How To Use Commercially Available Genomic Predictions

Michael Gonda
South Dakota State University

Follow this and additional works at: http://digitalcommons.unl.edu/rangebeefcowsymp
How To Use Commercially Available Genomic Predictions

Genomic predictions for simply-inherited traits

Genomic predictions for complex traits

Benefits of DNA Testing for Complex Traits

Limitations of DNA Testing for Complex Traits

2015 Range Beef Cow Symposium, Loveland, Colo.
How Does DNA Testing Work?

- Isolate DNA
- Chromosome
- What alleles are present at each locus?

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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Angus</th>
<th>Non-Angus</th>
<th>Angus</th>
<th>Non-Angus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth &amp; Feed Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average daily gain</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Mature weight</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Milk</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Residual feed intake (RFD)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Weaning</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Fat marbling</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Calving ease maternal</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Birth productivity rate</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Sire breeding</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

* *Bos taurus* cattle only

Igenity PROFILE

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

An Additional Limitation of DNA Testing

1. Discovery
2. Validation
3. Commercialize

Need to repeat process regularly!!
Igenity Production Index

- DNA-based selection index
- Default or custom weights
- Recommend custom weights

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

- Growth & Feed Efficiency
  - Mature weight
  - Mature weight
  - ADG
  - Dry matter intake
  - Weaning weight
  - Yearling weight
  - Reproduction & Calving Ease
    - Calving ease maternal
    - Heifer pregnancy rate

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

1. What breed(s) do you own?
   - ≥ 75% Black Angus
     - Igenity GOLD & SILVER
     - GMX Focus & Advantage
   - < 75% Black Angus
     - Igenity GOLD & SILVER
     - PredicGEN

2. What traits are economically relevant?
   - Bos taurus only

Selecting the Right DNA Test

1. What breed(s) do you own?
   - All-Purpose
     - Igenity GOLD & SILVER
     - GMX Total Advantage
   - Pre-weaning
     - GMX Focus
   - Post-weaning
     - GMX Feeder Advantage
   - Carcass
     - PredicGEN

2. What traits are economically relevant?

Selecting the Right DNA Test

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>518**</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? Call 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></td>
<td>Top 25% $B</td>
</tr>
<tr>
<td>Top 50% $B</td>
<td>X</td>
</tr>
<tr>
<td>Top 25% $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