



**ALMA**  
Alberta Livestock & Meat Agency Ltd.



**Government of Alberta** ■

# Canadian Bovine Genomics Workshop

**September 14, 2009**

**Calgary, Alberta**

# Centre for the Genetic Improvement of Livestock – A partner in the Alberta Centre for Livestock Genomics

Stephen Miller

Director, Associate Professor

UNIVERSITY  
*of* GUELPH

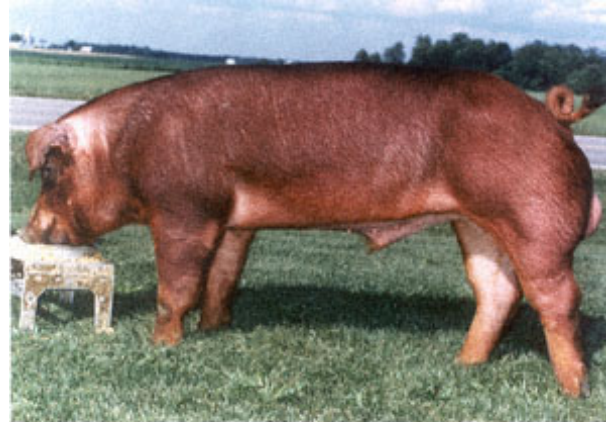
CHANGING LIVES  
IMPROVING LIFE

Canadian Bovine Genomics  
Workshop. Calgary.

September 14, 2009



# Centre for the Genetic Improvement Livestock



provided by National Swine Registry



Sheep

Fish

Poultry

Horses



# Strong Existing Collaboration

G. Vander Voort, M. Kelly, T. Caldwell<sup>1</sup>, D. Lu<sup>1</sup>, Z. Wang, J. Mah, G. Plastow, S. Moore, and S. Miller. Application of kernel partial least squares to estimate genomic breeding values of crossbred beef cattle. Abstract 280. J. Anim. Sci. Vol. 87, E-Supp2 : pg 314.

Li, H., Z. Wang, P. Stothard, M. Sargolzaei, F. Schenkel, S. Xu. 2009. Genome-wide analysis of QTL effects in Canadian Holstein cattle using empirical Bayes method. Proceeding of the 2009 ADSA-CSAS-ASAS Joint Annual Meeting, Montreal, Quebec, Canada. Journal of Dairy Science, 92 (E-Suppl. 1):399.

Lu. D., G. Vander Voort, M.J. Kelly, Z. Wang, J. Mah, G. Plastow, S.S. Moore and S.P. Miller. 2009. Extent of Linkage Disequilibria in Canadian Purebred and Crossbred Beef Cattle. ASAS/CSAS/ADSA Joint Annual Meeting, Montreal, QC

Wang, Z., Sargolzaei, M., Kolbehdari, D., Plastow, G., Moore, S., Schenkel, F.S. 2008. Whole genome association analysis for mapping QTL affecting economically important traits in North American Holstein cattle. Proceedings of the Canadian Society of Animal Science Annual Meeting, University of Guelph, ON, Canada. CD-ROM.

Schenkel, F.S.; Miller, S.P., Ye, X., Moore, S.S., Nkrumah, J.D., Li, C., Yu, J., Mandell, I.B., Wilton, J.W., and Williams, J.L. 2005. Association of single nucleotide polymorphisms in the leptin gene with carcass and meat quality traits in beef cattle. Journal of Animal Science, 83:2009-2020.

Schenkel, F.S., S.P. Miller, X. Ye, S.S. Moore, J.D. Nkrumah, C. Li, J. Yu, I.B. Mandell, J.W. Wilton and J.L. Williams. 2005. Association of single nucleotide polymorphisms in the leptin gene with carcass and meat quality traits in beef cattle. J. Anim. Sci. 83:2009-2020.

# Strong Existing Collaboration cont...

Schenkel, F.S., S.P. Miller, S.S. Moore, C. Li, A. Fu, S. Lobo, I.B. Mandell and J.W. Wilton. 2006. Association of SNPs in the leptin and leptin receptor genes with different fat depots in beef cattle. Proc. 8th World Congr. Genet. Appl. Livest. Prod. CD-ROM Communication No. 03-80

Kelly, M.J., M. Sargolzaei, F.S. Schenkel, Z. Wang, P. Stothard, S.S. Moore and S.P. Miller. 2008. Comparison of linkage disequilibrium decay between a multi-breed beef herd and purebred Angus, Piedmontese and Holstein cattle. CSAS Annual Meeting / Kennedy Conference, CD-ROM:BG07, Guelph, ON

Kelly, M.J., M. Sargolzaei, Z. Wang, D. Kolbehdari, P. Stothard, F.S. Schenkel, S.S. Moore and S.P. Miller. 2008. Estimates linkage disequilibrium in a multi-breed beef herd based on the Illumina Bovine SNP50 Beadchip. J. Anim. Sci. Vol. 86, E-suppl. 2

Kelly, M.J., M. Sargolzaei, F.S. Schenkel, S.S. Moore and S.P. Miller. 2008. Initial results from the Illumina Bovine SNP50 Beadchip of their implications for genomic selection. Alberta Bovine Genomics Program Annual Meeting. Banff, AB

Schenkel, F.S., S.P. Miller, S.S. Moore, C. Li, A. Fu, S. Lobo, I.B. Mandell and J.W. Wilton. 2005. Association of a single nucleotide polymorphism in the leptin receptor gene with carcass and meat quality traits in beef cattle. ASDA-ASAS-CSAS Joint Annual Meeting, Cincinnati, Ohio.

Schenkel, F.S., S.P. Miller, X. Ye, S.S. Moore, C. Li, J. Yu, I.B. Mandell, J.W. Wilton and J.L. Williams. 2004. Association between single nucleotide polymorphisms in the leptin gene and carcass and meat quality traits in beef cattle. Genotype analyses. CSAS Annual Meeting, Edmonton, Alberta.

Schenkel, F.S., S.P. Miller, S.S. Moore, C. Li, J. Yu, I.B. Mandell, J.W. Wilton and J.L. Williams. 2004. Association between single nucleotide polymorphisms in the leptin gene and carcass and meat quality traits in beef cattle. Haplotype analyses. CSAS Annual Meeting, Edmonton, Alberta.

# Collaboration between ABGP and CGIL

- Joint Research – Beef and Dairy
  - Publications
- Funding – Joint projects Provincially and Nationally
- International Collaboration

# International Collaboration



# Research and Implementation of Genomic Selection in Dairy Cattle in Canada

Collaborative work:



First official proofs  
released in August

2009

# Quantitative Genetics

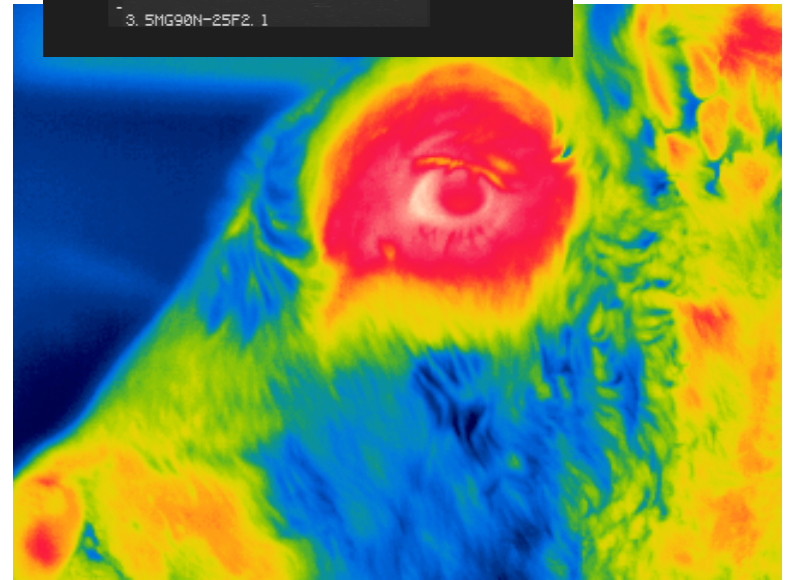
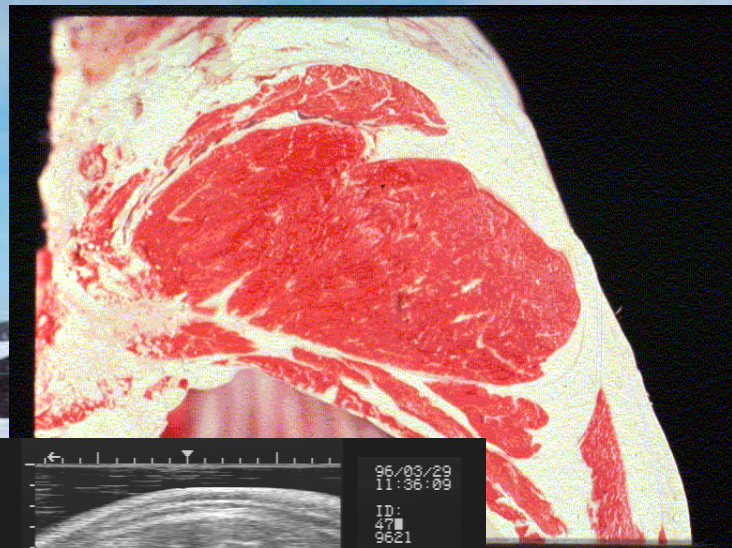
- Genomic Selection and use of 50,000 SNP has compounded the Quantitative and Statistical Genetics requirements for livestock Improvement
- World-wide shortage of expertise
- Historical Strength at CGIAR
- Opportunities to partner

# Deficit of Quantitative Talent

- The supply of well-trained quantitative biologists for roles in both academia and industry is not meeting demand. In the past 12 months, 105 positions for quantitative scientists (with a further 69 for genomic scientists and 57 for animal breeders) were advertised in the field of animal genomics (<http://www.animalgenome.org/community/discuss.html>).

# Genomic Selection

- Now implemented in Canada for Dairy Cattle.
- Quantitative requirements will continue to expand
  - 500,000+ SNP Chips, Complete Sequence
  - Non-additive genetic effects



# Addressing the Phenomic Gap

- Not met at any one institution
- Combining resources
  - Example Feed Efficiency
  - Beef Cluster Application
- Building a National Resource

# Beef Information Nucleus

- Working model developed in Australia
- Need to coordinate Pan-Canadian effort linked with USDA
  - University Facilities
  - Provincial Governments and AAFC
  - Breed Associations
  - Breeding and Genomics Companies

# Summary

- Strong existing collaboration
- Coordinated Canadian effort yields international opportunities
- CGIL complements ABGP program expertise in required quantitative skills
- Require Centre umbrella to coordinate pan-Canadian effort to bridge the phenomic gap