INNOVATION IN LIVESTOCK PRODUCTION: FROM IDEAS TO PRACTICE

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WARSAW, POLAND
Milking production, milking frequency and rumination time of grazing dairy cows milked by a mobile AMS

F. Lessire, JL Hornick, J Minet and I Dufrasne
Introduction

• AMS spread worldwide
  => new challenges to improve their profitability

• Combining AMS and grazing: possible?  
  Yes

• but needs to warrant good traffic of cows to the robot
Parameters influencing the traffic of grazing cows to the robot?

A) Parameters linked to the cows:

- Hierarchy
- Gregarious behaviour
- « Personnality »
Parameters influencing the traffic of grazing cows to the robot?

B) Parameters controllable by the farmer

- General herd management (calving, number of cows, etc)
- Grazing management
- Concentrate allocation
- Water allocation
- Quality of paths (smooth, mud,...)
- Herd’s health (mammitis, lameness)
Parameters influencing the traffic of grazing cows to the robot?

C) Uncontrollable parameters

- Weather conditions
- Soil conditions
- Day/night rhythm
- Distance to the robot
Weather conditions

- The average temperature has increased by ~1°C over the past hundred years (IPPC, 2013)
- Heat stress periods are likely to be more numerous in temperate areas
- How will heat stress influence cows’ traffic to the robot? => Aim of this study
Material and Methods

- Experimental farm of Sart Timan (Liège – Belgium)
- Herd: 45 Prim’Holstein dairy cows
- Milked on pasture by a mobile AMS (Lely A3®)
24 Ha of pasture are divided into 15 paddocks ranging from 0.6 to 3.1 Ha. Cows are allocated to day and night paddocks by passing through a selection gate.
Description of the grazing system

Grazing management
- Grass height and cover evaluation
- Day and night allocation
- Strip-grazing
- Grass sampling => nutritional value

Water availability:
- in pastures: depending on pastures
- Big pond near the robot (700 L)
Determination of Heat stress periods

- Temperature humidity indexes (THI) were calculated according to Ingraham et al (1979)
  - THI = \((1.8 \times AT + 32) - (0.55 - 0.55 \times RH) \times [(1.8 \times AT + 32) - 58]\)
  
  AT: amiant T°C- RH: relative humidity (%)

- Heat stress periods were defined by THI >72

- 2 periods of heat stress were identified in July (J) and in August (A)

- Each heat stress period compared with a “normal period” (N).
## Results

### Experimental design

<table>
<thead>
<tr>
<th></th>
<th>Nb cows</th>
<th>DIM</th>
<th>LN</th>
<th>distance</th>
<th>THI</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>HS</td>
<td>33 ± 0</td>
<td>183 ± 85</td>
<td>2.46 ± 1.68</td>
<td>700 ± 0</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>33 ± 0</td>
<td>182 ± 85</td>
<td>2.39 ± 1.64</td>
<td>635 ± 150</td>
</tr>
<tr>
<td>August</td>
<td>HS</td>
<td>33 ± 0</td>
<td>186 ± 92</td>
<td>2.58 ± 1.85</td>
<td>250 ± 34</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>33 ± 0</td>
<td>191 ± 75</td>
<td>2.30 ± 1.60</td>
<td>304 ± 0</td>
</tr>
</tbody>
</table>

DIM: days in milk; LN: lactation number; Distance: distance from the paddock to the robot.
## Results

### Grass supply

<table>
<thead>
<tr>
<th>Month</th>
<th>Grass height (cm)</th>
<th>Grass yield (kg DM/ha)</th>
<th>Grass available (kg DM/cow/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entry</td>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>12.0</td>
<td>6.6</td>
<td>1587</td>
</tr>
<tr>
<td>August</td>
<td>11.4</td>
<td>6</td>
<td>1734</td>
</tr>
</tbody>
</table>


# Results

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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>HS</td>
</tr>
<tr>
<td><strong>Milk yield</strong></td>
<td><strong>21.8 ± 0.6</strong>*</td>
<td>18.9 ± 0.6</td>
</tr>
<tr>
<td>(kg/cow/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Milkings</strong></td>
<td><strong>2.19 ± 0.08</strong>*</td>
<td>2.54 ± 0.11</td>
</tr>
<tr>
<td>(/cow/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Refusals</strong></td>
<td><strong>0.72 ± 0.15</strong></td>
<td>1.82 ± 0.21</td>
</tr>
<tr>
<td>(/cow/d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values are least square means ± SE  
***: p< 0.001 – NS: p>0.05  
Stat: SAS 9.3 proc mixed repeated day random animal – AR(1)
### Results

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<tbody>
<tr>
<td></td>
<td>N</td>
<td>HS</td>
</tr>
<tr>
<td>Rumination (min/cow/d)</td>
<td>440 ± 14***</td>
<td>365 ± 15</td>
</tr>
</tbody>
</table>

Values are least square means ± SE  
***: p< 0.001 – NS: p>0.05  
Stat: SAS 9.3 proc mixed repeated day – AR(1)
Conclusion

<table>
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<tr>
<th>HS</th>
<th>July</th>
<th>August</th>
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<tr>
<td>Milk Yield</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Milkings</td>
<td>→</td>
<td>=</td>
</tr>
<tr>
<td>Refusals</td>
<td>→</td>
<td>=</td>
</tr>
<tr>
<td>Rumination</td>
<td>→</td>
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Conclusion

Difference between July – August:

• Waste of energy linked to increase in milkings and refusals
• Increase of distance to the robot: 700 m in July – 270 m in August
• Grass cover lower in July (15 kg vs 17 kg)
• Access due to water nearby the robot => easier in August
• THI higher in July
Conclusion

Rumination

- Decrease in rumination time during heat stress confirmed by other studies (Calamari et al., 2011)

⇒ Heat stress has variable effects on milking parameters
Thank you for your attention

Acknowledgements

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