

## ANIMAL SCIENCE

**Title:** Validation of commercial DNA tests for production efficiency, meat quality, and maternal traits in purebred swine - **NPB ID #08-233**

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### Scientific Abstract

Use of molecular genetic information in selection programs can increase the capacity of management and selection tools already available. Commercial DNA tests have recently become available for use by US independent purebred seedstock producers. GeneSeek Inc., a commercial genotyping company in Lincoln, Nebraska has licensed the testing of numerous markers implicated to impact production efficiency of commercial pork production systems. The primary objective of this study is to examine the potential use of commercially available genetic markers in marker-assisted selection schemes employed by independent purebred seedstock producers, accomplished by the characterization of the allele segregation of commercially available markers in US purebred Duroc, Landrace, and Yorkshire populations as well as verification of the associations between phenotypes and alleles segregating within genes commercially available for testing.

Phenotypic data and DNA samples were utilized from three different repositories representing purebred pigs (N = 886 for growth, composition, and meat quality analysis; N = 885 for maternal analysis). Analyses were performed separately for each breed and locus for measures of growth, composition, and meat quality; however for the analysis of maternal traits, analysis was also performed separately by parity.

In parity 1 Yorkshire females, an increase in number born alive was observed for females of the GG genotype class. The difference in homozygous classes for the ESR gene in parity 1 Yorkshire females was approximately 0.87 pigs per litter. A significant difference between EPOR genotype classes was detected for first-parity Landrace females, where females homozygous for the C allele had 2.23 more pigs per litter than females carrying two copies of the T allele. The analysis of MC4R revealed no significant differences for measures of growth performance (days to 250 lbs. and average daily gain) among all three breeds evaluated. Analysis of tenth-rib backfat revealed a significant difference between homozygous MC4R genotype classes within the Duroc breed (0.60 in. for GG animals vs. 0.67 in. for AA animals). PRKAG3

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genotype was not found to be a significant source of variation for the meat quality measures evaluated in this study. The effect of the CAST gene was evaluated as the haplotype of both CAST loci (CAST249 and CAST638) within all three breeds, and the number of inherited copies of the favorable allele did not significantly contribute to enhanced meat or eating quality within the current study. However, a significant difference among haplotype classes was observed for juiciness score within the Yorkshire breed, where pigs with a greater number of A alleles corresponded to increased juiciness as detected by a sensory taste panel. This result was not found for the remaining two breeds, however.

Before marker-assisted selection is initiated, markers found in linkage disequilibrium with QTL that have an effect on a trait of interest need to be validated within the population where selection will be conducted. In the current study, several DNA tests currently available for testing and use have been confirmed to provide significant opportunity to gain additional selection accuracy and genetic gain within US purebred herds. On the other hand, some DNA markers implicated to have effects on economically relevant characters in previous studies were not confirmed within the current study.