Real time measurement of reticular temperature for the prediction of parturition and estrus in cows

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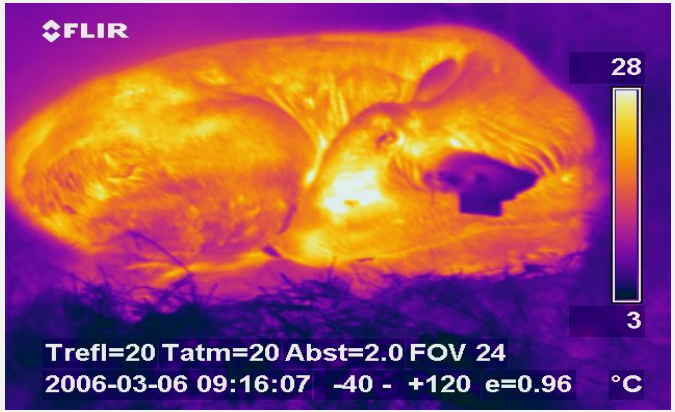
Austria

Body temperature

- Well established key indicator of physiological and pathological events

- **Increases of body temperature**
  - physiological: heat
  - fever: infections like mastitis, metritis...
  - heat stress
- **Decreases of body temperature**
  - physiological: parturition
  - metabolic diseases: hypocalcaemia, ketosis…
  - extreme cold

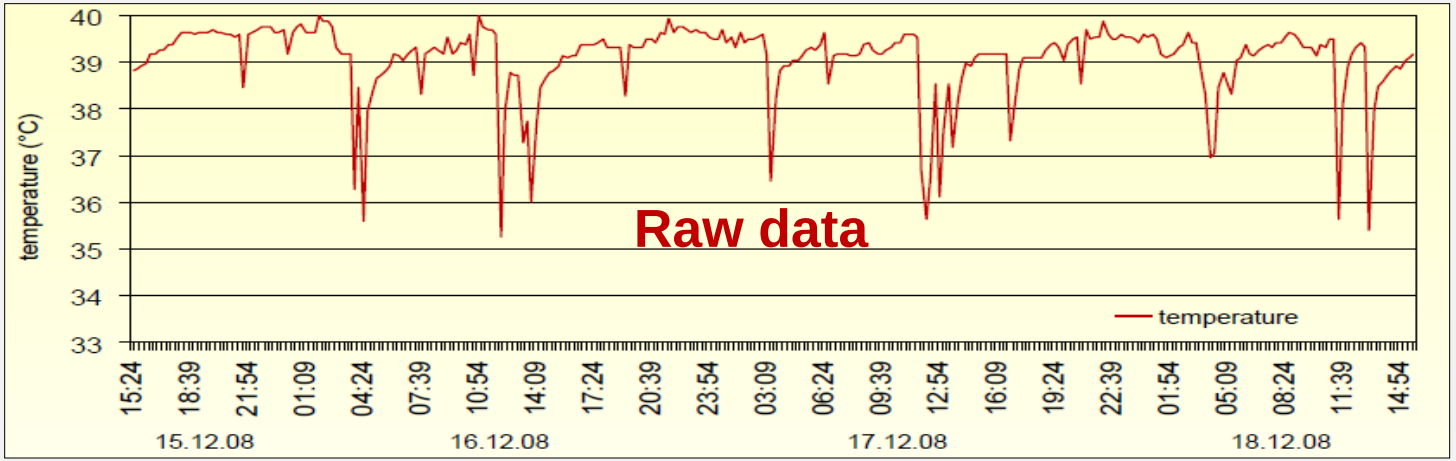


Body temperature measurement

- **Measurement of body temperture in dairy cows**
  - no continuous measurement, just spot sampling
  - time consuming procedure
  - individual differences → difficult interpretation

Many **health problems**, but also **physiological events** like **parturition** and **estrus**, could be detected at an early stage by a reliable method for **continuous** monitoring body temperature.

Continuous measurement of reticular (R) temperature

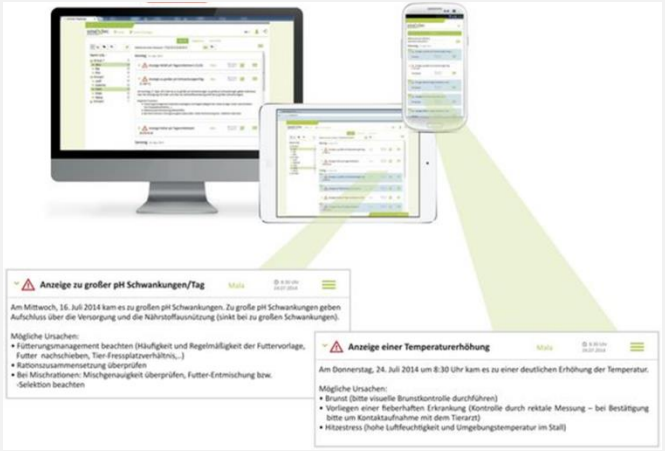


- **R-temperature is correlated with rectal temperature (r=0.65; Bewley et al. 2008)…**
- **… but is also influenced by:**
  - Sign. declines of temperature caused by water consumption
  - Influence: Temperature of water and amount of water intake
  - removed by a statistical method (*Wolfthaler et al. 2014*)
- **Interpretation of Δ (delta, changes of temperature °C)**

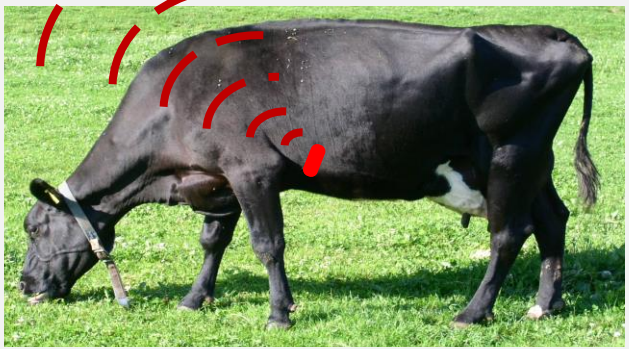
Indwelling sensor with data transmitting unit

(length 120 mm, diameter 36 mm, weight 208 g)

Indwelling sensor with data transmitting unit



temperature & pH
144 measurements/day



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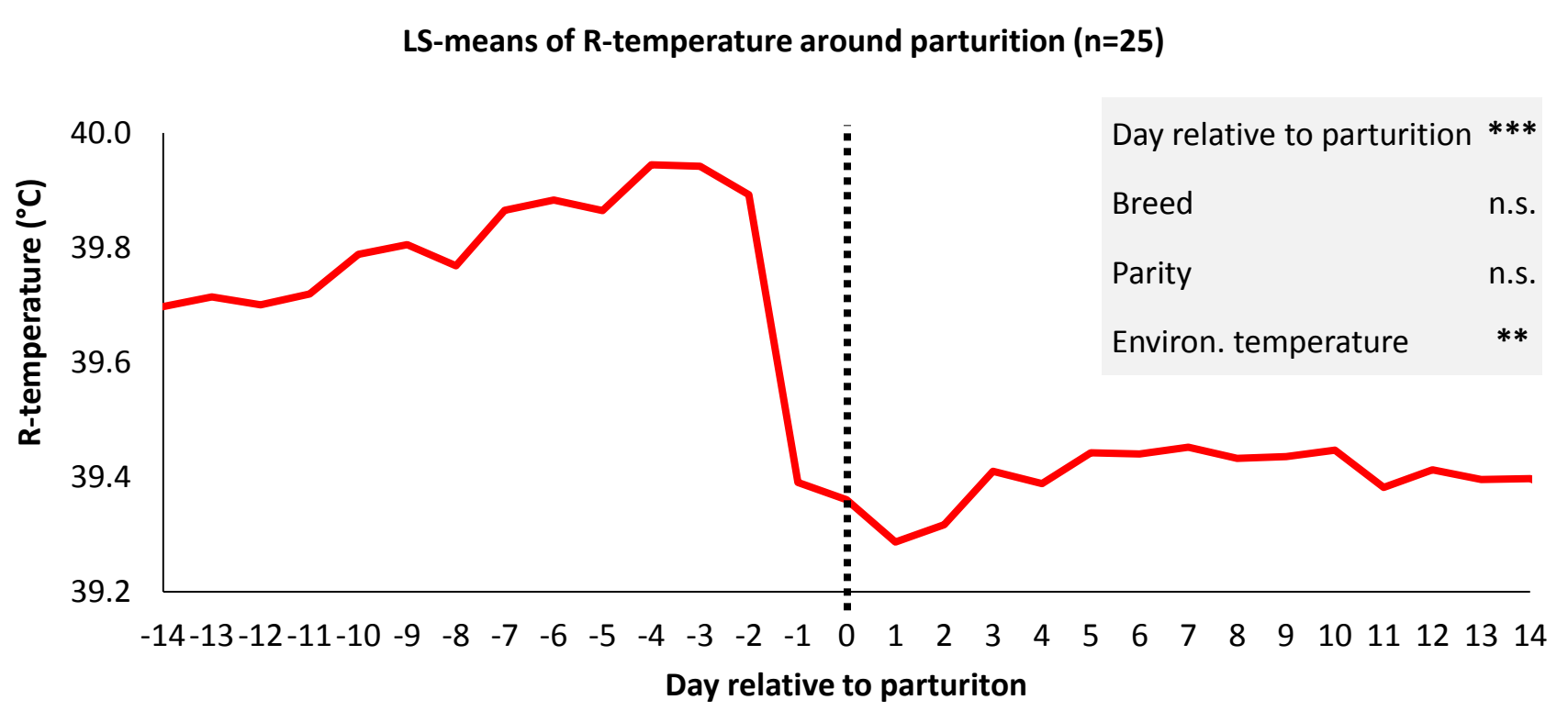
R-Temperature – Parturition

Key event for cow and calf

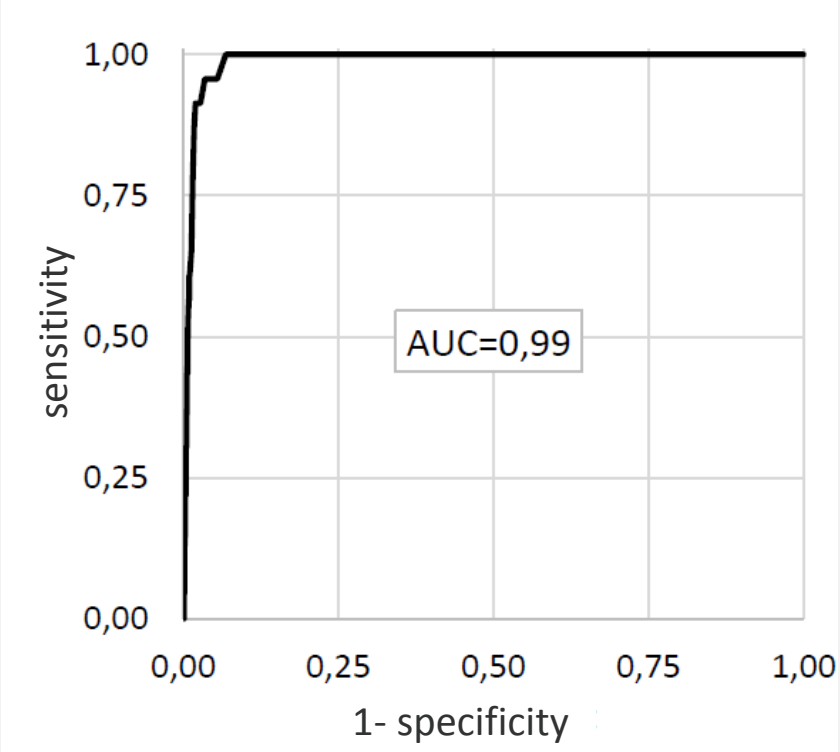
R-Temperature – Parturition – Results



R-Temperature – Parturition – Results

- Detection of an upcoming parturition within 24 hours (n=25)

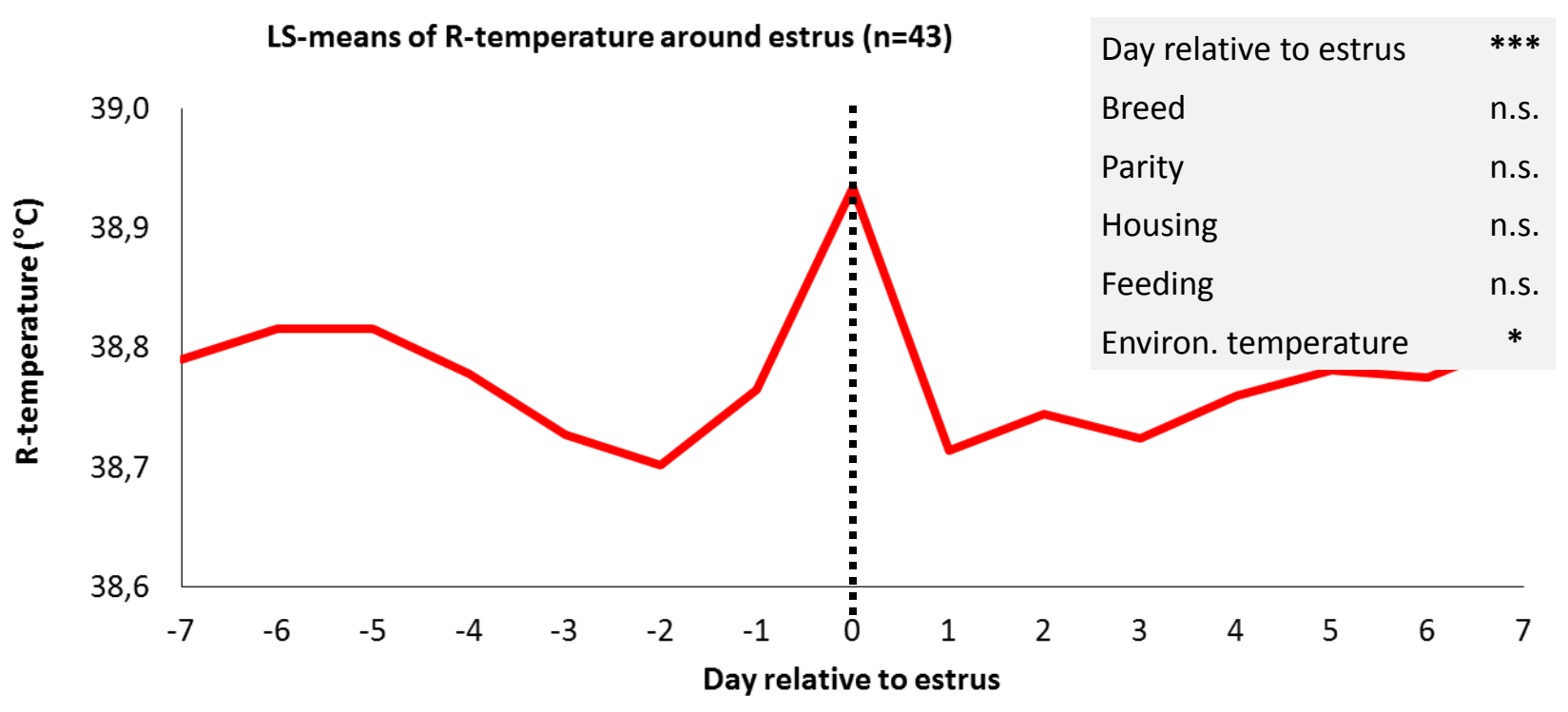
T-Difference	Test	
	sensitivity	specificity
≥0.30°C	100%	86%
≥0.40°C	100%	93%
≥0.50°C	96%	96%
≥0.60°C	87%	98%



R-Temperature – Estrus

Key event for cow and milk production

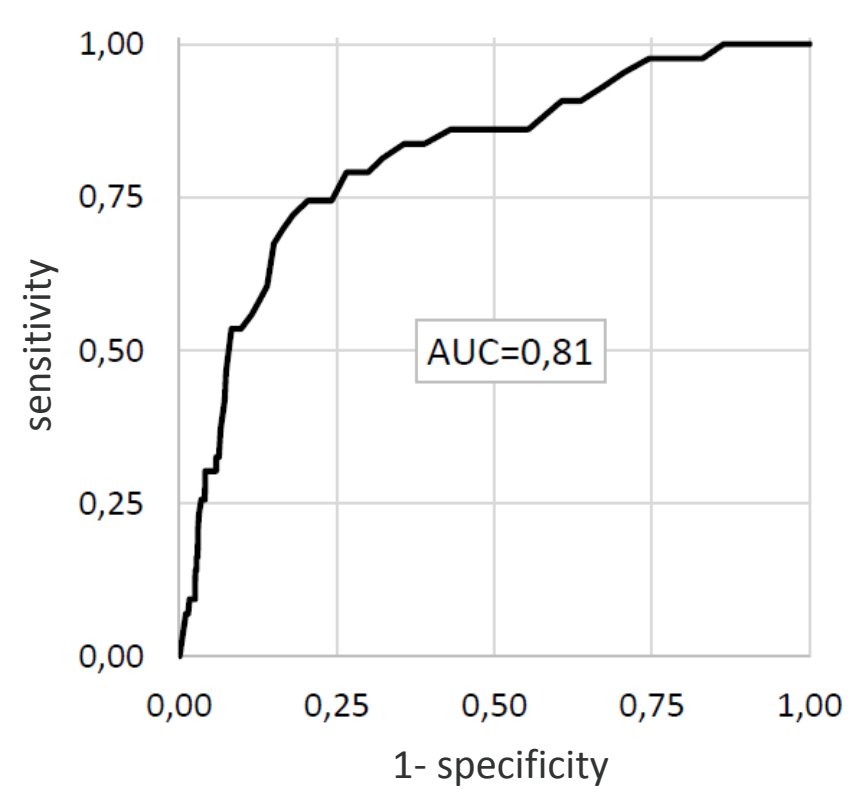
R-Temperature – Estrus – Results



R-Temperature – Estrus – Results

- Detection of estrus (n=43)

T-difference	Test	
	sensitivity	specificity
≥0,20°C	98%	17%
≥0,30°C	86%	57%
≥0,35°C	**79%**	**73%**
≥0,40°C	70%	34%
≥0,50°C	37%	93%



Conclusions

- **Body temperature is a key indicator for pyhsiological and pathological events**
- **Reticular temperature was significantly influenced by…**
  - day relative to parturition
  - day relative to estrus
- **Continuous measurement of reticular temperature can be used for…**
  - early detection of parturition (AUC = 0.99)
  - early detection of estrus (AUC = 0.81), but a combination with other heat detection methods is recommended
- **The indwelling sensor is a helpful tool to monitor reticular temperature and pH for both scientific and practical use**

For more results live from the reticulum visit poster S.7 P.16!

Effect of prepartum pH and concentrate levels on reticuloruminal-pH levels in dairy cows


M. Horn

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Aims: 1) effects of **two concentrate levels** (Con, Low) on reticuloruminal pH values p.p. 2) effects of **prepartum pH values on postpartum pH values** of lactating cows receiving **no concentrate before parturition.**

Methods: 20 dairy cows; continuous pH measurements (10 min) between week 2 prepartum and week 6 postpartum.

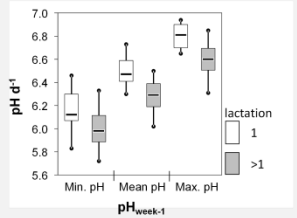
Ration: Dry period: hay and grass silage; After parturition: hay and grass silage, concentrate increased from **2 to 7.5** and from **1 to 3.7** kg DM for groups **Con** and **Low**, resp..

Statistics: mixed model, weekly means.

Results and conclusions:

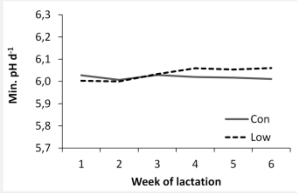
- **No diet effects** - cows were able to react within the physiological range of adaptation.
- **Mean pH before parturition** significantly **affected pH-levels after parturition.**
- The results support the theory of the existence of **cow-specific baselines concerning rumen fermentation** and emphasise the importance of further research on this topic.

Figure 1: **Min. pH, Mean pH and Max. pH during the last week before parturition**



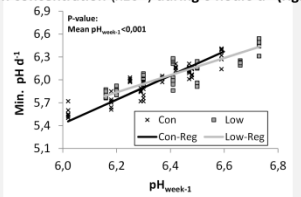
✓ *p.p.: pH values varied between animals*

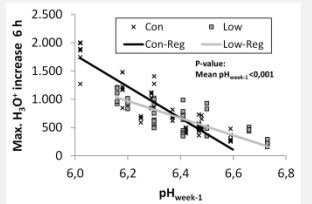
Figure 2: **Min. pH for group Con and Low from 1st to 6th week of lactation**



✓ *a.p.: no sig. diet effects on pH found*

Figure 3: **Effect of Mean pH before parturition on Min. pH (left) and short-term fluctuation of H_3O^+-Ion concentration (x10^{-8}) during 6 hours d^{-1} (right)**





✓ *Lower Mean pH before parturition → 1) lower pH values from 1st-6th week of lact. 2) stronger pronounced short term fluctuations of H_3O^+-ion concentrations 3) longer time span with pH < 6.2*

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Conclusions

Thank you for your attention!

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