

200 Reduced growth performance of pigs fed methionine deficient diet may be associated with their reduced muscle cell differentiation. Shengfa F. Liao¹, Zhongyue Yang¹, M. Shamimul Hasan¹, Rebecca Humphrey¹, Jean Feugang², Derris Burnett¹, John K. Htoo³, ¹Mississippi State University, ²Mississippi State University, ³Evonik Nutrition & Care GmbH

Methionine (Met) is the second or third limiting AA in typical swine diets and plays important roles in promoting the growth, especially, the muscle growth of pigs. This research studied the effects of dietary Met restriction on growth performance and myogenic gene expression in growing pigs. Eight genes in two families, including myogenic regulatory factor family comprising myogenic differentiation 1 (MyoD1), myogenic factor 5 (Myf5), myogenin (MyoG) and myogenic factor 6 (Myf6), and myocyte enhancer factor 2 (Mef2) family comprising Mef2A, Mef2B, Mef2C and Mef2D, were selected for analysis. Individually penned barrows (crossbred, 23.6±2.4 kg) were randomly assigned to two dietary treatments. A basal diet (Diet 1; Met-deficient) was formulated to contain 0.22% standardized ileal digestible (SID) Met and 0.52% SID Met+Cys but to meet the NRC (2012) recommendations for other nutrients. Crystalline DL-Met was added to the basal diet to generate Diet 2 adequate in Met (0.37% SID Met, 0.67% SID Met+Cys). During the four-week ad libitum feeding trial, ADG, ADFI and G:F were measured. Immediately before and after the trial, muscle samples were collected from the longissimus dorsi using a standard biopsy protocol. Total RNA was extracted from the muscle samples (TRIzol Reagent; Invitrogen) and subjected to cDNA reverse-transcription (QuantiTect Reverse Transcription Kit; Qiagen). Transcribed cDNA were used for qPCR analysis (Rotor-Gene Q System; Qiagen). Comparative $\Delta\Delta CT$ method was used for quantitation. Data were analyzed with Student's T-test. Pigs fed Diet 1 (vs. Diet 2) had a lower ADG and G:F ($P < 0.01$). Before the feeding trial, all the tested genes had comparable mRNA levels between the two treatments ($P > 0.17$). After the trial, Diet 1 pigs showed tendency for lower levels of Myf6 and Mef2D mRNA ($P < 0.09$). These results suggest that the reduced ADG and G:F is associated with the possibly-reduced muscle cell differentiation in pigs fed Met-deficient diet.

Keywords: methionine, myogenic gene, growing pig

207 Improving Performance of Finishing Pigs with Added Val, Ile, and Trp: Validating a Meta-analysis Model. Hayden R. Kerkaert¹, Henrique S. Cemin², Mike D. Tokach¹, Jason C. Woodworth³, Joel M. DeRouchey¹, Robert D. Goodband¹, Steve S. Dritz¹, Keith Haydon⁴, Chad W. Hastad⁵, Zach Post⁵, ¹Kansas State University, ²Hubbard Feeds, ³Department of Animal Sciences & Industry, College of Agriculture, Manhattan, KS 66506, ⁴CJ America - Bio, ⁵New Fashion Pork

Based on a recent meta-analysis, we hypothesized that increased dietary Val, Ile, or Trp could correct possible amino acid interactions caused by high dietary Leu in diets containing high levels of corn protein, namely dried distillers grains with solubles (DDGS). A total of 1,200 pigs (PIC TR4×(Fast LW×PIC L02); initially 33.6±0.63 kg) were used in a 103-d study. The 6 dietary treatments were corn-soybean meal-DDGS-based diets as follow: low level of Lys-HCl (SBM), high Lys-HCl and moderate Ile, Val, Trp (NC; AA above NRC 2012 estimates), moderate Lys-HCl and high Ile, Val, Trp (PC), and PC with either increased L-Val (Val), L-Ile (Ile), or L-Trp (Trp). Diets contained 30% DDGS until pigs reached approximately 100 kg and then 20% DDGS until market. Data were analyzed as a randomized complete block design using lmer function in lme4 package in R with pen considered as the experimental unit, body weight as blocking factor, and treatment as a fixed effect with 10 replicates/treatment. Overall final BW and ADG were greater for pigs fed SBM, Val, and Ile diets than the NC with PC and Trp intermediate. Pigs fed the Val diet had greater ($R < 0.05$) ADFI than the NC with pigs fed SBM, PC, Ile, and Trp intermediate. No differences were detected between treatments for G:F. In conclusion, increasing Val or Ile in high Lys-HCl-DDGS-based diets improved growth performance and final BW compared with pigs fed diets containing high levels of HCl-Lys without added Val and Ile. These results demonstrate that negative effects of high Leu in corn-DDGS-based diets can be overcome by increasing the ratios of Val and Ile to Lys.

Table 1. Effects of added Val, Ile, or Trp on growth performance of growing-finishing pigs

Item ^{1,2}	SBM	NC	PC	Val	Ile	Trp	SEM
Initial BW, kg	33.5	33.5	33.6	33.6	33.6	33.5	1.38
Final BW, kg	136.2 ^a	130.6 ^b	134.3 ^{ab}	136.0 ^a	135.4 ^a	133.9 ^{ab}	0.96
Overall (d 0 to 103)							
ADG, kg	1.035 ^a	0.990 ^b	1.015 ^{ab}	1.031 ^a	1.029 ^a	1.010 ^{ab}	0.0084
ADFI, kg	2.629 ^{ab}	2.563 ^b	2.611 ^{ab}	2.656 ^a	2.629 ^{ab}	2.602 ^{ab}	0.0207
G:F	0.394	0.387	0.389	0.388	0.392	0.388	0.0021

¹Amino acid ratios to Lys for Leu, Ile, Trp, and Val were 168, 76, 19.3, and 85, respectively, for SBM treatment, 133, 51, 17.0, and 68, respectively, for NC, and 145, 61, 19.0, and 70, for PC. Val, Ile, and Trp diets had same ratios as PC except ratio for Val (76), Ile, (66) or Trp (21.1) were increased for the respective diets.

²BW = body weight. ADG = average daily gain. ADFI = average daily feed intake. G:F = gain-to-feed ratio.

^{a,b}Means with different superscripts are significantly different ($P \leq 0.05$)

Keywords: finishing pig, valine, isoleucine, tryptophan