



ALMA
Alberta Livestock & Meat Agency Ltd.



Government of Alberta

Canadian Bovine Genomics Workshop

September 14, 2009

Calgary, Alberta

International Beef Genomics:

United States Example

John Pollak

Cornell University



Questions

What is the international situation – U.S.?

Is there an International Genomics Strategy?

How is Canada positioned to influence and/or align with this strategy?

What can we learn?

U.S. Example

Discovery

Tools

1 – Methodology

2 – Higher density panels

Validation

Demonstration

Discovery

This period between BFI Canada and now has seen an amazing number of animals genotyped with the 50K panel.

Applied to:

Bull repositories – focus on traits with data collection infrastructure

Animal phenotypes – focus on novel traits

Discovery

ARS (beef and dairy)

US MARC (phenotype and 2000 bulls)

Beltsville (dairy bull repository)

Discovery

NBCEC (field populations)

Healthfulness (Iowa State)

Feedlot Health (Colorado State)

Reproduction and Stayability (Cornell)

Industry partner: Pfizer Animal Genetics

Discovery

University Programs

Examples:

University of Missouri - Beef bull repository

University of Illinois – Genetic defects

Texas A and M, UC Davis, Washington State....

Discovery

USDA Competitive Grants

Examples with an NBCEC flavor (all interrelated):

Milt Thomas, NMSU – Reproduction

Alison Van Eenennaam, UCD – Integrated

Dorian Garrick, ISU – Bioinformatics

**Van Tassell, Taylor and Pollak – Whole Genome
Enabled Animal Selection**

Discovery

Industry

Major DNA genetic service providers have R&D programs.

Projects in collaboration with university researchers and independent projects

U.S. Example

Discovery

Tools

1 – Methodology

2 – Higher density panels

Validation

Demonstration

Tools

Methodology

The advent of large SNP panels presents a challenge to analysis of data.

Software for the implementation of procedure like Bayes “B” (and derivatives) is being developed.

GenSel – Iowa State University (freeware)

Tools

Methodology

There are many advantages to universal software to include eliminating duplication of effort and having a system that is understood and tested by all.

Tools

Methodology

Integration of information for selection

Optimal use of DNA-derived information and EPDs comes from appropriately indexing all sources of information.

Tools

Blending of results:

Indexing the MBVs and traditional genetic predictions.

Tools

Using genotypes:

Either fitting directly or through the genomic relationship matrix

Misztal – University of Georgia

Tools

Fitting MBVs:

Using the molecular predictions as correlated information in genetic evaluation

Kachman – University of Nebraska

(American Angus Association application)

U.S. Example

Discovery

Tools

1 – Methodology

2 – Higher density panels

Validation

Demonstration

Tools

Larger panel: Is 50K enough?

In all of the discovery efforts, we are leaving a lot of unexplained genetic variation on the table.

The proportion of the genetic variation explained by MBVs is typically quite good in the discovery populations but most often disappointing (< 20%) in validation populations.

We also are seeing that the MBVs developed in one breed do not work as effectively in other breeds.

Tools

Larger panel: Is 50K enough?

Some Issues:

Variation from rare minor alleles.

LD issues leading to lack of “portability” of discovery from one breed to another.

Tools

How will we apply the new “larger panel”?

We have exhausted a lot of financial resources using the 50K.

Will it be cost effective to consider redoing all animals genotyped with the 50K?

I have not seen a strategic plan in academia for the most efficient, cost effective use of the new panel.

U.S. Example

Discovery

Tools

1 – Methodology

2 – Higher density panels

Validation

Demonstration

Validations

Process of replicating discovery results in
“*independent*” populations.

Past validations are examples of joint efforts
of the U.S., Australia and Canada.

Validations

Running out of populations:

We don't have populations with phenotypes for all traits needing validation.

We are using populations we do have phenotyped for discovery.

We also have problems with populations being disproportionately related to the discovery group.

Validation: Step Two

We have not developed an in-depth strategy for “assessment” of DNA tools.

We are looking across breeds.

Not assessing differences across management schemes or environments.

ISSUE: Phenotypes

From the process of discovery to broader assessment, the major issue is lack of phenotypic information.

We simply do not have enough at this time, and efforts towards collaboration in pooling resources are necessary.

Is There a U.S. Genomics Strategy?

Positive: A large number of projects with a wide range of target traits and approaches.

We also have projects in:

Developing methodology for delivery.

Developing extension materials.

In validation.

Is There a U.S. Genomics Strategy?

Negative: Disjointed. We have not found efficient ways of combining our resources for discovery or for validation.

There is a strategy within ARS, within NBCEC, within USDA competitive grants and in the commercialization companies but not necessarily across organizations.

Questions

Is there a U.S. Genomics Strategy?

At the 30,000 foot level,,,,, = kind of.

U.S. Example

Discovery

Tools

1 – Methodology

2 – Higher density panels

Validation

Demonstration

Demonstration

There is still a lot of inertia impeding adoption and there is the need to develop consumer confidence in the process.

The EPD lesson:

EPDs were eventually accepted as producers gained confidence that the predictions matched what they saw in their records.

The Weight Trait Project



AMERICAN
Simmental
ASSOCIATION
406-587-4531
e-mail: simmental@simmgene.com
website: www.simmental.org

UNIVERSITY OF
Nebraska
Lincoln



South Dakota State University
You can GO ANYWHERE from here.®



National Colorado State University-Cornell University-University of Georgia
Beef Cattle Evaluation
Consortium

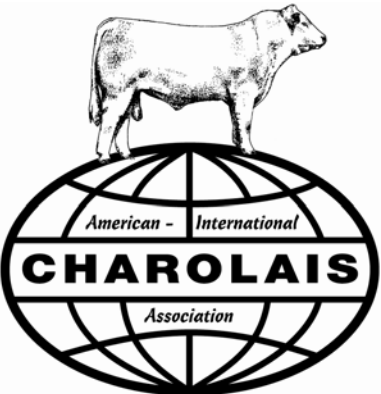


NDSU

Building Better Beef...
Red Angus



ANGUS
THE BUSINESS BREED



UNIVERSITY OF
Nebraska
Lincoln

Analysis



National Colorado State University-Cornell University-University of Georgia
Beef Cattle Evaluation
Consortium

Field study



Discovery

R & D



UNIVERSITY OF
Nebraska
Lincoln

South Dakota State University

You can GO ANYWHERE from here.®

National

Colorado State University-Cornell University-University of Georgia

Beef Cattle Evaluation

Consortium

 **KSTATE**
Kansas State University,
Research and Extension

UCDAVIS
UNIVERSITY OF CALIFORNIA

NDSU

Extension



AMERICAN
Simmental
ASSOCIATION
406-587-4531
e-mail: simmental@simmgene.com
website: www.simmental.org

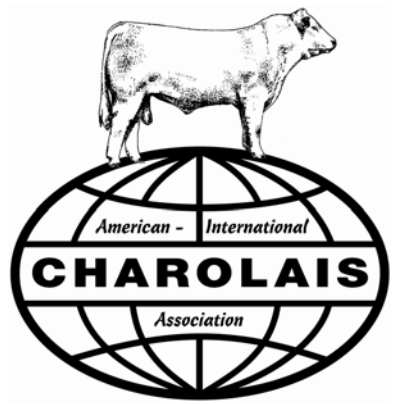


American
Gelbvieh Association



AMERICAN
HEREFORD
ASSOCIATION

**Industry
Infrastructure**



American - International
CHAROLAIS
Association

Building Better Beef...
Red Angus



LIMOUSIN

ANGUS
THE BUSINESS BREED



igenity[®]

**21
Ranches**

North Dakota

2 Collaborators

South Dakota

4 Collaborators

Nebraska

6 Collaborators


Colorado

1 Collaborator

Kansas

7 Collaborators

Iowa

1 Collaborator

**Collecting ~ 18,000 DNA
samples**

Demonstration

Concept in this project is to force collaboration among the different organizations through the need to deliver the demonstration project.