

Canadian Bovine Genomics Workshop

September 14, 2009

Calgary, Alberta

Alberta Ingenuity Centre for Livestock Genomics Technology (ALICET)

Bridging the Gap between Innovation and Adoption

Alberta Ingenuity Centre for Livestock Genomics Technology
Building on successes of the past

Alberta Bovine Genomics Program

1999
Canadian Alberta Beef Industry Development Fund (CABIDF) sponsored chair in molecular biology of beef cattle production established with support of \$1,300,000

Technical staff and first students appointed

Gene marker associations for carcass merit traits

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Alberta Bovine Genomics Program

2001-2004
First MSc. and PhD. Students graduate
Pioneered high density Single Nucleotide Polymorphisms (SNP) analysis in cattle
Genetic markers for Residual Feed Intake (RFI) developed
Genetic markers for carcass traits developed

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Alberta Bovine Genomics Program

2004 - 2009
The initiative was enhanced operationally to the point it achieved program status through support from industry and government:
Alberta Beef Producers, Canadian Cattlemen's Association (BCRC), Alberta Agricultural Research Institute (AARI), Canadian Foundation for Innovation (CFI), and Natural Sciences and Engineering Research Council of Canada (NSERC)

Formal alignments with AAFC and AARD through researchers imbedded in program:
John Basarab
Changxi Li
Carolyn Fitzsimmons

Genetic markers validated and commercialized

High throughput whole genome mapping technologies developed

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Alberta Bovine Genomics Program

2004 - 2009
Participated in the Bovine Genome Sequencing Project with international organizations

The Bovine Genome Sequence was published in the journal *Science* in April, 2009.

Development of a whole genome analysis tool to assay over 50,000 point mutations in cattle in a single reaction

**This is now the international standard for research and genetic evaluation in cattle.*
Livestock Decoded

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Alberta Bovine Genomics Program

Outcomes

- Over 200 genetic markers developed and commercialized for:
 - Parentage
 - Carcass and Meat Quality Traits
 - Feed Efficiency
 - Dairy Traits
- Bovine Genome sequenced and internationally adopted SNP chip developed
- Elite Canadian Angus and Holstein re-sequenced
- 12 Graduate students completed and employed in Industry, Government and Academia
- Greenhouse Gas (GHG) protocols under development

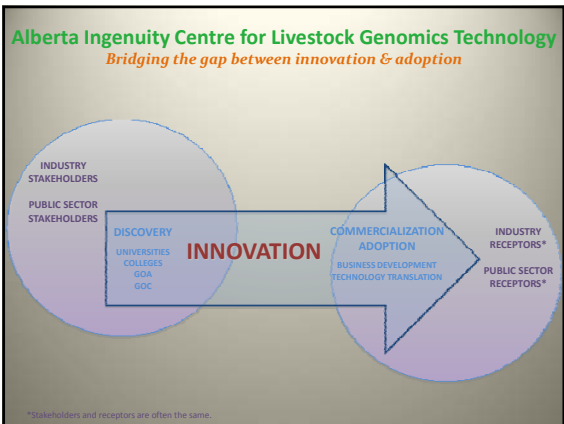
**Alberta now recognized internationally as a leader in Livestock Genomics*

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Alberta Bovine Genomics Program

Collaborations with other leading initiatives across Canada

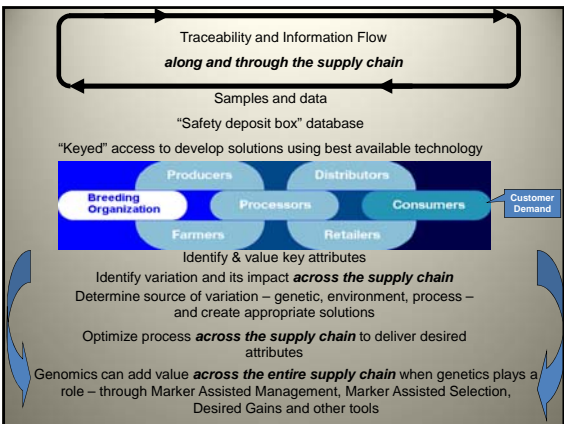
- EmbryoGen (U of A/U Laval)
- CGIL (University of Guelph)
- U of C Vet School
- AAFC
- AARD
- Olds College
- VIDO
- Genome Sciences Centre
- USDA
- BeefCRC



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Vision

To deliver world leading and transformative livestock genomic technologies that will be applied across livestock value chains to the benefit of all Albertans.

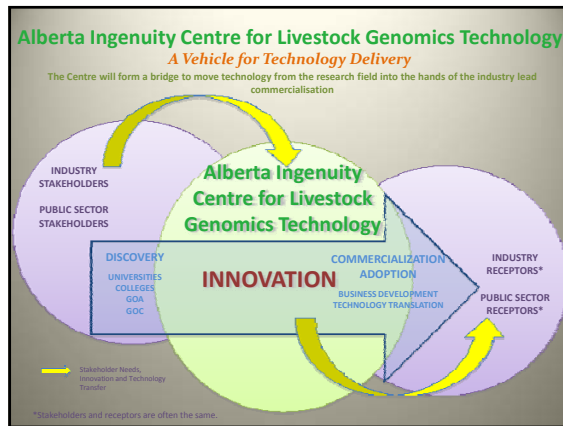


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Mission

AICLGT will create the 'bridge' between genomic research and the opportunities and threats facing the livestock industry. It fundamentally addresses three key needs:

1. The need for an organizational structure that links the genomics research with the needs of the broader livestock industries.
2. The need for increased scientific and technological capacity within the current science resource base to address the "phenomic gap."
3. The need to facilitate adoption and gain benefit for livestock industries in Alberta.



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- Improving coordination
- Creating better value for money (by organizing optimized use of animals – as in the Cluster proposals and ATAG)
- Reducing unnecessary duplication
- Improving replication (and power)
- Reducing time for application (through direct participation of industry) etc.

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AGI & IGENITY To Introduce Industry's First Genomic-Enhanced EPDs For Multiple Traits

Angus producers will have first access to breed-specific DNA profile

DULUTH, Ga. — Angus Genetics Inc.* (AGI) and Merial have entered into an exclusive agreement to provide American Angus Association* breeders with genomic-enhanced expected progeny differences (EPDs) powered by IGENITY*. This will be the first time beef producers have access to genomic-enhanced EPDs for multiple traits at once — and from an Angus-specific DNA profile.

Posted By BEEF Magazine News Staff On July 15, 2009 (3:28 pm) In News
<http://blog.beefmagazine.com/feedingroom/category/news/>

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AICLGT will build on the substantial resources available in Alberta and across Canada

- AICLGT aims to be a focus for genomics research nationally working with groups across the country
- No one group can do it all, collaboration is essential
- Infrastructure is scarce and expensive therefore it needs to be managed with provincial and national coordination in mind
- Animal resources are fundamental to any genomics program and do not exist in adequate numbers in any one place
- Expertise is distributed and synergies should be exploited

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Resources

Human Resources

- University of Alberta (U of A), University of Calgary (U of C), Olds, Alberta Agriculture and Rural Development (AARD), Agriculture and Agri-Food Canada (AAFC), Industry

Facilities (U of A, AARD, AAFC)

- Kinsella, Lacombe, South Campus, Agricultural Genomics and Proteomics Unit

Strategic Alliances

- University of Guelph, Cooperative Research Centre for Beef Genetic Technologies (Beef CRC) Australia, United States Department of Agriculture (USDA), Universities in Brazil.
- Beefbooster, Cor Van Raay Farms, Semex Alliance, Hypor, Genesis, Genoa Biotechnologia S.A.

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Operational Business Plan

Strategic Research

- Creating tomorrows opportunities (5-15 Years out)
- Relevance and excellence (industry participation and peer review)
- Multiple Federal and Provincial Agencies (eg AAFC new programs)
- Strong industry support at the core level as well as specific project collaborations

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Operational Business Plan

Research and Development (Pan Canadian and International)

- U of A and partners (AARD, U of C, Centre for Genetic Improvement of Livestock (CGIL), AAFC, Beef CRC, USDA, Industry)

Technology Translation

- Joint "venture" between the Centre (infrastructure, knowledge), AARD (field staff), Colleges, livestock industries and DNA service providers

Technology Transfer and Commercialization

- Specific contracts with established industry partners
- New Ventures such as spin offs, partnerships etc

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Operational Business Plan

Education and Training

- Providing industry with the expertise needed for adoption
- Universities – PhD., MSc., and undergraduate training
- Colleges and Industry – Internships and graduate placements

Workshops and Demonstration Days

- The use of Kinsella infrastructure
- Industry partnerships

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Operational Business Plan *Human Resources*

Research and Development

- Existing Staff and Alliances

Technology Transfer and Translation

- Multiple Agencies Contributing
- Need a new paradigm under which to operate
- Clear reporting structures established
- Performance driven

Technology Commercialization

- Technology, Entrepreneur, and Company (TEC) Edmonton

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Operational Business Plan *Infrastructure*

Research and Development (Universities, AARD, Colleges)

- Kinsella Ranch, Biobank, Genomics Laboratory

Technology Translation

- Kinsella Ranch infrastructure is intended to improve capacity for "proof of concept" research with industry partners
- Biobank provides sample repository and phenotypic databases to aid industry adoption.
- Technology must be passed off to industry

Technology Transfer and Commercialization

- University funded office space at College Plaza

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Areas of Focus

Verifying the traceability of livestock and livestock products

- AARD, Livestock Identification Services Ltd of Alberta (LISA), Canadian Cattle Identification Agency (CCIA), U of A

Health of livestock and livestock products to ensure security of trade and public health

- U of C, CFIA, University of Guelph (U of Guelph), U of A

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Areas of Focus


Improved quality of livestock products (added value)

- U of A, AARD, Industry

Selection for improved production efficiency and reduced environmental impact


- Industry, U of A, AARD, Olds

1957 Genetics -ACRBC Males




Quantitative Genetics has been incredibly successful!

"Today"




Day 43 Day 57 Day 71 Day 85

(Havenstein et al., 2003a)




Progeny Tested Bull
O-Man

- Semen sales ~200,000 units / year
- Semen price \$40 / unit
- Income > \$5 million / year
- 40,144 daughters already milking
 - 29,811 in United States
 - 1,963 in France, 1,895 in Denmark, 1,716 in Italy, 839 in Holland, etc.



O-Man Daughters vs. Average Cows

Trait	O-Man daughter	Average Holstein
Milk (gallons/day)	10.4	10.0
Protein (lbs/day)	2.78	2.58
Cell count (1000/ml)	205	262
Productive life (mo)	33.8	27.7
Pregnancy rate (%)	25.7	23.1
Calving difficulty (%)	3%	8%



Genomic Tested Bulls
Available Jan 2009

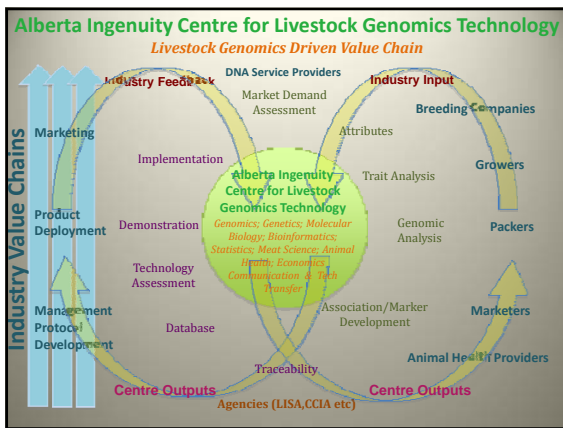
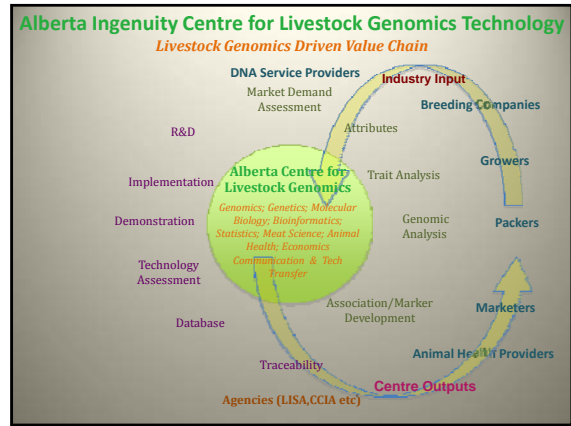
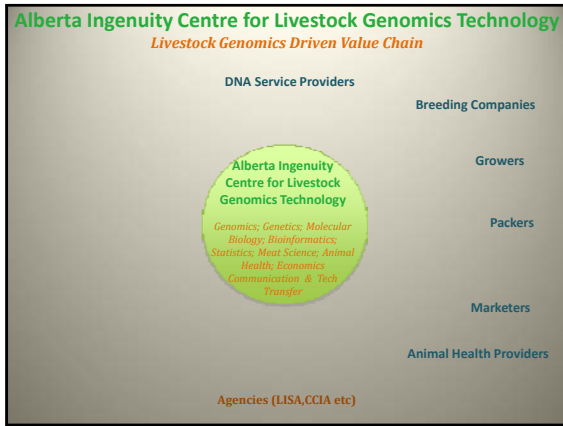
	Age (yrs)	Reliability	Net Merit
Freddie	4	69	918
Al	1	67	914
Russell	1	65	854
Alan	1	68	841
O-Man	10	99	778

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Adding Value to the Process

From Alberta Innovates

- Increased effectiveness and integration of Livestock Genomics Research
- Alignment of programs and investments across the Province and the country
- Increased focus on key areas relevant to Alberta's economy
- Improved facilitation of knowledge, IP and skill transfer within the system and between stakeholders
- Improved accountability and outcomes through integrated performance monitoring and continuous improvement processes



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In Summary

A conduit for genomics technology to livestock industries

Develop and evaluate new technologies

Aid industry to adopt through

- Commercialization
- Technology Transfer
- Technology Translation

Provide the basis by which to establish value chains through technology adoption and information sharing