Delivering Valued Genomic Products to Livestock Customers

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Predict The Future Now!
Who We Are

A Pfizer business

A leading global animal health company

Working to assure a safe, sustainable global food supply from healthy beef and dairy cattle, swine, poultry, sheep and fish

Helping dogs, cats and horses live healthier longer lives
What We Do

**A leader** in discovery, development, and manufacture of veterinary vaccines & medicines

5000+ colleagues worldwide including 800+ veterinary R&D scientists and specialists

Diverse portfolio of leading veterinary products & services for livestock & companion animals
PAH Leads Industry in Global R&D Investment

R&D Spend (in $Millions)

- PAH R&D $321 million

Strategic Investments Include:
- Animal Genetics
- Diagnostics
- Emerging Infectious Diseases

Why Genetics – The Challenge

Key Data

In **50** years, the world *population* will require **100%** more *food*¹ and **70%** of this food must come from efficiency-improving *technology*²

Source: Food Economics and Consumer Choice (Simmons, 2008)
Genomic Tools for Dairy Cattle
U.S Holstein Genetic Trend – Sires and Elite Dams

- Units of Trait
- Birth Year
- AIPL Bull PTA
- AIPL Cow PTA

Genetic Gap
What is CLARIFIDE® for Dairy?

A Portfolio of Predictions and Tools to Implement Genetic Improvement of Commercial Dairy Females

- A panel of 6,900 (LD) and 50,000 (50K) genetic markers
  - USDA Animal Improvement Programs Laboratory (AIPL)
  - Derived from 54,001 (50K) marker panel test

- Delivers genomic predictions for:
  - Holstein, Jersey, and Brown Swiss
  - 30 production, health and type traits
  - 9 composite indexes

- Includes markers to:
  - Authenticate parentage
  - Bolster reliability of genetic predictions
  - Help manage inbreeding
CLARIFIDE® Empowers Female Selection

Based on CLARIFIDE in Holstein Cattle. Pfizer Animal Genetics, Data on File.
What’s a SNP Genotype Worth?

Pedigree is equivalent to information on about 7 daughters

For the protein yield ($h^2=0.30$), the SNP genotype provides information equivalent to an additional 34 daughters

John Cole: aipl.arsusda.gov/publish/presentations/.../NCSU_2012_jbc.pptx
What’s a SNP Genotype Worth?

And for daughter pregnancy rate ($h^2=0.04$), SNP = 131 daughters
Genomic Predictions Upper Midwest Dairy
(n=240)

$R^2 = 0.2673$
Correlation = 0.52

Actual Milk Production (ME305)

CLARIFIDE Milk Genomic Prediction Based on AIPL Predictions (DGV April 2011)

Based on CLARIFIDE in Holstein Cattle. Pfizer Animal Genetics, Data on File
Strategies for Accelerating the Female Genetic Improvement
Real World Example: Strategic Breeding

- California Dairy Customer is using sexed semen in better heifers to improve quality of future female progeny
- Strategic allocation of sexed semen in top 50% of gPTA heifers for Net Merit $
Real World Example: Strategic Breeding

- Future progeny of California Dairy *will increased genetic progress* 134% or $224 Net Merit in the next heifer generation.
Dairy Solutions Provider

- Comprehensive portfolio of products and services
- Deliver solutions for technical business challenges
- Strive to earn a place in dairy management teams
Partnering to Deliver Genomic Products

American Angus Assoc.  ANCP  Red Angus Assoc  NAPCo  Ovita
Traits – GE-EPDs & Ranks

• Calving Ease Direct
• Birth Weight
• Weaning Weight
• Yearling Weight
• Dry Matter Intake (RADG)
• Residual Feed Intake
• Yearling Height
• Scrotal Circumference
• Docility
• Calving Ease Maternal
• Milking Ability
• Mature Weight
• Mature Height
• Carcass Weight
• Fat Thickness
• Ribeye Area
• Marbling Score
• Tenderness

Parentage – HD 50K

Features of HD 50K for Angus
HD 50K Information is Integrated into EPDs, Indexes and Accuracy Values

Lot 1 Pfizer Example
Reg. No:

GE-EPDs simplify selection, mating and marketing because all available data is integrated, removing the need to consider individual sources of trait information.
<table>
<thead>
<tr>
<th>Trait</th>
<th>Average Change in EPD from HD 50K&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Average Change in Accuracy with HD 50K from .05&lt;sup&gt;2&lt;/sup&gt; Accuracy</th>
<th>Approximate Progeny Equivalents</th>
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<td>14</td>
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<tr>
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<tr>
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<tr>
<td>FAT</td>
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<sup>1</sup>Derived from animals with ≤ .30 accuracy.  
<sup>2</sup>Accuracy from pedigree only.
Acquiring Technology

- Sponsored Research
  - Academic Institutions
  - CSIRO
- License Technology
  - Ovita
  - Australian CSIRO
  - Genetic Conditions
- Internal R&D
  - Nelore predictions
  - Global Angus predictions
- Collaborative research
  - Angus Genetic, Inc.
  - Large Pastoral Companies

R&D Pipeline Decisions
“Customer focused”
Integrated Solutions Path Forward

- Can we use synergies to develop complete solutions for our customer’s challenges?
  - Health Traits
  - Diagnostic tools to refine genomics
  - Rational use of Pharma/biopharma products