USE OF RED BREEDS FOR CROSSBREEDING

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CROSSBREEDING IN DAIRY CATTLE

• Crossbreeding is growing by about $\frac{1}{2}$ to 1% per year in many populations
• Why?
  – Economics
  – Ease of management
  – Inbreeding
  – Fertility
  – Many other reasons
INBREEDING TREND IN GLOBAL HOLSTEIN SIRES

Miglior et al. 2014. Canadian Dairy Network
GENETIC TRENDS FOR DAUGHTER PREGNANCY RATE (DPR) IN THE US HOLSTEIN POPULATION (APRIL 2016)

Breeding values DPR

Red box – 40 years in condensed form

Green box – recent years

Birth year of Holstein cows
CROSSBREEDING CONCEPTS

• Crossbreeding is for commercial herd segment – still need seedstock herds
• Hybrid vigor or heterosis is important but not the most critical concern
  – Overall performance (especially economic) of crosses is most critical
  – Breed contribution is critical
  – Sire performance within breed is critical
  – Optimum number of breeds and rotation depends on many factors
• Not a “one size fits all” program or situation
  – Producers should look at their individual circumstance
  – Personal preference can play a legitimate role
### Percentage of maximum heterosis using 2, 3 & 4 unrelated breeds

<table>
<thead>
<tr>
<th>Generation</th>
<th>2 breeds</th>
<th>3 breeds</th>
<th>4 breeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>88</td>
<td>94</td>
</tr>
<tr>
<td>6</td>
<td>66</td>
<td>84</td>
<td>94</td>
</tr>
<tr>
<td>7</td>
<td>67</td>
<td>86</td>
<td>94</td>
</tr>
<tr>
<td>8</td>
<td>66</td>
<td>86</td>
<td>93</td>
</tr>
<tr>
<td><strong>Over time</strong></td>
<td><strong>67%</strong></td>
<td><strong>86%</strong></td>
<td><strong>94%</strong></td>
</tr>
</tbody>
</table>
CROSSBREEDING PROGRAMS

• Many Holstein X “other breed” crosses with little planning involved – producers should have a good plan!

• Most common crossing plan involves 3 breeds
• Holsteins plus 1 breed from 2 of the following 3 groups:
  – RDC (Ayrshire) based group
    • Danish Red, Finnish Ayrshire, Norwegian Red, Swedish Red & other related breeds
  – SIM based group & Normande & Brown Swiss (Alpine or Continental group)
    • Brown Swiss, Fleckvieh, Milking Simmental, Montbeliarde, Normande
  – Jersey
CROSSBREEDING PROGRAMS

• Common 2 breed crosses (other than Holstein X Jersey)
• Holstein plus 1 breed from the RDC (Ayrshire) based group
  • Danish Red, Finnish Ayrshire, Norwegian Red, Swedish Red & other related breeds
• Jersey plus 1 breed from the RDC (Ayrshire) based group
  • Danish Red, Finnish Ayrshire, Norwegian Red, Swedish Red & other related breeds
CROSSBREEDING PROGRAMS

- Common 4 breed crosses

- Holstein

- 1 breed from the RDC (Ayrshire) based group
  - Danish Red, Finnish Ayrshire, Norwegian Red, Swedish Red & other related breeds

- 1 breed from SIM based group plus Brown Swiss & Normande
  - Brown Swiss, Fleckvieh, Milking Simmental, Montbeliarde, Normande

- Jersey
Comparison of Montbeliarde X Holstein and Viking Red X Holstein crossbreds with pure Holsteins in 8 Minnesota herds
Hazel et al. 2016 (University of Minnesota preliminary report)

<table>
<thead>
<tr>
<th></th>
<th>Holstein</th>
<th>Montbeliarde X Holstein</th>
<th>Viking Red X Holstein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cows</td>
<td>978</td>
<td>513</td>
<td>540</td>
</tr>
<tr>
<td>1st lactation milk (actual, kg)</td>
<td>10,970</td>
<td>10,954</td>
<td>10,537**</td>
</tr>
<tr>
<td>1st lactation fat + protein (actual, kg)</td>
<td>741</td>
<td>760*</td>
<td>749</td>
</tr>
<tr>
<td>Days open in 1st lactation</td>
<td>125</td>
<td>113**</td>
<td>117*</td>
</tr>
<tr>
<td>Overall conception rate 1st lactation (%)</td>
<td>38</td>
<td>46**</td>
<td>43*</td>
</tr>
<tr>
<td>Survival to 2th lactation (%)</td>
<td>80</td>
<td>84*</td>
<td>83</td>
</tr>
<tr>
<td>1st calving stillbirths (%)</td>
<td>9</td>
<td>4**</td>
<td>5*</td>
</tr>
</tbody>
</table>

* Significantly different from Holsteins P<.05
** Significantly different from Holsteins P<.01
Comparison of Norwegian Red crosses and Holsteins in US herds  

<table>
<thead>
<tr>
<th></th>
<th>Holsteins</th>
<th>Norwegian Red X Holstein crosses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cows</td>
<td>129,433</td>
<td>979</td>
</tr>
<tr>
<td>Number of herds</td>
<td>81</td>
<td>37</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; lactation milk yield (adj. to 36 mo, kg)</td>
<td>11,901</td>
<td>11,394**</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; lactation fat + protein (adj. to 36 mo, kg)</td>
<td>796</td>
<td>781**</td>
</tr>
<tr>
<td>Days open average across lactations</td>
<td>170</td>
<td>155**</td>
</tr>
<tr>
<td>Survival to 4&lt;sup&gt;th&lt;/sup&gt; lactation (percentage)</td>
<td>31</td>
<td>51**</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; calving stillbirths when bred to Holstein (%)</td>
<td>9.6</td>
<td>3.7*</td>
</tr>
</tbody>
</table>

* Significantly different from Holsteins P<.05  
** Significantly different from Holsteins P<.01
GENETIC EVALUATIONS IN USA

• USA genetic evaluation system is multi-breed
  – Includes crossbred daughters
  – Allows easy conversion from one breed base to another and comparisons across breeds
  – Works well for imported breeds with many US daughters:
    – Milk, fat and protein yield (and component percentages)
    – Daughter pregnancy rate (and cow and heifer conception rates)
    – Somatic cell score
  – Does not work well for imported breeds:
    – Productive life (longevity)
    – Calving ease (no data)
    – Stillbirths (no data)
    – Conformation traits (few daughters recorded)
Comparison of top daughter proven Holstein, Red Dairy Cattle (RDC) and Simmental (SIM) based sires from April 2016 USA genetic evaluations

- Non-Holstein PTAs are on Holstein base plus heterosis

<table>
<thead>
<tr>
<th></th>
<th>milk (lbs)</th>
<th>fat (lbs)</th>
<th>protein (lbs)</th>
<th>SCS</th>
<th>Daughter Pregnancy Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean for 597 active AI Holsteins</td>
<td>+611</td>
<td>27</td>
<td>22</td>
<td>2.89</td>
<td>0.5</td>
</tr>
<tr>
<td>Mean for top 25 RDC(^1) sires</td>
<td>-86</td>
<td>39</td>
<td>26</td>
<td>2.87</td>
<td>5.7</td>
</tr>
<tr>
<td>Mean for top 25 SIM(^2) sires</td>
<td>115</td>
<td>31</td>
<td>27</td>
<td>3.08</td>
<td>7.6</td>
</tr>
</tbody>
</table>

\(^1\) Includes Danish Red, Finnish Ayrshire, Norwegian Red and Swedish Red. Current procedures at US CDCB do not allow exact calculations so RDC means are conservative.

\(^2\) Includes Fleckvieh, Montbeliarde and Simmental.
SUMMARY

• Crossbreeding is growing primarily because of economics and the need for improved fitness in Holsteins.
• Crossbred cows sired by top Simmental based and Red Dairy Cattle based bulls will perform similar to pure Holsteins for key production traits and much better for fitness traits.
• A well-designed crossbreeding program will produce more profitable cows compared to pure Holsteins under most commercial herd management circumstances.