PSXIII-B-14 Investigation of the Blood Transcriptome of Young Healthy Pigs to Identify Genetic Indicators for Disease Resilience.

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Abstract: The objective of this study was to investigate the genetic control of the blood transcriptome of young healthy pigs (~27 days of age) to identify genetic indicators for disease resilience. We estimated the heritability of the expression of 16,545 genes and their genetic correlations with 26 measures of performance and resilience before and after exposure to a natural polymicrobial disease challenge. Weaned barrows (n=3,205, Yorkshire*Landrace, 50 batches) from healthy multiplier farms were evaluated for disease resilience in an experimental facility consisting of a high-health quarantine nursery and a challenge nursery and finisher. All pigs were genotyped with a 650k array. Blood samples collected on 1,591 pigs in the quarantine nursery were used for 3' mRNA sequencing and analysis of white blood cell (WBC) counts. Heritability of gene expression was estimated using mixed linear models with (WI) or without (WO) accounting for WBC. The number of genes with significantly heritable expression levels (p< 0.05) was similar for the WI (4,994) and WO models (5,515). Genes with heritable expression levels were significantly enriched for biological processes such as cell activation, immune system process, stress response, and leukocyte activation (q< 1.0×10^-5). One genomic region with heritable expression levels, based on average heritability estimates of genes in windows of 0.5Mb, overlapped with the major histocompatibility complex. Significant genetic correlations (p< 0.05) were observed with all recorded phenotypes but not beyond expected false discovery rates (FDR). However, enrichment analysis of genes ranked by estimates of genetic correlations with recorded phenotypes revealed 7 significant GO biological processes (FDR< 0.05), of which 5 were related to innate and/or adaptive immunity. These results suggest that expression levels in blood of young healthy pigs for genes in specific biological pathways have potential as indicator traits to select for disease resilience. Funding from USDA-NIFA #2017-67007-26144, Genome Canada, Genome Alberta, and PigGen Canada.

Keywords: swine, gene expression, disease resilience

PSXIII-B-I Black Soldier fly Larvae Were More Digestible Than Adult Flies, and Nutrient Disappearance in Black Soldier fly Larvae can be Predicted Using Acid Detergent Fiber Based on in Vitro Assays for Pigs.

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Abstract: The objectives were to evaluate the nutrient utilization of fish meal, black soldier fly (BSF, Hermetia illucens) larvae, and adult BSF meal and to develop equations for estimating in vitro nutrient disappearance of BSF larvae for pigs. Two-step and 3-step in vitro procedures were used to simulate the digestion and absorption of nutrients in the gastrointestinal tract of pigs. In Exp. 1, defatted BSF larva meal had less (P < 0.05) in vitro ileal disappearance (IVID) of dry matter (DM; 81.2% vs. 91.6% and 61.6%) and crude protein (CP; 81.8% vs. 92.2% and 67.2%) and in vitro total tract disappearance (IVTTD) of DM (82.6% vs. 93.6% and 65.7%) and organic matter (OM; 78.1% vs. 91.5% and 63.2%) than fish meal and greater (P < 0.05) values than adult BSF. In Exp. 2, CP concentrations in BSF larvae were negatively correlated with ether extract (r = -0.91) but positively correlated with acid detergent fiber (ADF; r = 0.98) and chitin (r = 0.95). Acid detergent fiber and chitin concentrations in BSF larvae were negatively correlated with IVID of DM (r = -0.98 and -0.88) and CP (r = -0.87 and -0.84) and IVTTD of DM (r = -1.00 and -0.94) and OM (r = -0.99 and -0.98). Equations for in vitro nutrient disappearance of BSF larvae using ADF (% DM) as an independent variable were developed: IVID of CP, % = -0.95×ADF + 95 (r = 0.75 and P = 0.058) and IVTTD of OM, % = -2.60×ADF + 95 (r = 0.75 and P = 0.058). In conclusion, in vitro nutrient utilization of defatted BSF larva meal was less compared with fish meal but was greater compared with adult flies and in vitro nutrient utilization of BSF larvae can be predicted using ADF as an independent variable.

Keywords: black soldier fly, nutrient utilization, swine