

ANIMAL SCIENCE

Title: Determining the biological and metabolic differences between slow and fast growing pigs raised in commercial conditions – **NPB #11-124**

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Scientific Abstract

Weaning transition is a stressful event in the pig's life. While most pigs recover rapidly from this stressor, a portion of the population lags behind their contemporaries in growth performance. The underlying biological and molecular mechanisms involved in post-weaning differences in growth performance are poorly understood. The objective of this experiment was to determine the metabolic basis for poor weaned-pig transition compared to better-transitioning contemporaries by identifying changes in metabolic pathways that are correlated with, and may control, differences in post-weaning success using transcriptional profiling of muscle and adipose tissue. A total of 1,054 pigs were reared in commercial conditions and weighed at birth, weaning, and 3 wk post-weaning. Transition ADG (tADG) was calculated as the average daily gain between weeks 0 and 3 post-weaning. Nine pigs from each of the lowest 10th percentile (low tADG) and the 60th-70th percentile (high tADG) were harvested at 3 wk post-weaning. We measured body composition and generated transcriptional profiles of longissimus dorsi (LM) and subcutaneous adipose tissue for these animals using RNAseq. Overall, 622 genes were differentially expressed ($q \leq 0.10$, fold change ≥ 1.2) in LM and no differentially expressed transcripts ($q \leq 0.10$) were identified in adipose tissue samples. Pathway analyses of differentially expressed genes in LM indicated a shift to decreased protein synthesis, increased protein degradation, and reduced glucose metabolism in the muscle of low tADG. Some of these responses are likely due to changes in Akt pathway signaling including reduced translation initiation by negative regulators of the mTOR pathway and increased ubiquitin-dependant degradation signaling through FoxO1 and atrogin-1 (Fbx32). Many of the gene expression differences between poor transitioning pigs and their contemporaries may be related to low availability of energy and AA in low tADG pigs. This information provides new insight into the metabolic changes occurring in the post weaning period, helping to lead to new strategies to achieve greater success under commercial conditions.

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