Data from automatic milking systems used in genetic evaluations of temperament and milkability

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EAAP, Warsaw, September 2015
Session 27
Norwegian dairy farming

• Larger herds with automatic milking systems (AMS)
• >1/3 of the dairy cows are in AMS herds
  ≈1500 milking robots
• AMS will be the dominating dairy production system in Norway within a few years
Automatic milking systems (AMS)

• Vast amounts of data are recorded daily
• Objective, frequent and accurate measures of many traits
• How can we best make use of these data?
Aim

- Examine whether data routinely recorded in AMS can be used to define new behavior- and milkability traits
- Estimate genetic correlations between these new traits and the current subjectively scored temperament, milking speed, and leakage
AMS data

- 46 herds with DeLaval milking robots
- Minimum 2 years of data from each herd
- Information from >6000 cows and >2 mill daily records

- Data for genetic analyses
  - Records from 6 to 305 days after calving
  - Lactation 1-7
  - Norwegian Red A.I. sire
Milkability

**MILKABILITY** = Milk yield per total time spent in the milking robot; kg milk per minute “box time”

Box time = actual milking time
  + time used for preparation and attachment of teat cups
  + the time the cow uses before she decide to leave the robot

- A combined measure of milking speed / milk flow and how efficient the cow is when visiting the milking unit
- Directly associated with the capacity of the milking robot

- Lactation mean milkability from day 6 to 305
Distribution of milk yield per minute spent in the milking robot

Overall mean: 1.5 kg milk per minute box time

95 % were within the interval 0.7 – 3.3.
Behavior traits

• Proportion of milkings with “kick-offs” during a lactation (pKO)
• Proportion of incomplete milkings during a lactation (pIC)
Subjectively scored traits

Temperament, milking speed and leakage

– 1st lactation cows
– Data from 330 000 cows
– Scored routinely by dairy farmers
– 3 categories
Model

• Multi-variate linear animal models
  – 3 AMS traits
  – 3 subjectively scored traits
• Variance components estimated using DMU (Madsen & Jensen. 2007)
Heritability and genetic correlations

AMS traits

<table>
<thead>
<tr>
<th>Trait</th>
<th>Milkability</th>
<th>pKO</th>
<th>pIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milkability</td>
<td>0.29</td>
<td>-0.35</td>
<td>-0.23</td>
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<tr>
<td>Proportion KickOffs (pKO)</td>
<td>0.20</td>
<td>0.88</td>
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<tr>
<td>Proportion Incomplete (pIC)</td>
<td>0.08</td>
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</table>

Subjectively scored traits

<table>
<thead>
<tr>
<th>Trait</th>
<th>Temperament</th>
<th>Milking speed</th>
<th>Leakage</th>
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</thead>
<tbody>
<tr>
<td>Temperament</td>
<td>0.10</td>
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<td>-0.11</td>
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<tr>
<td>Milking speed</td>
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<td>-0.84</td>
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<tr>
<td>Leakage</td>
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<td>0.14</td>
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</tbody>
</table>

Low score is favorable for all traits except milkability. Correlations marked

Favorable Unfavorable
Genetic correlations between AMS- and subjectively scored traits

<table>
<thead>
<tr>
<th>AMS traits</th>
<th>Subjectively scored traits</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Milkability</td>
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<tr>
<td>Incomplete</td>
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<td>0.08 0.18</td>
<td>-0.12 0.20</td>
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</tbody>
</table>

Similar traits genetically

Potential traits to consider as alternative measures of temperament

Genetic association between difficult temperament and slower milking

Unfavorable but not as strong as to subjectively scored milking speed (0.84)

Low score is favorable for all traits except milkability. Correlations marked:

- favorable
- unfavorable
New traits

• The cow meet different challenges in the AMS herds
• The breeding program should be adjusted accordingly with respect to traits, trait definitions and weights in the total merit index
• Measures related to milking and cow traffic recorded in AMS that can be used to define new behavior- and milking efficiency traits
• Genetic improvement of such new trait would be beneficial also in other production systems
Conclusion

• Data from AMS can be used for genetic evaluations
• Data routinely recorded in AMS provide information on new traits that can supplement or replace current traits in genetic evaluation
Avler for bædre liv