



Potential Application of Genomics for Improving The Quality of Canadian Pork



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Genomics for the Pig Industry

Thousands of genotypes: The availability of high-density single nucleotide polymorphism (SNP) panels for the swine industry has created an opportunity to use genomic information to improve the quality of Canadian pork.



Commercial availability: A commercial test for over 64,000 genetic markers (64K SNP panel) has been available since January 2009 and has been used in several swine research projects in Canada.

Potential application: In order to develop practical applications for use in the swine industry, there is a need to collect phenotypes for traits of interest on many pigs, genotype them and determine associations between the 64K SNP genotypes and phenotypes. The resulting associations can be used to predict genetic values for other animals in the population based on a genetic test without having to measure the phenotypes.

Practical implication: Genomics has an important practical advantage for meat quality traits which are expensive to measure. Since meat quality measurements are carried out after death, these animals cannot be selected for breeding. A DNA-based test focused on meat quality traits offers an opportunity to develop genomic evaluation methods for selecting breeding animals early in life to improve meat quality.



Experiment



Animals: 700 purebred pigs from herds across Canada were sampled.

Station test: Pigs from various herds across Canada were tested at the Deschambault station in Quebec.

Genotyping: Genotyping was performed by DNA Landmarks using high-density SNP panels.

Meat quality measurements:

Muscle	<i>Longissimus dorsi</i>	<i>Gluteus medius</i>
Trait	Average \pm Standard Deviation	
Ultimate pH	5.62 \pm 0.13	5.61 \pm 0.12
Luminosity	51.63 \pm 2.99	51.77 \pm 3.06
Japanese color score	3.47 \pm 0.51	3.80 \pm 0.57
Marbling score (NPPC)	2.77 \pm 0.81	-
Drip loss %	3.50 \pm 2.30	-

Genotypes quality: The quality of 64K SNP genotypes on about 3,000 pigs from this and other recent studies in the same Canadian breeds was evaluated:

- ✦ Genotyping call rate: 0.96
- ✦ Genotyping error rate: 0.01
- ✦ Average minor allele frequency: 0.24
- ✦ Hardy-Weinberg equilibrium: 0.96
- ✦ Linkage disequilibrium(r^2): 0.31-0.33

Highlights

- ✦ The distribution of SNPs and genotype quality suggest that using the 64K SNP panel is a good tool for the application of genomics.
- ✦ The observed level of linkage disequilibrium between SNPs within breeds should be sufficient to capture quantitative trait loci controlling the variation in meat quality measurements. This is necessary for carrying out association tests and genomic selection on economically important traits such as carcass and meat quality.
- ✦ The observed variation of carcass and meat quality measurements on station tested pigs offers the possibility of selecting for a range of desired characteristics depending on market needs.
- ✦ The advanced high throughput genomics technology is available and CCSI's infrastructure for the application of genomics is in place. More work is needed to apply this technology in the Canadian pig industry. More carcass and meat quality data as well as genotypes are crucial.

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