Evaluation of heart rate and lying behaviour to predict calving of dairy cows

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Outline

• Context of calving
• Goals
• Experimental design
• Results
• Conclusions
### Context

Source: North Carolina State University

<table>
<thead>
<tr>
<th>Calving categories</th>
<th>Calving percent in category</th>
<th>Calf mortality (%) within 48 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heifers</td>
<td>Cows</td>
</tr>
<tr>
<td>Unassisted</td>
<td>45</td>
<td>79</td>
</tr>
<tr>
<td>Easy pull</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Hard pull</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Jack needed</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Veterinarian</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: North Carolina State University
Context

Economic aspects
- Animal health
- Loss

Herd management
- Herd size
- Labour

Welfare
- Mortality
- Health
Goals

Evaluation of non-invasive methods to predict calving

• Heartrate
• Activity
• Lying behaviour

Recording parallel to a completely monitored calving as first approach
Experimental design

- Separate experimental calving barn
- Section of 12 cubicles as holding area
- 15 single calving pens
- 26 cows
  - 15 heifers
  - 11 cows
Experimental design

Monitoring of cows (check) every 3 hours

Constant service hours (even on weekends)

„Backup“ of overall behaviour by video observation

Measuring of rectal temperature twice/d

Roughage feeding (MR) once/d

Concentrate feeding two times/d manually
Material & Methods – Activity and lying behaviour

ALT-Pedometer

Storage capacity (internal) 736 records

Storage interval 5 min with sampling of lying/standing, activity and position every 15 s

Radio transmission of internal data every 4 hours

Overall storage of records in a relational data base system (MS-Access)

Pedometers fixed at left foreleg
Material & Methods -
Heartrate measurement

Polar® heartrate monitors S 810i
Polar® equine software & Kubios
5 s interval
Electrodes wettened every 3 – 4 hours
Results - Activity

Days ante partum [d]

- Heifers
- Cows

Calving

Activity [n]

Graph showing activity levels for heifers and cows in the days ante partum, with a peak at calving.
Results – Overall lying behaviour

Heifers and cows

Maximum

Minimum

p ≤ 0.001
Results – Lying bouts

Days ante partum [d]

Lying bouts [n]

50
40
30
20
10
0

0 1 2 3 4 5 6 7

Days ante partum [d]

Lying bouts [n]

50
40
30
20
10
0

0 1 2 3 4 5 6 7

Days ante partum [d]

Lying bouts [n]
Results - Heartrate

- **Heifers (n=9)**
  - Basal value
  - 1-4 hours a. p.

- **Cows (n=6)**
  - Basal value
  - 1-4 hours a. p.
Results - Heartrate

Heifers (n=9)  nonlinear fit heifers
Cows (n=6)  nonlinear fit cows
Conclusions

Pedometer
- Activity and lying behaviour give reliable results
- Telemetric device necessary

Heartrate
- Potential for short term prediction
- Less reliable
- Bolus as solution (wireless)
Thanks for your attention!