

The Branched Chain Amino Acid (BCAA) Requirements of the Young Pig

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The BCAA requirement in the young pig (<5 kg) has not been determined previously and the NRC recommendations for swine (1998) are based mainly on extrapolations from studies conducted on 10-20 kg piglets. Traditionally, the BCAA have been considered to be primarily catabolized in the muscle and their metabolism during first pass in the small intestine has not received attention. We have recently shown that the gut has a major impact on the metabolism of several amino acids (e.g. threonine, methionine), therefore we need to determine if the gut has a role in BCAA metabolism.

The objective of this research was to measure the requirement of the gut for BCAAs. We accomplished this by measuring BCAA requirement by indicator amino acid oxidation in orally compared to intravenously-fed piglets. Piglets (n=32, 2 d, 1.6 ± 0.35 kg) received elemental diets containing adequate nutrients for 5 days. On days 6 and 8, the piglets randomly received one of the test BCAA concentrations (0.2, 0.8, 1.4, 2.0, 2.6, 3.2 or 3.8 g/kg/d). The BCAAs were fed as a mixture of isoleucine:leucine:valine in the ratios of 1:1.8:1.2; this is the recommended ratio for ideal protein in pigs. Diets were infused continuously via IV or gastric catheters. On day 7 and 9, phenylalanine (PHE) oxidation was determined by 4 hr primed constant infusion of L-[1-¹⁴C]-PHE (3.5 µCi/kg/h) and measurement of radioactivity in expired CO₂. Using breakpoint analysis, the total BCAA requirement was determined to be 1.47 and 2.61 g/kg/day for IV and oral feeding respectively.

Implications: These results show that the neonatal piglet small intestine uses approximately 44% of the total BCAA intake. Current recommendations by NRC (1998) for total BCAA intake (1.99 g/kg/d) is considerably lower than our determined requirement of 2.61 g/kg/d. Thus supplementation of diets with BCAA for weaned piglets might be beneficial, especially under conditions of early weaning where piglets may experience gastrointestinal stress or disease. Additional BCAA may be required in weaning diets to achieve optimal growth and performance. (Supported by Alberta Pork & AARI.)