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
Other tests

• Simple genetic conditions
  • Horned/polloled
  • 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) (Genemax Advantage) ($17) (Genemax Focus)
GeneMax™ Advantage

• 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
GeneMax™ Focus

- Genomic predictions for feedlot gain and marbling, in addition to sire assignment
  - **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.

($17)
• 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® - Confident Selection

DNA profiles for 75% Angus and higher
- Igenity Angus Silver
- Igenity Angus Gold

DNA profiles for crossbred and purebred cattle
- Igenity Gold
- Igenity Silver
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.
The training population – impact

• The **accuracy drops** when utilized in a **crossbred** commercial cattle population.

• Correlation between test and true BV $\sim 0.3$ 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?