

# Application of Mixed Genetic Models for Genetic Improvement of Quantitative Traits in Livestock Populations: Two Selection Experiments in Pigs

Nada Nadarajah, Ph.D.  
Auburn University

## Abstract:

Based on quantitative genetics theory, quantitative traits result from combined effects of multiple genetic loci each with small effect and environment. Now, we know that all genes do not have a small effect and perhaps a few genetic loci (QTLs) may have large effect. Nevertheless, substantial genetic progress has been achieved for economically important traits in farm animals by selective mating. Selection is an important tool that has been used by geneticists to change the gene and genotype frequencies in livestock and plant populations to change economically important traits in the desirable direction. Realized response to selection over time would depend on the magnitude of genetic parameters (genetic/phenotypic (co) variances; heritabilities and genetic correlations) of traits considered in selection programs. Current genetic evaluation programs incorporate pedigree information of individuals into the mixed model equations (MME) when analyzing performance data to obtain estimates of genetic parameters and predictions of genetic merit. Sire, sire-maternal grandsire and individual animal models (IAM) are popular mixed-models used in prediction of breeding values (genetic merit) to identify superior parents to produce future progenies in livestock improvement programs. In the univariate/multivariate IAM, the best linear unbiased predictions (BLUP) of the random animal effect are referred to as estimated breeding values or estimated progeny difference (EBVs or EPDs) that are used to rank candidates for desired traits to select for future breeding.

Results from two selection experiments involving two breeds of pigs carried out at Auburn University will be presented.

- a) a) Five generations of single trait selection in Landrace pigs for increased real-time ultrasound loin eye area at 10<sup>th</sup> rib at 168 days of age.
- b) b) Six generations of selection for improved lean growth efficiency in Duroc pigs based on an index computed from estimated breeding values (EBVs) of pigs for ultrasound backfat thickness at 10th rib (UBF) and predicted EBVs for feed to gain ratio (F/G) using the genetic relationships between UBF and adjusted 168 day weight.