Title: Selection for increased intramuscular fat and its effect on other quality traits and the fatty acid composition of pork - **NPB #06-191**

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Scientific Abstract

Selection was practiced for seven generations and based on estimated breeding value for IMF from fitting a two-trait animal model and the full relationship matrix in MATVEC. A randomly mated, unselected control line (CL) was maintained in the population. The two traits emphasized were IMF estimated on the carcass and IMF predicted using real-time ultrasound on the live animal. Longissimus muscle samples (LM) (n=663, 357 in CL, 306 in SL) collected from pigs in generations 3 through 7 and adipose tissue samples from pigs in generations 6 and 7 were used to determine the fatty acid composition of IMF and adipose tissue. Total lipids were extracted from trimmed LM samples and tenth-rib subcutaneous adipose tissue and methylated directly with acetyl chloride and methanol. Triacylglycerols (TAG) were separated from phospholipids (PL) in IMF by thin-layer chromatography. All fatty acid methyl esters were quantified by using gas chromatography. Pigs in the SL had more backfat, less loin muscle area, and consequently, lower carcass lean percentage when compared with pigs in the CL. Control line pigs had more favorable objective color measures. Select line pigs had more flavor and less off-flavor, and were generally more desirable for sensory panel scores when compared with pigs from the control line. Additionally, SL pigs had more total SFA in adipose tissue and more MUFA in the intramuscular fat than pigs in the control line. Total PUFA was higher in CL pigs, regardless of fat depot. The greatest heritability estimates were found for lauric acid (C12:0), palmitoleic acid (C16:1*n*7), stearic acid (C18:0), linoleic acid (C18:2*n*6), and α-Linolenic acid (C18:3*n*3) which were 0.73, 0.40, 0.36, 0.33, and 0.26, respectively. Genetic correlations between IMF content and C16:0, C18:0, and C18:1 did not differ from zero. However, negative genetic correlations between IMF and C17:0, and between IMF and C18:2 were found (-0.61 and -0.80, respectively). Loin muscle area was positively correlated with C18:2 concentrations (0.75), and tenth-rib backfat was negatively correlated (-0.62) with C18:2. Monounsaturated fat concentrations from IMF were negatively correlated with LMA (-0.70), but positively correlated with BF10 (0.77). Intramuscular fat PUFA concentrations were negatively correlated with IMF and BF10, but positively correlated with LMA. No significant genetic correlations were found in the current study between eating quality traits (flavor score and off-flavor score) and the respective fatty acids. Results suggest that the fatty acid composition of fat depots in pigs is a correlated response to selection for quantity of IMF. When selection for IMF is executed, attention to the correlated response in fatty acid composition must be accounted for when looking at the overall meat and eating quality traits of pork. Understanding changes in fatty acid composition as a correlated response to selection for IMF is more important than direct selection for fatty acid composition.