Use and Added Value of AI Data for Genetic Evaluation and Dairy Cattle Improvement

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Use of AI Data

- Herd management
  - Future calving dates
  - Diagnose cow fertility problems

- Determine semen fertility
  - Optimize semen concentration
  - Improve semen processing methods

- Genetic evaluation
Improving data

- **Pedigree records**
  - Match up AI data with registration records
  - Verify that the dam of the calf was bred to the sire of the calf approximately 9 months ago
  - Check that this was the last breeding for the dam prior to the birth of the calf.

- **Improvements will affect all genetic evaluation systems**

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Improving data

- **Service sire for Calving ease & Calf survival**
  - Match up AI data with calving record
  - Verification similar to pedigree records

- **Days open**
  - Can be calculated from calving dates
  - Use AI data to estimate conception date rather than from next calving date
  - Estimate days open for cows that did not (yet) calve again
Enhance existing GE

- Account for Pregnancy effects in production evaluations
  - Use AI data to obtain insemination dates
  - Ideally need pregnancy check to verify that conception took place
  - Use calving date 9 months later to verify conception
  - Or assume there was conception if there are no subsequent inseminations

Impact of Days Pregnant

![Chart showing impact of days pregnant on milk yield](chart.png)

Source: J. Bohmanova, J. Jamrozik and F. Miglior, 2008
When combining AI data with other information, the following traits are calculated in Canada:

- Age at first service (Heifers)
- Interval from calving to first service (Cows)
- 56-day Non-Return-Rate
- Interval from first service to conception
- Number of services

**Ability to Conceive (1)**

- 56-day Non-Return-Rate
  - Requires first insemination and inseminations made in the next 56 days
- **Advantages:**
  - Available soon after the first service
  - No other data required
- **Disadvantages**
  - Only considers fertility of first insemination
  - Not a very accurate measure of fertility
Ability to Conceive (2)

- **Number of Services**
  - Requires all inseminations

- **Advantages:**
  - No other data required
  - Good measure of how much effort was expended to try to get the cow to conceive

- **Disadvantages:**
  - All inseminations are required
  - Need to wait until we have all of them

Ability to Conceive (3)

- **Interval from first service to conception**
  - Requires first and last insemination

- **Advantages**
  - Easy to understand measure of fertility
  - Can be calculated accurately

- **Disadvantages**
  - Need to determine that there was conception
    - Pregnancy checks or next calving date
  - Need conception
Ability to conceive

- 56-day Non-Return-Rate
  - Fast measure of fertility
  - Uses records from all cows

- Number of services
  - More detailed analysis of less fertile cows
  - Uses records on all cows

- Interval from first service to conception
  - Can be calculated accurately
  - But only if there is conception

Reproductive performance

- In Canada these female fertility traits are evaluated together with calving traits:
  - Calving ease
  - Calf survival
  - Gestation length
  - Calf size

- Virgin Heifer and Cow traits are assumed to be different but correlated traits
EBV Correlations Among Female Fertility Traits

<table>
<thead>
<tr>
<th></th>
<th>NRR-H</th>
<th>NS-H</th>
<th>FSTC-H</th>
<th>CTFS</th>
<th>NRR-C</th>
<th>NS-C</th>
<th>FSTC-C</th>
<th>DO</th>
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<tr>
<td>Age at first service (AFS)</td>
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<td>-.07</td>
<td>.23</td>
<td>-.19</td>
<td>-.09</td>
<td>.11</td>
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<td>Non return rate in heifers (NRR-H)</td>
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<td>.74</td>
<td>-.17</td>
<td>.61</td>
<td>.54</td>
<td>.49</td>
<td>.28</td>
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<td>.63</td>
<td>.64</td>
<td>.60</td>
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<tr>
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<td>.62</td>
<td>.68</td>
<td>.66</td>
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<td>.28</td>
<td>.38</td>
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<td>Non return rate in cows (NRR-C)</td>
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<td>.80</td>
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<tr>
<td>First service to conception in cows (FSTC-C)</td>
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<tr>
<td>Days open (DO=CTFS+FSTC-C)</td>
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</table>

Signs have been changed: Positive Correlation means desirable relationship

Added Value

- More information collected => more value
- Minimal required fields
  - Cow (unique ID)
  - Semen or sire used (unique ID)
  - Date of breeding
- To evaluate fertility:
  - Herd, technician
  - Breeding for Embryo Transfer
  - Hormone treatment used to get the cow in heat (synchronization)
### Added Value

<table>
<thead>
<tr>
<th>Herds providing data</th>
<th>Some</th>
<th>Some</th>
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<tbody>
<tr>
<td>Data from each herd</td>
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<td>Improving data</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Enhancing GE</td>
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<td>?</td>
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<td>Yes</td>
</tr>
<tr>
<td>Female Fertility</td>
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<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Conclusions

- **Use of AI data**
  - Improving other data
  - Enhance existing GE systems
  - Creating a genetic evaluation system for Female fertility

- **Higher Value of data**
  - When collecting more fields
  - in more herds
  - with more complete recording in each herd
Thank You!