Genomics, EPDs and their application to beef herds in Florida

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Outline

- Revisiting some basic genetic concepts
- Beef cattle – traditional selection
- Genomic selection - practical questions
  - Dairy Industry as a genomic selection success story
  - Beef Industry as an “opportunity for improvement”
- What genomic tests are available?
- What do the results mean?
- Current and future status of this technology

Available Genomic Tests

Genomic testing

- Available through breed associations, partnered with companies providing genotyping services (Zoetis, Neogen/GeneSeek)
- Several types of tests main difference is the number of genetic markers included

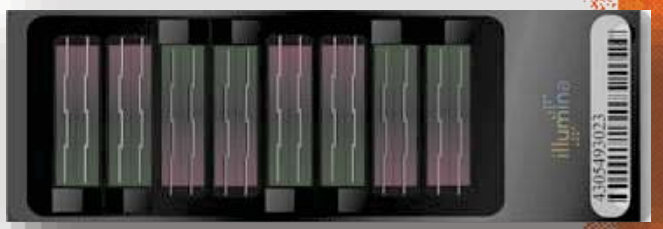
  50K = 50,000 SNP

  $75-90 for the high-density chips

  $45-55 for the low-density imputation chips
- Breed assoc. includes genomic info into genetic evaluations

genomic-enhanced EPD

Bovine HD (700K)



Bovine SNP50 (50K)

Bovine LD (3K)

Other tests

- Simple genetic conditions
  - Horned/polled
  - Coat color
  - Genetic abnormalities
- Costs vary, large number of labs providing the tests, price range **$22 - 45**
- Stand alone test for parentage: **$18 - 30**
- Many of these simple genetic tests can be purchased less expensively as an **add-on** to the higher density genotyping tests.

Commercial cattle testing

- Several tests marketed for use on commercial cattle
- Not directly part of a breed association genetic evaluation program
- No independent, peer-reviewed papers in the scientific literature documenting the field performance.

Angus Genetics Inc. (AGI)

- Marketed by Zoetis, designed for animals at least **75%** Black **Angus**
- Not intended for use in registered Angus females or bulls
- Predictions - not incorporated into the AAA NCE and will not influence the GE-EPDs of registered animals.

($39) GMX GENEMAX Advantage

CERTIFIED ANGUS BEEF

GMX GENEMAX Focus **$17)**

GeneMax™ Advantage

($39)

- Heifer selection and mating tool
- Three economic **index** scores:
  - **Cow Advantage** - predicts differences in profitability due to heifer development, pregnancy and calving, and sale of weaned progeny
  - **Feeder Advantage** - predicts differences in net return of feeder calf progeny due to growth, feed efficiency and CAB carcass merit
  - **Total Advantage** - diff in profitability across all traits in Cow and Feeder Advantage index scores

Trait Score
Calving Ease Maternal
Weaning Weight
Heifer Pregnancy
Milk
Mature Weight
Cow Advantage Score
Gain
Carcass Weight
Marbling
Ribeye Area
Fat Thickness
Feeder Advantage Score
Total Advantage Score

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GeneMax™ Focus

GMX
GENEMAX Focus

- Genomic predictions for feedlot gain and marbling, in addition to sire assignment **($17)**
  - **GMX Score** – combined, economically weighted value for marbling and gain
  - **GMX Marbling** & **GMX Gain** – the genomic prediction for each trait is ranked against the GeneMax™ database (top 20% - score 5).
- Rankings – relative to Angus populations in the GeneMax™ database (purebred & crossbred)
- Not a comparison of all genetics in the U.S. cowherds, only high percentage Angus cattle.

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PredicGEN

- Marketed by Zoetis® - heifer selection tool for **straight-bred** or **crossbred** British/Continental animals that are less than 75% Black Angus.
- **Carcass** traits predicted: marbling score, USDA yield grade, grid merit and tenderness.
- **Grid merit index** represent underlying economic index values for combined marbling and yield grade.
- Data reported on a 0 to 100 scale (50 is average)

Correlation of **0.31**, **0.34**, **0.45** for tenderness, yield grade and marbling phenotypes

Supports sire verification

Igenity/Neogen/Geneseek

DNA profiles for **75%** Angus and higher

- Igenity Angus Silver
- Igenity Angus Gold

DNA profiles for **crossbred** and purebred cattle

- Igenity Gold
- Igenity Silver

NEOGEN®

Igenity® – Confident Selection

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Igenity Breed-Specific Tests

- **Igenity Angus Silver** ($25): includes calving ease maternal, heifer pregnancy, docility, milk, average daily gain, marbling
- **Igenity Angus Gold** ($40), additionally includes birth weight, mature weight, residual average daily gain, weaning weight, tenderness, ribeye area, back fat thickness and carcass weight.

Igenity Gold and Silver

- Marketed by Neogen® as "DNA profiles for crossbred and purebred cattle."
- **Igenity Silver** ($25) evaluates six traits (calving ease maternal, stayability, residual feed intake, average daily gain, tenderness, marbling)
- **Igenity Gold** ($40) includes an additional 7 traits (birth weight, calving ease direct, heifer pregnancy, docility, milk, ribeye area and back fat thickness).

Neogen - development of these tests involved large populations with phenotypic data and/or EPDs comprising tens of thousands of animals of various biological types.

The six main datasets in the training data set were from six breed associations: Black Angus, Hereford, Gelbvieh, Limousin, Red Angus, and Simmental.

Training population – impact

- The **accuracy drops** when utilized in a **crossbred** commercial cattle population
- Correlation between test and true BV **~ 0.3** when estimating the genetic merit of commercial crossbred animals.
- Correlation likely to be **even lower** in animals comprised of breeds **not in the original training** set.

The lower the correlation, the more possible inaccuracy there is in the ranking based upon that test.

Future outlook / Summary Points

- Genomic information
  - Increase the **accuracy** of EPDs
  - Add "**novel**" traits to our suite of available EPD (feed efficiency, healthfulness, nutritional value, disease resistance, thermotolerance)
- **Large resource** populations with phenotypes are required for discovery and validation.
- Need **breed specific** prediction equations.

Genomics - technology to accelerate genetic progress.

Thank You!

Questions?

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