Effect of Dietary Tryptophan Supplementation on Growth, Energy Balance and Blood Metabolites in Milk-Fed Low Birth Weight Pigs

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INTRODUCTION

- Low birth weight (LBW) is associated with reduced postnatal growth, glucose intolerance and abnormal lipid metabolism that results in development of the metabolic syndrome in adulthood.
- Dietary tryptophan (Trp) has been shown to reduce liver fat in rodents, laying hens and pigs and suppress the hyperglycemia in rodents.
- Little is known on the effect of dietary Trp on growth, lipid metabolism and glucose metabolism in LBW infants.
- **Objective**: was to investigate the effect of supplemental Trp on growth, glucose metabolism and lipid metabolism in piglet model of LBW.

METHODS

Animals: LBW (<1.0 Kg) and normal birth weight (NBW; >1.0 Kg) pigs were selected from twelve sows and randomly assigned to 4 milk-based diets (n=7-8; 7 days old) for 3 weeks:

1) NBW with 0% L-Trp (NBW-T0)
2) LBW with 0% L-Trp (LBW-T0)
3) LBW with 0.4% L-Trp (LBW-T0.4)
4) LBW with 0.8% L-Trp (LBW-T0.8)

NBW LBW

Measurements and Sample Collection:

- Feed intake was measured during each meal (4-5 meal/day).
- Body weight was recorded biweekly.
- At week 3, blood samples were collected at baseline (0), 60 and 120 min after a meal test in overnight fasted animals, pigs euthanized and liver samples collected.

METHODS

Sample Analysis:

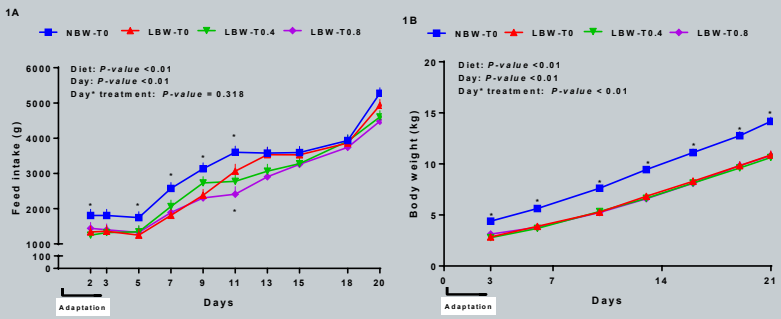
- Blood samples were analyzed for glucose and triglyceride using chemistry analyzer.
- Liver samples were analyzed for gene expression of lipid and glucose metabolism markers using qPCR.

Statistical Analysis:

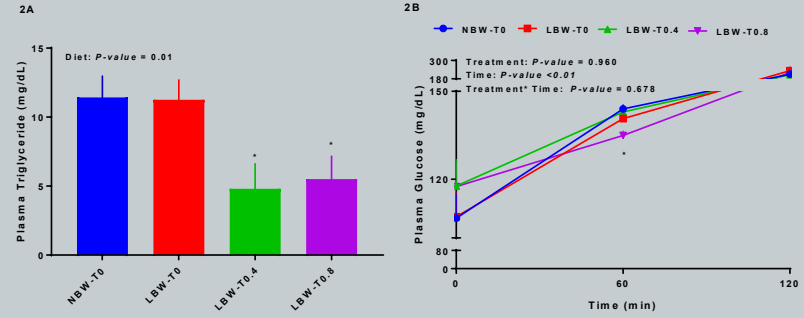
- The data were analyzed using univariate GLM with Dunnett's post-hoc test (SPSS®) with LBW-T0 as the control.

RESULTS

LBW-T0.4 and LBW-T0.8 did not change feed intake and body weight (Fig. 1A & 1B)

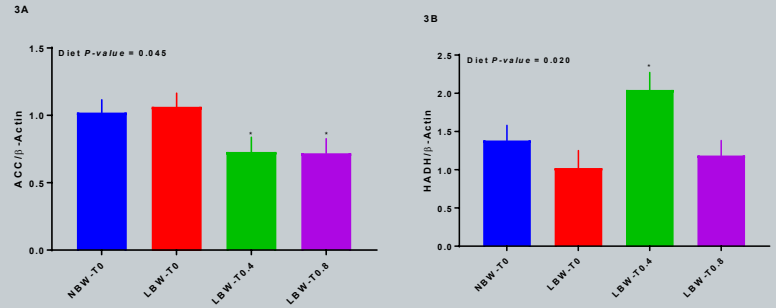


LBW-T0.4 and LBW-T0.8 had lower plasma triglycerides and LBW-T0.8 had lower blood glucose at 60 min (Fig. 2A & 2B).

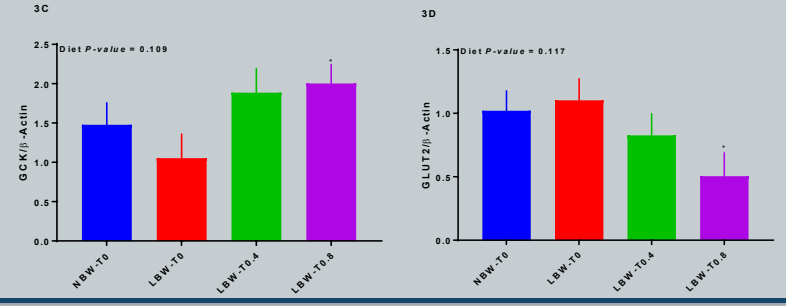


RESULTS

LBW-T0.4 and LBW-T0.8 had lower mRNA abundance of liver ACC and LBW-T0.4 had higher mRNA abundance of liver HADH (Fig. 3A & 3B)



LBW-T0.8 had higher mRNA abundance of liver GCK and lower transcript of GLUT2 (Fig. 3C & 3D)



CONCLUSIONS

- Trp supplementation without affecting the animals' growth and feed intake, improved hepatic lipid and glucose metabolism through reducing lipogenesis and glucose efflux and increasing lipolysis and glycolysis.

FUNDDING

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