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How To Use Commercially Available Genomic Predictions

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Follow this and additional works at: http://digitalcommons.unl.edu/rangebeefcowsymp
Genomic predictions for simply-inherited traits

- E^D
- E^D

- E^e

- ee

Genomic predictions for complex traits

- Feeds & feeding management
- Pasture quality & stocking density
- Calving season
- Climate & weather
- Exposure to pathogens
- Preventative medicines
- Exposure to stress
- Animal handling
- Maternal effects (effect of dam)

Benefits of DNA Testing for Complex Traits

- GPA Before Entering Class

- Sire

- Dam

- Grandsire

Limitations of DNA Testing for Complex Traits

- Environment
- Genetics NOT included in DNA test
- Genetics included in DNA test

Limitations of DNA Testing for Complex Traits

- Environment
- Genetics NOT included in DNA test
- Genetics included in DNA test
How Does DNA Testing Work?

- Isolate DNA
- Chromosome
- What alleles are present at each locus ("red circles")?
- Combine over all loci ("red circles")
- Report results to producers

An Additional Limitation of DNA Testing

1. Discovery
2. Validation
3. Commercialize

Seedstock vs. Commercial DNA Tests

**Seedstock DNA Tests**
- Incorporated directly into genomically-enhanced EPDs
- More accurate but also more expensive
- Breed-specific DNA tests
- Work with breed association

**Commercial DNA Tests**
- Standalone DNA tests reported to producers
- Less accurate but also less expensive
- Some breed-specific tests and some for all *Bos taurus* cattle
- Purchase from company

Genomically-enhanced EPDs

- Expected progeny differences (EPDs)

Igenity PROFILE

- **GOLD Profile**
  - 13 to 15 traits
  - $40/head
- **SILVER Profile**
  - 6 traits
  - $25/head

- **Igenity GOLD Profile**
  - Black Angus
  - Non-Black Angus

- **Igenity SILVER Profile**
  - Black Angus
  - Non-Black Angus

- *Bos taurus cattle only

<table>
<thead>
<tr>
<th>Trait</th>
<th>Angus</th>
<th>Non-Angus</th>
<th>Angus</th>
<th>Non-Angus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily gain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mature weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual feed (kg/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowl weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reproduction &amp; Calving</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calving ease direct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calving ease maternal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifer pregnancy rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stayability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Bos taurus cattle only

2015 Range Beef Cow Symposium, Loveland, Colo.
Parentage test offered for no additional charge, but need to provide DNA from all parents or parents’ DNA already genotyped by GeneSeek (Igenity).

*I. taurus cattle only

### Interpreting Igenity PROFILE Results

<table>
<thead>
<tr>
<th>Animal ID</th>
<th>Marbling</th>
<th>Stayability</th>
<th>Fat Thickness</th>
<th>Docility</th>
</tr>
</thead>
<tbody>
<tr>
<td>701</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>702</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Animal 701’s daughters are 5.3% (12.9% - 7.6%) more likely to remain productive until six years of age than Animal 702’s daughters.

### GeneMax (Zoetis/CAB)

- **GMX Focus**
  - GMX Score (ADG & Marbling)
  - $17/head

- **GMX Advantage**
  - Cow Advantage Index
  - Feeder Advantage Index
  - Total Advantage Index
  - $44/head

### GeneMax Advantage

<table>
<thead>
<tr>
<th>Trait</th>
<th>Core</th>
<th>Feeder</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth &amp; Feed Efficiency</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mature weight</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbling</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Feed intake</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Day matter intake</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Breeding weight</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reproduction &amp; Calving Ease</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Calving Ease</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fertility</td>
<td>x</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Parentage test offered for no additional charge, but need to provide DNA from all parents or parents’ DNA already genotyped by Zoetis Animal Genetics.
GeneMax Smart Outlier Reporting

Interpreting GeneMax Results

PredicGEN (Zoetis)
- Carcass genetic merit
  - Marbling, Tenderness, and Yield Grade
- Grid merit index
  - Marbling and Yield Grade
- Results reported on 0-100 scale
- Cost = $19.50/head
- <75% Black Angus cattle

Selecting the Right DNA Test

Selecting the Right DNA Test
- All-Purpose
  - Igenity GOLD & SILVER
  - GMX Total Advantage
- Pre-weaning
  - GMX Focus
- Post-weaning
  - GMX Feeder Advantage
- Carcass
  - PredicGEN

What should you do if multiple DNA tests are appropriate for your operation?
Using DNA Test Results

<table>
<thead>
<tr>
<th>GMX Focus Score Category</th>
<th>Number of Animals</th>
<th>Marbling Score</th>
<th>Average Daily Gain (lbs/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (80-99)</td>
<td>83</td>
<td>538*</td>
<td>4.33</td>
</tr>
<tr>
<td>Mid-High (60-79)</td>
<td>32</td>
<td>538*</td>
<td>4.36</td>
</tr>
<tr>
<td>Mid-Low (40-59)</td>
<td>30</td>
<td>479*</td>
<td>4.27</td>
</tr>
<tr>
<td>Low (0-39)</td>
<td>28</td>
<td>466*</td>
<td>4.22</td>
</tr>
</tbody>
</table>


Means with different superscript letters are significantly different (P < 0.05)

Using DNA Test Results - Selection

1. Rank replacement heifers on relevant DNA test results
2(a). Lots of genetically superior heifers? Cull genetically inferior heifers.
2(b). Equal number of genetically superior & inferior heifers? Select “best” and cull “worst.”
2(c). Lots of genetically inferior heifers? Select genetically superior heifers.
3. Use other criteria to complete selection decisions

Using DNA Test Results - Mating

Mate to bull with low Milk EPD
Mate to bull with high Milk EPD

Using DNA Test Results - Marketing

<table>
<thead>
<tr>
<th>SIRES</th>
<th>Feeder Calf Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 25% $B</td>
<td>Top 25% $B</td>
</tr>
<tr>
<td>Top 50% $B</td>
<td>X</td>
</tr>
<tr>
<td>Top 75% $B</td>
<td>X</td>
</tr>
<tr>
<td>GMX &gt; 75</td>
<td>X</td>
</tr>
<tr>
<td>GMX 60-74</td>
<td>X</td>
</tr>
<tr>
<td>Angus-base</td>
<td>(X)</td>
</tr>
</tbody>
</table>

How To Collect DNA?

- Semen
- Whole blood (w/ anticoagulant)
- Tissue sample (e.g., ear notch)
- Blood spot on FTA card

Take Home Messages

- DNA testing can be useful for selecting replacement heifers, mating decisions, and marketing programs
- DNA testing does have limitations, like all predictions of genetic merit
- DNA testing should be used jointly with other selection criteria for replacement heifers
Acknowledgements