

# Arginine is not synthesized during first-pass liver metabolism in the newborn piglet

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Endogenous arginine (ARG) synthesis in the neonatal piglet is regulated by dietary ARG intake. However, the first-pass intestinal synthesis of ARG from its major precursor proline (PRO) is not affected by deficient vs. excess ARG intake, raising a question regarding the site of this regulation. First-pass metabolism refers to the metabolism of ingested nutrients by the intestine and liver before they enter the peripheral circulation.

The first-pass liver synthesis of ARG was determined in piglets (~ 7 days old) receiving either excess (1.80 g/kg/d; n=8) or deficient (0.20 g/kg/d; n=8) dietary ARG for 5 days. Piglets received 3 primed, constant radioisotope infusions on separate days: [U-<sup>14</sup>C]PRO given intravenously (IV) and intraportally (IP), and either [4,5-<sup>3</sup>H]ARG or [guanido-<sup>14</sup>C]ARG given IV. Using the results from each PRO infusion in combination with those from the IV ARG infusion, the amount of ARG synthesized from PRO was calculated. First-pass liver synthesis was the difference between the IP and IV rates of synthesis.

Although the piglets fed the deficient ARG diet had higher ARG synthesis in both the presence (excess = 0.06 g/kg/d; deficient = 0.20 g/kg/d;  $p < 0.0001$ ), and absence (excess = 0.07 g/kg/d; deficient = 0.17 g/kg/d;  $p < 0.0001$ ) of first-pass liver metabolism, there was no net synthesis of arginine during first-pass liver metabolism, regardless of ARG intake. Therefore, something other than first-pass liver metabolism regulates ARG synthesis in the neonate.

## Implications

Arginine is a dietary essential amino acid for the young pig; however, sow's milk contains low arginine relative to the estimated requirement. Therefore, sufficient endogenous arginine synthesis must be present to support growth and maintain homeostasis.

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