

Adaptation to a Change in Dietary Lysine or Protein Occurs Quickly Regardless of Pig Weight

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We previously established a new method to determine amino acid requirements in piglets. This method involves feeding varying levels of a test amino acid and measuring the oxidation of an indicator amino acid (IAAO). A major advantage of the IAAO technique is the short time necessary for adaptation to different test diets. We are adapting the IAAO method for use in young growing pigs (20-30 kg) and adult sows (200-300 kg). The present objective was to establish the adaptation time required for a change in phenylalanine (PHE) oxidation (the indicator amino acid) to plateau in response to a test diet (lysine intake in growing pigs and protein intake in sows).

Study Design and Results: All pigs and sows were surgically implanted with venous catheters for isotope infusion. After 7 d on a complete diet, growing pigs were fed a lysine deficient diet (56% of requirement) for 6 d and then refed the complete diet (123% of requirement) for another 6 d. PHE oxidation was determined on days 0, 2, 3, 4, 6 and 8, 9, 10, 12. Sows were fed diets with protein N at 100% of requirement for 6 d, at 50% for another 8 d and 200% for another 8 d. PHE oxidation was measured on days 0, 1, 2, 4, 5, 7, 8 and 9, 10, 12, 13, 15, 16. PHE oxidation (% dose) was not affected by day of adaptation within a diet ($P>0.05$), but was affected by diet fed (growing pigs: low lysine= $16.7 \pm 1.8\%$; high lysine= $7.6 \pm 1.9\%$; $P<0.05$) (sows: N at 50%= $6.4 \pm 0.9\%$; N at 100%= $4.9 \pm 0.5\%$; N at 200%= $3.4 \pm 1.2\%$; $P<0.05$). The repeated measurement of PHE oxidation clearly demonstrated the precise repeatability of our method (growers: CV= $7.2 \pm 3.8\%$ sows: CV= $10.2 \pm 5.0\%$). These studies demonstrate that the IAAO method requires minimal adaptation (i.e. <2d) regardless of live weight or type of deficiency (lysine or protein) and is highly repeatable.

Implications: This study supports the use of the IAAO technique in pigs of all ages, including those in gestation or lactation. Development of the IAAO method for use in all pigs would rapidly improve the knowledge base of amino acid requirements used in feed formulations. (Supported by Alberta Pork, Alberta Agricultural Research Institute and Degussa Huls AG.)