Crossbreeding Opportunities

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Daughter photo of a top ranked bull from a major cross-breeding company
Management Considerations?
Holstein Mortality Rate

“Hoard’s Dairymen

“I bought it on eBay; I thought it said Guernsey.”
Genetic Trends: Productive Life

AIPL, 2008
Holstein Inbreeding

-13 Days Productive Life
+.36 d Age at first calving
+.26 d calving interval

AIPL-USDA, 2008; Smith et al., 1998
What is the Problem?

- Economics Dictate that Farms Maximize “Efficiency”
- Holsteins Selected for High Production
  - Extreme production stresses reproductive and health systems
  - The best environment for health / repro may not be the most “efficient”
- Genotype by Environment Mismatch
Matching G to E

1. Maximize reproductive and health environments at extreme levels of production

2. Select within breed for cows that will perform in a “less optimal” environment

3. Crossbreed
### Jersey and Brown Swiss

Average merit of $F_1$ Holstein crosses on the Holstein scale.

<table>
<thead>
<tr>
<th>Second breed</th>
<th>Net merit ($)</th>
<th>Cheese merit ($)</th>
<th>Fluid merit ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td>-58</td>
<td>-27</td>
<td>-201</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>18</td>
<td>79</td>
<td>-241</td>
</tr>
<tr>
<td>Guernsey</td>
<td>-184</td>
<td>-138</td>
<td>-395</td>
</tr>
<tr>
<td>Jersey</td>
<td>44</td>
<td>113</td>
<td>-269</td>
</tr>
<tr>
<td>Milking Shorthorn</td>
<td>-249</td>
<td>-223</td>
<td>-373</td>
</tr>
</tbody>
</table>

VanRaden and Sanders, 2003
Planned Crossbreeding
Foreign Breeds: Days Open

Foreign Breeds: Survival

Foreign Breeds: Production

Foreign Breeds

- Meet expectations
  - Improved fertility
  - Reduced calving difficulties
  - Increased survival
  - Lowered yield

- Have the advantage of being unique / new & exciting
  - Folks also don’t know their faults!

- What about familiar US breeds?
<table>
<thead>
<tr>
<th></th>
<th>Jersey x Holstein</th>
<th>Holstein</th>
<th>Dif.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (lbs)</td>
<td>15,752</td>
<td>16,982</td>
<td>-1230</td>
</tr>
<tr>
<td>Fat (lbs)</td>
<td>604</td>
<td>611</td>
<td>-7</td>
</tr>
<tr>
<td>Protein (lbs)</td>
<td>491</td>
<td>525</td>
<td>-33</td>
</tr>
<tr>
<td>Days Open</td>
<td>127</td>
<td>150</td>
<td>-23</td>
</tr>
</tbody>
</table>

Heins et al., 2008
## Jersey x Holstein

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Jersey x Holstein</th>
<th>Holstein</th>
<th>Dif.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stature</td>
<td>133.6</td>
<td>142.5</td>
<td>-8.9</td>
</tr>
<tr>
<td>Udder Clearance</td>
<td>47.7</td>
<td>54.6</td>
<td>-6.9</td>
</tr>
<tr>
<td>Front Teat Distance</td>
<td>15.8</td>
<td>14.0</td>
<td>1.8</td>
</tr>
<tr>
<td>SCS</td>
<td>3.22</td>
<td>2.95</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Heins et al., 2008
# Brown Swiss x Holstein

<table>
<thead>
<tr>
<th>Breed</th>
<th>Days Open</th>
<th>SCS</th>
<th>AFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein</td>
<td>156</td>
<td>2.73</td>
<td>25.85</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>156</td>
<td>2.78</td>
<td>26.58</td>
</tr>
<tr>
<td>BS x HO</td>
<td>144</td>
<td>2.54</td>
<td>25.68</td>
</tr>
<tr>
<td>BS x (BS/HO)</td>
<td>153</td>
<td>2.66</td>
<td>26.58</td>
</tr>
</tbody>
</table>

Dechow et al., 2007
Brown Swiss x Holstein: Yield

<table>
<thead>
<tr>
<th>Breed</th>
<th>Daily Milk</th>
<th>Daily Fat</th>
<th>Daily Pro.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein</td>
<td>73.31</td>
<td>2.67</td>
<td>2.20</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>62.35</td>
<td>2.53</td>
<td>2.05</td>
</tr>
<tr>
<td>BS x HO</td>
<td>71.21</td>
<td>2.80</td>
<td>2.25</td>
</tr>
<tr>
<td>BS x (BS/HO)</td>
<td>64.47</td>
<td>2.56</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Dechow et al., 2007
Healthy cows age gracefully

Dechow et al., 2007
What about the next generation?

- Crossbreeding will **FAIL** if poor sires used
- Many geneticists recommending 3-breed rotation
  - 2-breed rotation = 67% heterosis
  - 3-breed rotation = 86% heterosis
  - HO x BS x JE?
  - HO x BS x SR?
- Will high production genes be diluted too much
  - HO x BS x HO x JE?
- First generation likely the best
Recombination

Dechow et al., 2007
Heterosis Perspective

- It’s not all about heterosis
  - Holstein x Angus would have a high level of heterosis!
  - May be overestimated due to recombination loss
- Economically viable dairy breeds
  - Complement each other
  - Added bonus of heterosis
It doesn’t take much skill to feed a Holstein Calf.
Crossbreeding

- First generation meets expectations
  - Less production
  - Higher fitness levels
- Expectations for crosses with HO

<table>
<thead>
<tr>
<th></th>
<th>Yield</th>
<th>Health and Repro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normande</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montbeliarde</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jersey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swedish Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Swiss</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- What happens next?
Understand the Trade-Off

- You will improve
  - Fertility
  - Survival
  \[\text{Partly offset production/lactation losses}\]
- You WILL STILL reduce production
- Trade off economical in some herds – not for others
Possible Breed Rotations

- Large breeds
  - Holstein
  - Brown Swiss
  - Swedish Red
  - Montbéliarde?

- Small breed
  - Holstein
  - Jersey
  - Swedish Red
  - Normande?

- Can mix sizes
Questions?

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