Citrulline is an effective precursor for arginine in the neonatal piglet

Kristine L. Urschel[1], Anna K. Shoveller[1], Richard Uwiera[2], Paul B. Pencharz[3] and Ronald O. Ball[1]

[1]Swine Research and Technology Centre, 4-10 Agriculture/Forestry Centre, University of Alberta, Edmonton, AB T6G 2P5, [2]Health Sciences Laboratory Animal Services, University of Alberta, Edmonton, AB T6G 2S2, [3]Hospital for Sick Children, Toronto, ON M5G 1X8;
Email: ron.ball@ualberta.ca

Arginine (ARG) is an indispensable amino acid for the neonatal piglet. However, sow's milk contains low ARG relative to the estimated requirement. Although week-old piglets are able to increase ARG synthesis from proline (PRO) in response to dietary ARG deficiency, there is an upper limit to this synthesis and piglets still have a diminished arginine status. Sow's milk contains PRO, ornithine (ORN) and citrulline (CIT), however the extent to which each of these may act as a precursor for ARG synthesis in piglets is unknown. Our objective was to compare the relative effectiveness of CIT, ORN and PRO as precursors for ARG.

The effectiveness of potential ARG precursors in improving whole-body ARG status was assessed in piglets (~ 7 days old) receiving either an ARG deficient (-ARG) diet or the -ARG diet supplemented with an equimolar amount of either ARG (ARG+), CIT (CIT+), ORN (ORN+) or PRO (PRO+). Blood samples were taken daily from d 3 – d 7 to measure plasma ammonia and urea nitrogen concentrations. Beginning on d 5, piglets received 3 primed, constant infusions on separate days to measure ARG flux and PRO conversion to ARG.

Piglets fed the +CIT and +ARG diets had lower plasma ammonia and urea nitrogen ($P<0.05$) concentrations, and higher plasma ARG concentrations ($P<0.0001$) than those fed the -ARG, +ORN and +PRO diets. Isotope kinetic analysis is underway. These results indicate that supplemental CIT, but not PRO or ORN, is an effective precursor for ARG in week-old piglets.

Implications:
ARG synthesis from supplemental CIT can meet whole-body ARG requirements in week-old piglets fed an ARG deficient diet

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