The use of reticulo-rumen boluses for early fever detection in young male calves

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Outline

Introduction:
  – Bovine Respiratory Disease

Main part:
  – Aim of the study
  – Material & Methods
  – Results

Conclusion
most relevant calf diseases:

- diarrhea (approximately 50% of calves affected)
- Bovine respiratory disease (BRD; approximately 25% of calves affected)
- associated with a reduced growth during further development
- attributable for most of the antimicrobial treatments associated with calf rearing and calf fattening

Kaske et al. 2010
Introduction
Bovine respiratory disease – a multifactorial disease

Environment:
- climate
- draught, air quality
- cleaning & desinfection
- ...

Feeding:
- nutrients
- vitamins
- major minerals
- trace elements
- water
- ...

Animal:
- stress
- age
- colostrum intake
- body constitution
- breed
- ...

Infections:
- viruses
- bacteria
- parasites
- mycoplasma

One of the first symptoms of BRD is an elevated body temperature ➔ FEVER
Introduction
- Bovine Respiratory Disease -

- for a successful treatment and a full recovery of the animal an early and reliable detection of the first symptoms such as fever is of vital importance

However:
- in large herds often less time is available for regular health monitoring of individual animals

**Aim of the study:**
Is an automated temperature monitoring feasible to detect fever in young male calves?
Material & Methods
- Animals and management -

- duration of trial: 8 weeks
- 150 pre-weaned male calves
  - age at arrival on farm: 16.6 ± 3.3 d
  - weight at arrival on farm: 54 kg ± 5 kg
  - feeding of milk replacer supplied by automatic calf feeders (ca. 10% of BW); *ad libitum* supply of hay, concentrates and water
  - antibiotic metaphylactic treatment offered with milk replacer at arrival (Neomycinsulfat und Sulfadiazin/Trimethoprim)
- health monitoring at least twice a day
  - in animals with clinical signs of BRD rectal temperature was measured
- every 2 weeks rectal temperature was measured in all animals
- rectal temperature ≥ 40 °C = rectal hyperthermia (rehyp)
Material & Methods:
- Monitoring of temperature

- on day of arrival: all calves received a temperature measuring bolus (Medria, France)
- every 5 minutes reticulo-ruminal temperature was obtained

- data management:
  - mean values over 30 min periods
  - mean values over daytime periods (6:00-10:00, 10:00-14:00, 14:00-18:00, 18:00-00:00, 00:00-06:00)
  - CUSUM (cumulative sum) to identify deviations between values over a period of time and to create an alarm

- reticulo-ruminal temperature ≥ 40 °C = reticulo-ruminal hyperthermia (reruhyp)
Results

✓ rectal hyperthermia (≥ 40°C): **31 animals**

✓ correlation between rectal and reticulo-ruminal temperature: **R = 0.75**

<table>
<thead>
<tr>
<th></th>
<th>Reticulo-ruminal hyperthermia periods (≥ 40°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 min</td>
</tr>
<tr>
<td>No. of calves</td>
<td>147</td>
</tr>
<tr>
<td>Number of reruhyp periods</td>
<td>424 ± 489</td>
</tr>
<tr>
<td>(Mean ± SD)</td>
<td></td>
</tr>
<tr>
<td>Duration of reruhyp periods</td>
<td>35 ± 41</td>
</tr>
<tr>
<td>(h)</td>
<td></td>
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</tbody>
</table>
### Results

#### Accuracy values of reruhyp

<table>
<thead>
<tr>
<th>Time period</th>
<th>Sensitivity %</th>
<th>Specificity %</th>
<th>Positive predictive value %</th>
<th>Negative predictive value %</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 min</td>
<td>77</td>
<td>97</td>
<td>73</td>
<td>98</td>
</tr>
<tr>
<td>CUSUM-test</td>
<td>71</td>
<td>98</td>
<td>86</td>
<td>98</td>
</tr>
<tr>
<td>Daytime period</td>
<td>61</td>
<td>97</td>
<td>69</td>
<td>97</td>
</tr>
</tbody>
</table>

- ✔️ accuracy values have to be interpreted with caution
- ➢ further studies are needed with at least daily measurements of rectal temperature to predict real accuracy values

rehyp: rectal temperature ≥ 40 °C
reruhyp: reticulo-ruminal temperature ≥ 40 °C
Results

- Before and on day of rehyp almost all calves can be detected by the measurement of bolus temperature.

- Time interval between first detection of reruhyp and rehyp: 80 ± 70 h

rehyp: rectal temperature ≥ 40 °C
reruhyp: reticulo-ruminal temperature ≥ 40 °C
Conclusion

✓ Automatic temperature measuring devices can be applied to pre-weaned calves.

✓ An early detection of increased body temperature is possible.

✓ The implementation of an alarm system helps to improve the early detection of an increased body temperature.

✓ A thorough clinical examination should still be performed in animals which created an alarm to improve the responsible use of antimicrobials.
Thank you for your attention!

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