

Intestinal atrophy decreases arginine synthesis in neonatal piglets

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Arginine (ARG) is an indispensable amino acid in piglets and is necessary for protein, urea, polyamine, creatine and nitric oxide synthesis. Dietary ARG intake in suckling piglets is insufficient to support maximal piglet growth. Piglets can synthesize some ARG, with the major dietary precursor being proline, and the primary site of this synthesis is the small intestine. Weaning is associated with intestinal atrophy and this may result in a decrease in arginine synthesis and decline in arginine status. In this study we used intravenous (IV) feeding as a means to induce intestinal atrophy, with or without the addition of an infusion of glucagon-like peptide 2 (GLP-2). GLP-2 has been shown to maintain intestinal structure during IV feeding by reducing cell death and protein breakdown, and maintaining intestinal blood flow. Our objective was to determine the effect of intestinal atrophy on ARG synthesis in young piglets.

IV-fed male piglets (n=10, ~1.7 kg) were allocated to a continuous infusion (1 mL/kg/hr) of either GLP-2 (n =5; 0.4 nmol/mL) or 0.9% saline (n =5) into the jugular vein catheter for 7 d. Piglets received 2 d of a complete diet, followed by 5 d of an ARG deficient (0.60 g/kg/d) diet, which was used to promote maximum ARG synthesis. Piglets received primed, constant infusions of ARG (d 6) and PRO (d 7) isotopes to measure ARG flux and arterial PRO conversion to ARG, respectively.

Plasma ARG concentrations and ARG fluxes were similar (P>0.05). Piglets receiving GLP-2 had a greater jejunal mucosal mass (P=0.003) and a two-fold greater rate of ARG synthesis ($\mu\text{mol/kg/hr}$) from PRO (11.6 vs. 6.3) (P=0.03).

Implications:

Intestinal atrophy results in a decrease in the rate of ARG synthesis from arterial PRO. Therefore, to ensure maximal piglet growth during weaning, dietary ARG supplementation may be necessary (Funded by Alberta Pork, NSERC and AARI).