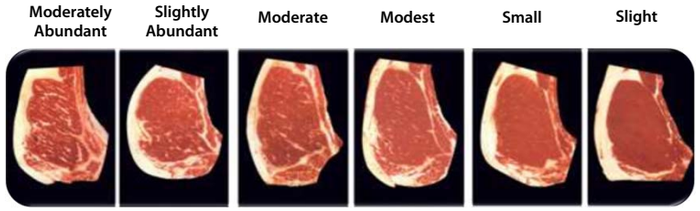
Identifying SNPs associated to Loin Marbling Score in Canadian Duroc Pigs

A. Neustaeter[1], D. A. Grossi[1], M. Jafarikia[1,2], M. Sargolzaei[1,3], and F. S. Schenkel[1]

[1]Centre for Genetic Improvement of Livestock, University of Guelph, Ontario, Canada; [2]Canadian Centre for Swine Improvement Inc., Ottawa, Ontario, Canada; [3]The Semex Alliance, Guelph, Ontario, Canada ; Contact: anna781@gmail.com

Introduction

- An increase in loin marbling score (LMS) is related to increased pork palatability.
- The Duroc breed has high economic merit due to superior growth and efficient food utilization, but intense selection for leanness has decreased its meat sensorial characteristics.
- Obtaining and validating genes associated with LMS could increase accuracy of LMS selection.



The USDA grading scale for pork loin marbling

Objectives

- Identify chromosomal regions associated with LMS in Duroc via Genome-Wide Association Study (GWAS).
- Enrich findings to identify genes that contribute to genetic variation in LMS.

wcgalp.com

10th World Congress on Genetics Applied to Livestock Production

Materials and Methods

- EBVs for LMS from 426 animals were used as pseudo phenotypes
- 35,429 SNP genotypes from the Porcine SNP60 chip were used

GWAS

- GQLS association test (Feng et al. (2011)) was applied
- 10% chromosome-wise false discovery rate (FDR) was used

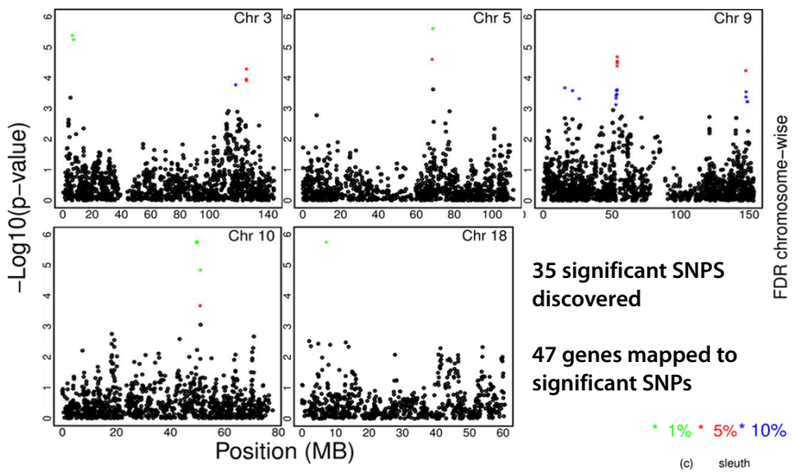
Map genes

- NGS-SNP scripts used to map genes harboring or close to significant SNPs at a distance of ≤100kb (Grant et al. (2011))

Enrich

- Functional enrichment of genes obtained via DAVID 6.7 software (Huang et al. (2007))

Results



35 significant SNPS discovered

47 genes mapped to significant SNPs

Figure 1. Selected chromosomal plots of a genome-wide association study for loin marbling score in Duroc pigs

List of relevant biological processes and pathways enriched in functional analysis of genes associated with LMS

Biological Process (BP) or Pathway	Gene Symbol
BP: steroid metabolic process	SORL1[a,i] APOB[a]
BP: sterol metabolic process	SORL1[a] APOB[a]
BP: transmission of nerve impulse	GRIK4[a] CLCN1[a]
BP: neurological system process	GRIK4[a] ITGA8[i]
Pathway: Regulation of actin cytoskeleton	FGF23[a] ITGA8[i]

[a] SNP located up to 100kb of gene; [i] Intron variant

Conclusions

Some of the SNPs significantly associated with loin marbling score in Duroc pigs were located close to/within genes involved in lipid metabolism.

These identified genes are potential candidates for explaining the underlying genetic variation in loin marbling score in Duroc pigs and deserve further investigation.

Identifying SNPs associated to Loin Marbling Score in Canadian Duroc Pigs

A. Neustaeter[1], D. A. Grossi[1], M. Jafarikia[1,2], M. Sargolzaei[1,3], and F. S. Schenkel[1]

[1]Centre for Genetic Improvement of Livestock, University of Guelph, Ontario, Canada; [2]Canadian Centre for Swine Improvement Inc., Ottawa, Ontario, Canada; [3]The Semex Alliance, Guelph, Ontario, Canada ; Contact: anna781@gmail.com

Acknowledgements

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

Fédération des producteurs de porcs du Québec

Swine Innovation Porc

OSI

Atlantic Swine Centre

Agriculture, Pêcheries et Alimentation Québec

CDPQ Centre de développement du porc du Québec inc.

Growing Forward Programs

CDAQ Conseil pour le développement de l'agriculture du Québec

New Brunswick Agricultural Council / Conseil agricole Nouveau-Brunswick

MRAC Manitoba Rural Adaptation Council Inc.

Agricultural Adaptation Council

Agri-Futures

Canadian Swine Breeders Association / L'Association canadienne des éleveurs de porcs

WSTA Western Swine Testing Association

PigGen Canada

References

- Feng, Z. et al., 2011(Ann. Appl. Stat.)
- Grant J. R. et al., 2011 (Bioinformatics)
- Huang, D. et al. 2009 (Nat. Protoc.)

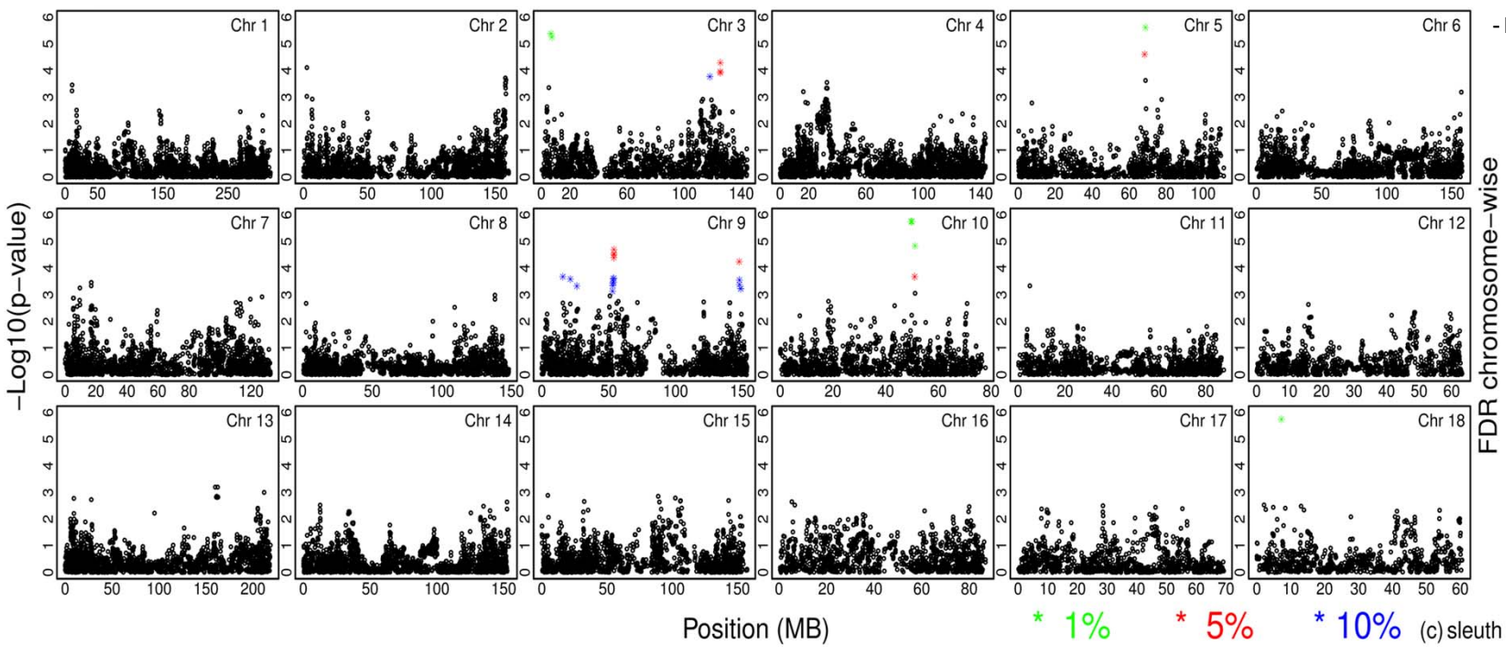


Figure 2. Chromosomal plots from the Genome Wide Association Study for loin marbling score in Duroc pigs; blue dots significant at 10%, red at 5%, and green at 1%

Click here to return to poster

Scan here for abstract