Effect of HMGA1 on performance traits in Duroc, Landrace and Yorkshire pigs

Mohsen Jafarikia1, Frédéric Fortin2, Laurence Maingel1
Stefanie Wyss1, Brian Sullivan1

1Canadian Centre for Swine Improvement, Central Experimental Farm, Building #54, 960 Carling Ave., Ottawa ON Canada K1A 0C6
2Centre de développement du porc du Québec, Place de la Cité, tour Belle Cour 2590, boul. Laurier, bureau 450, Québec QC Canada G1V 4M6

Introduction:
- The high mobility group AT-hook 1 (HMGA1) gene is reported to have an effect on growth, backfat thickness and lean depth in pigs.
- Including candidate genes such as HMGA1 in national BLUP evaluation can potentially increase the accuracy of EBVs and genetic progress on performance traits associated with this gene.

Objective:
- Estimate the allelic frequency of the HMGA1 C576T polymorphism in Canadian Duroc, Landrace and Yorkshire pigs.
- Investigate the effect of HMGA1 SNP on backfat thickness (BFT), loin muscle depth (LMD), average daily gain (ADG), average daily feed intake (ADFI) and feed conversion ratio (FCR).

Materials & Methods:
Animals
- A total of 598 barrows from herds across Canada were sent to the test station in Deschambault, Quebec.
- The numbers of pigs per breed were 183, 183 and 232 for Duroc, Landrace and Yorkshire breeds, respectively.

Genotyping
- Station-tested pigs were genotyped for HMGA1 C576T.

Performance Recording
- Performance data was collected on animals evaluated over two trials in 2010. Measurements were taken for body weight and feed intake as well as ultrasonic measurements for backfat and loin muscle depth. Backfat and muscle depth were adjusted to 100 kg live weight.

Association Analysis
- Statistical model included:
  - Fixed effects: breed, trial, HMGA1 genotype and HMGA1 genotype by breed interaction. Age and weight at start of test were included as covariates.
  - Random effects: Birth litter, farm of origin within trial and pen within trial.
- The SAS MIXED procedure (2002-2008) was used for analysis.

Results & Discussion:

Association Analyses
- Minor allele (T) frequencies were 0.14, 0.11 and 0.08 for the Duroc, Landrace and Yorkshire breeds, respectively.

Minor Allele Frequency
- Minor allele (T) frequencies were 0.14, 0.11 and 0.08 for the Duroc, Landrace and Yorkshire breeds, respectively.

Effect of HMGA1 on BFT, ADG and ADFI across breeds
- Significant interactions of breed by genotype were found for LMD and FCR (p<0.01).
- Pigs genotyped as CC in Duroc and Yorkshire breeds had 1.73±0.83 mm and 2.33±0.97 mm greater LMD than their CT counterparts, respectively (P<0.05).
- Pigs genotyped as CC in Duroc and Landrace breeds had 0.05±0.03 (p<0.10) and 0.07±0.04 (p<0.05) higher FCR than their CT counterparts, respectively.
- Pigs genotyped as TT in Yorkshire breed had 0.23±0.1 higher FCR than their CC and CT counterparts (P<0.05).

Effect of HMGA1 on LMD and FCR within breeds

Conclusions & Recommendations:
- The HMGA1 C576T SNP had low variability in all three swine breeds under study.
- Including HMGA1 genotype in genetic evaluations should increase the accuracy of EBVs of traits associated with this polymorphism.
- A larger study is suggested to confirm the effects found in this study, to increase the number of TT genotypes and to assess the potential value of including HMGA1 genotype in swine genetic evaluation.

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