litter size, and 60, 80, 100, 140, 160 and 180% in LG. Sows were fed 2 mg/(kg BW·h) of L[1-¹³C]Phenylalanine (Phe) over 4 h in 8 ½-hourly meals. Expired CO₂ and plasma free Phe were analyzed for ¹³C enrichment above background. Requirements were determined as the breakpoint in 2-phase nonlinear models. Sows grew from 167.7 kg (SE 3.93) at breeding to 211.9 kg (SE 5.18) post farrowing. The sows had litters of 14.5 piglets (SE 0.43) weighing 19.0 kg (SE 1.41) at birth. The Trp requirement was greater (P = 0.002) by 52% in LG (2.6 g/d) compared to EG (1.7 g/d). Phe oxidation (P = 0.029) and body protein breakdown (P = 0.017) decreased from EG to LG. Phe retention and oxidation responded quadratically (P = 0.038) to increasing Trp intake. The increase (P = 0.001) in Phe retention from EG (2.94 g/d) to LG (8.28 g/d) agreed with a gain of 1 g/d N per fetus in LG and indicated that maternal protein gain was similar in EG and LG. Heat production and energy retention were not affected (P = 0.92) by Trp intake but increased and decreased, respectively, (P < 0.01) from EG to LG.

Implications: The changes in Trp requirement and energy retention during gestation cannot be adequately met by increasing the feed allowance of a single diet throughout pregnancy. Therefore, phase feeding of 2 diets with different Trp contents is necessary to balance Trp and energy intake with the changing Trp and energy requirements in pregnancy. (Supported by ALIDF, ACAAF, Alberta Pork, Ontario Pork and Ajinomoto)