

Methionine Requirement is Affected by Gut Function in the Early-Weaned Piglet

Anna K. Shoveller¹, Paul B. Pencharz^{2,3} and Ronald O. Ball^{1,2,3}

¹Alberta Pork Research Centre, 4-10 Agriculture/Forestry Centre, University of Alberta, Edmonton, AB, T6G2P5; ²The Hospital for Sick Children, Toronto, ON, M5G 1X8; and ³University of Toronto, ON.
Email: rball@afns.ualberta.ca

Introduction

The gut may use a substantial proportion of dietary methionine (MET) intake. Dietary methionine is used for protein synthesis, the synthesis of cysteine (CYS), and as methyl donor for polyamine synthesis in the gut. CYS is a major component of mucins and is also required for glutathione and taurine synthesis. Mucins are needed as a protective barrier, to lubricate the gut and aid in digestion. Early weaning of piglets commonly is accompanied by dysfunction of the gut, resulting in diarrhea, intestinal disease, reduced food intake, incomplete digestion and weight loss. We have used a total parenteral nutrition (TPN) model to look at amino acid requirements when the gut is bypassed.

Study Design

The intravenous and oral requirement of methionine was determined in piglets receiving either oral or intravenous TPN, using the indicator amino acid oxidation technique. Piglets received elemental diets containing adequate energy, phenylalanine (PHE) and excess tyrosine, with varied MET concentrations and no cysteine. Diets were continuously infused via intravenous or gastric catheters. PHE oxidation ($n=28$ for both groups) was determined using a primed constant infusion of $[1-^{14}\text{C}]\text{PHE}$ and by measuring expired $^{14}\text{CO}_2$ and plasma specific radioactivity of PHE. For both groups, PHE oxidation decreased linearly ($p<0.01$) as MET intake increased, then became low and constant. Using breakpoint analysis, the MET requirement was estimated to be 0.54 and 0.35 g/kg/day for oral and intravenous feeding, respectively.

Implications

These data show that the gut uses at least 35% of dietary MET intake. Therefore, supplementation of MET and possibly CYS during weaning may enhance the growth, development and health of the gut and improve post weaning performance. (Supported by Alberta Pork and AARI.)