Are reticular temperatures correlated to body temperature in dairy cows?

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Background

- Body temperature (rectal or vaginal measured) (BT) is still the most common used parameter to monitor animals responses to **physiological** and **environmental** alterations (Nakamura et al., 1983)

→ Indicator for health, estrus, heat stress, ... (Lefcourt et al., 1999).

- Physiological BT of dairy cows: 38.6 – 39.2 °C (Piccione & Refinetti, 2003)

Locations to measure body temperature:

Rectum → „Gold standard“
Vagina
Udder (Milk)
Peritoneum
Tympanum

Accuracy ? Practicability ?

\+

- Automatic and continuous recording
  - ➢ Labor extensive
- No risk of injury (?)

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- Costs
- Lifetime (battery)
- Affected by drinking and feeding

Objective

Comparison of rectal, vaginal and reticular temperatures in dairy cows in relation to daytime and climatic conditions.

Material and methods

- 12 Holstein-Friesian dairy cows
  - 65.0 ± 19.0 DIM
  - 36.4 ± 10.4 kg milk/day
- Outdoor loose - housing barn, AMS

Climatic conditions

- 9 Tinytag data logger
- Barn temperature (°C, T) and relative humidity (%, RH) recorded at 15-min intervals

→ THI = (1.8 x T + 32) – (0.55 – 0.0055 x RH) x (1.8 x T – 26) (NRC, 1971)

Body temperature measurement

Rectal and vaginal temperature

- 5-day periods in June and October 2013
  - Digital Thermometer

Body temperature measurement

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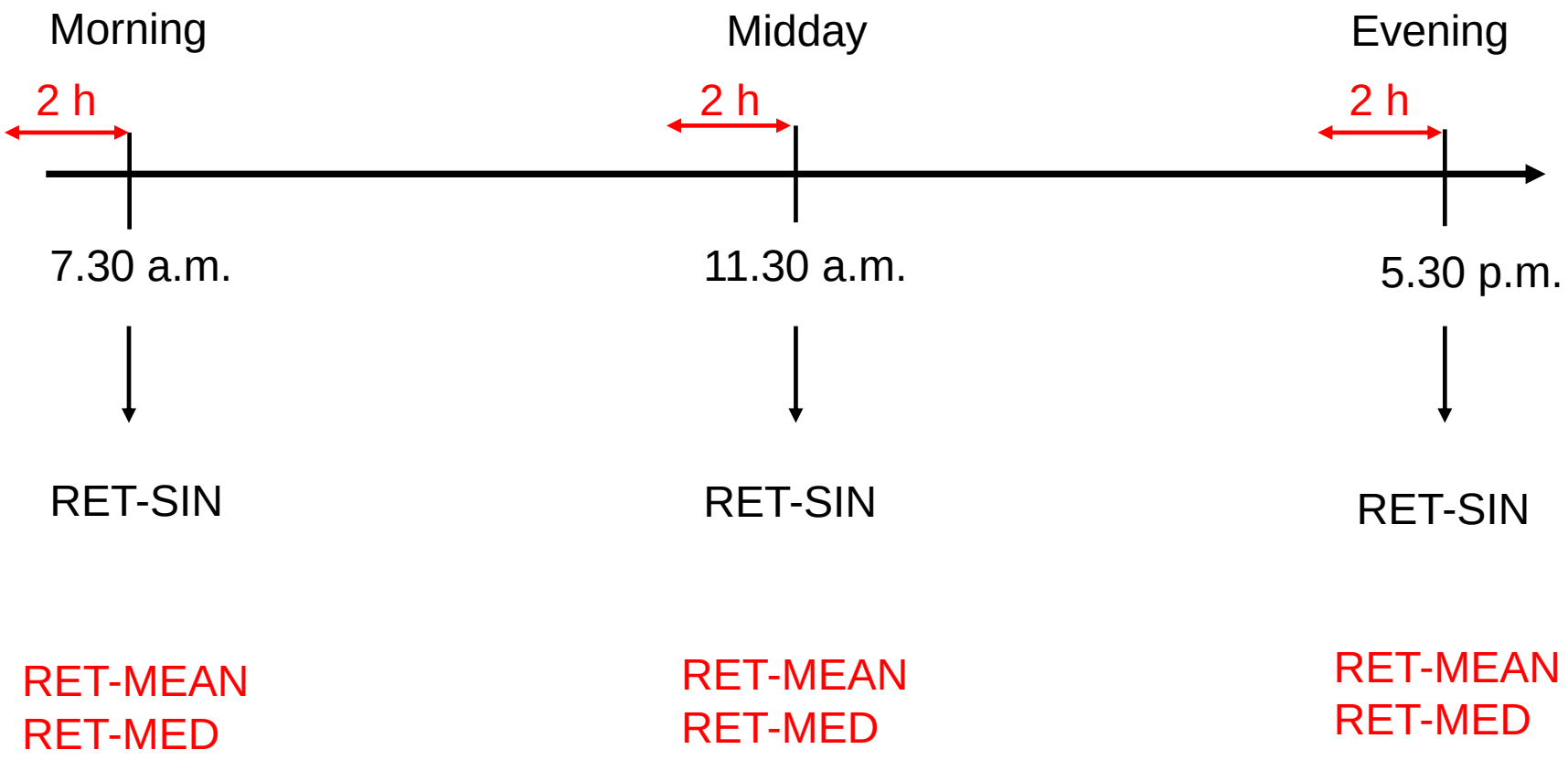
Reticular temperature

- smaXtec pH and Temp Sensor (smaXtec animal care sales GmbH, Graz, Austria)
- Records every 10 min
- Wireless data transfer by mobile reader

Body temperature measurement

Rectal and vaginal temperatures



Statistical analysis

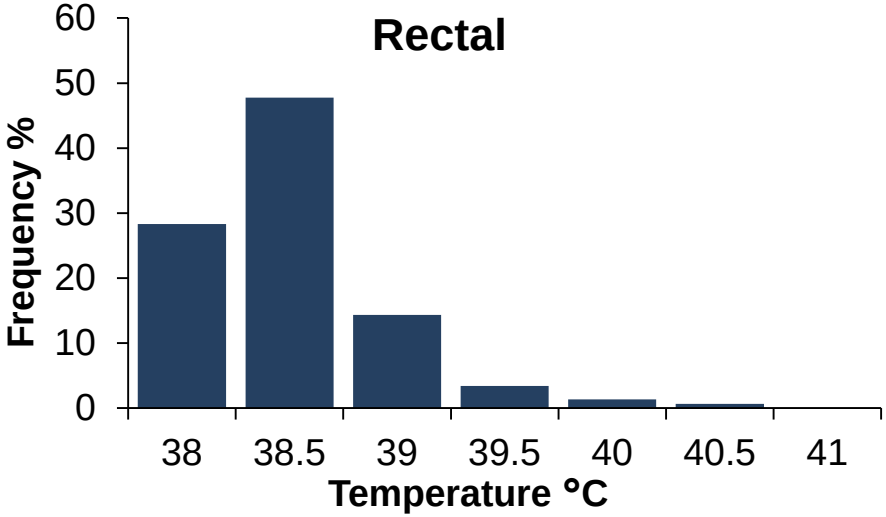
- Data analysis with SAS 9.3
- Correlation between methods (PROC CORR)
- Effects on BT (PROC MIXED):

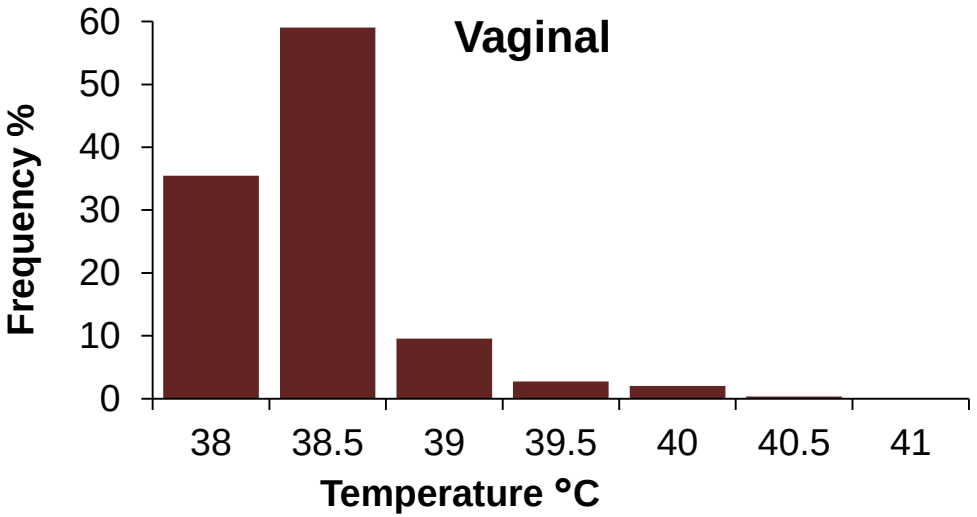
$$Y_{ijklmn} = \mu + Meth_i + Mo_j + (Meth \times Mo)_{ij} + Ti_k + D_l(Mo)_j + Cow_m + e_{ijklmn}$$

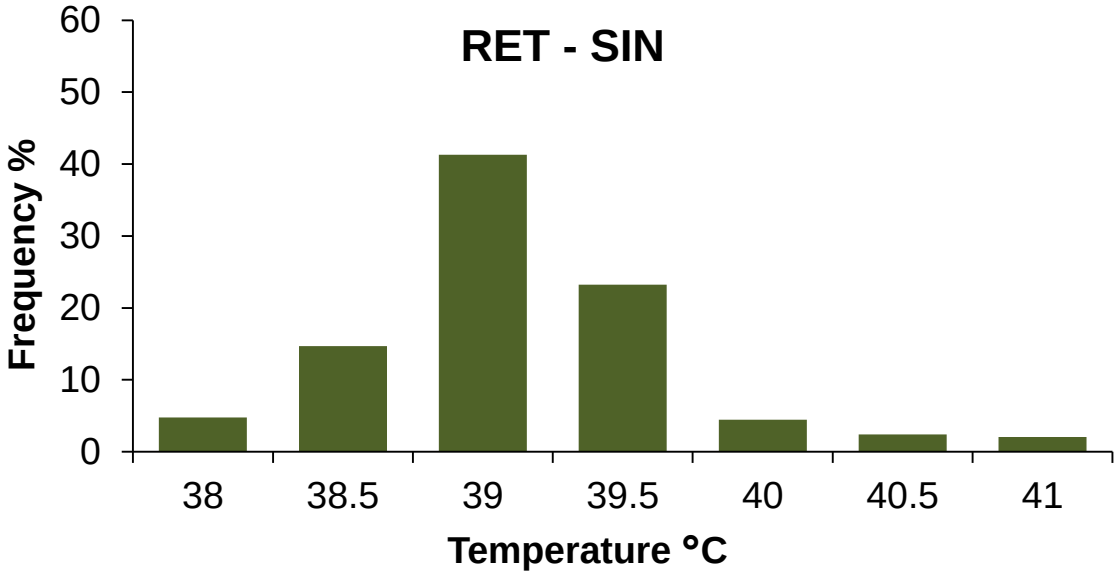
Y_{ijklmn}	=	BT-measurement
μ	=	overall mean
$Meth_i$	=	fixed effect of measurement method
Mo_j	=	fixed effect of month
$(Meth \times Mo)_{ij}$	=	interaction between method and month
Ti_k	=	fixed effect of time of day
$D_l(Mo)_j$	=	fixed effect of day within month
Cow_m	=	repeated effect of the cow
E_{ijklmn}	=	overall error

Results and Discussion

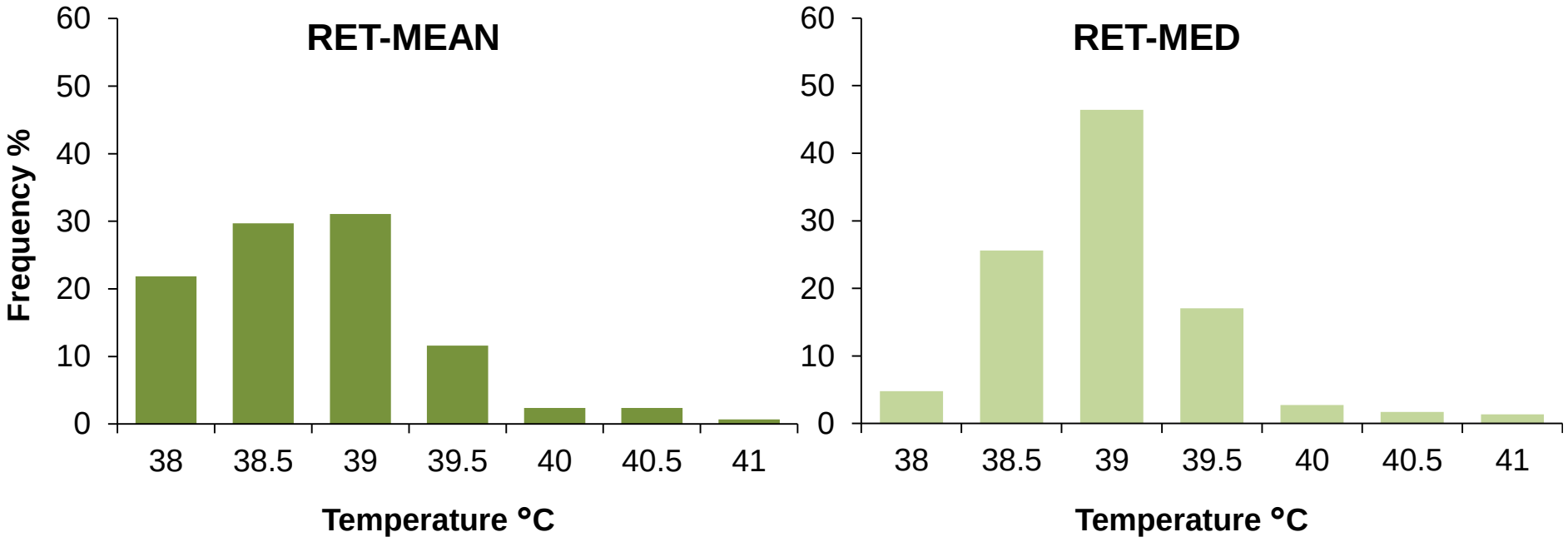
Frequencies of BT-measurements



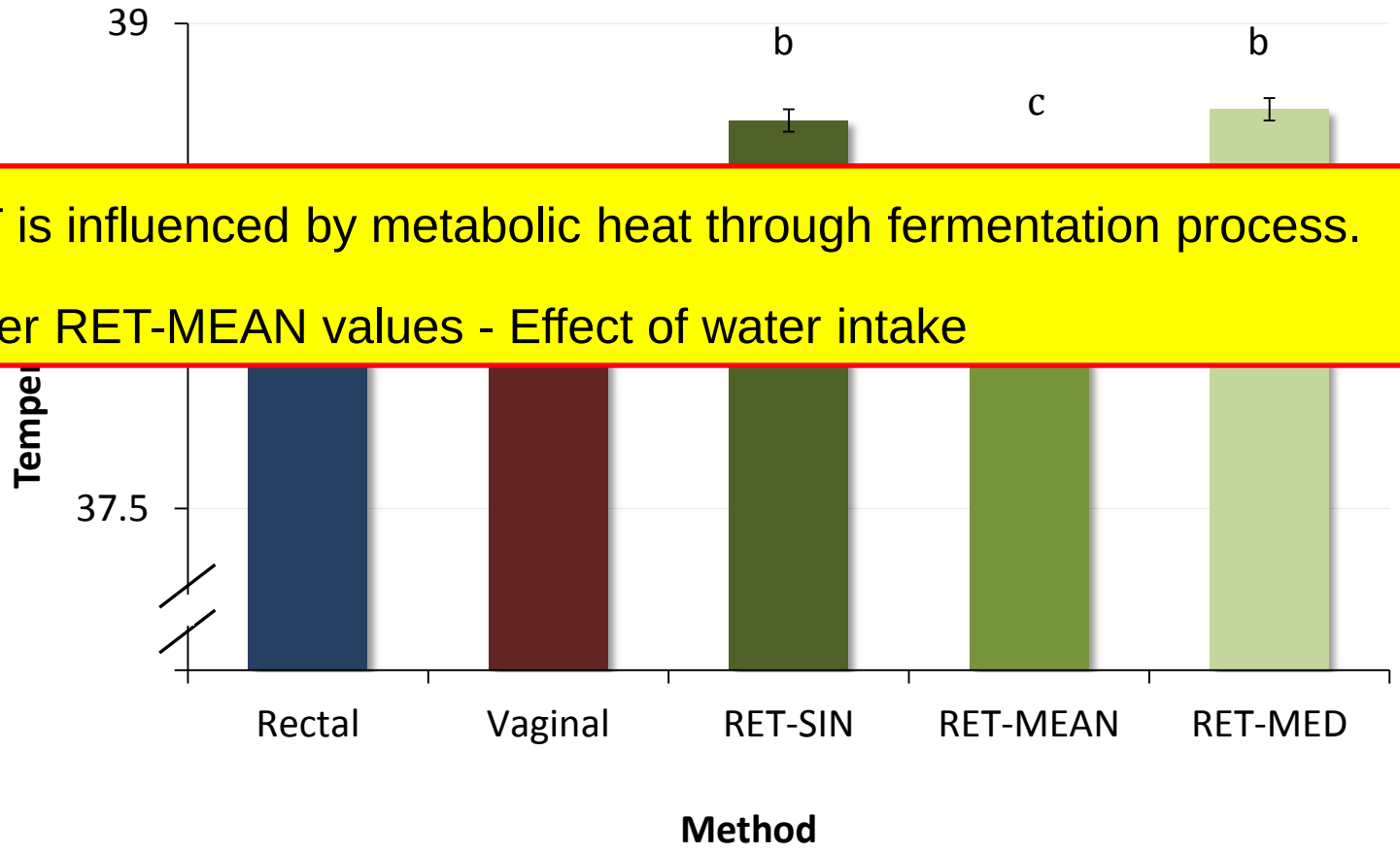




Frequencies of BT-measurements



Comparison of BT-measurements during study period



RET is influenced by metabolic heat through fermentation process.

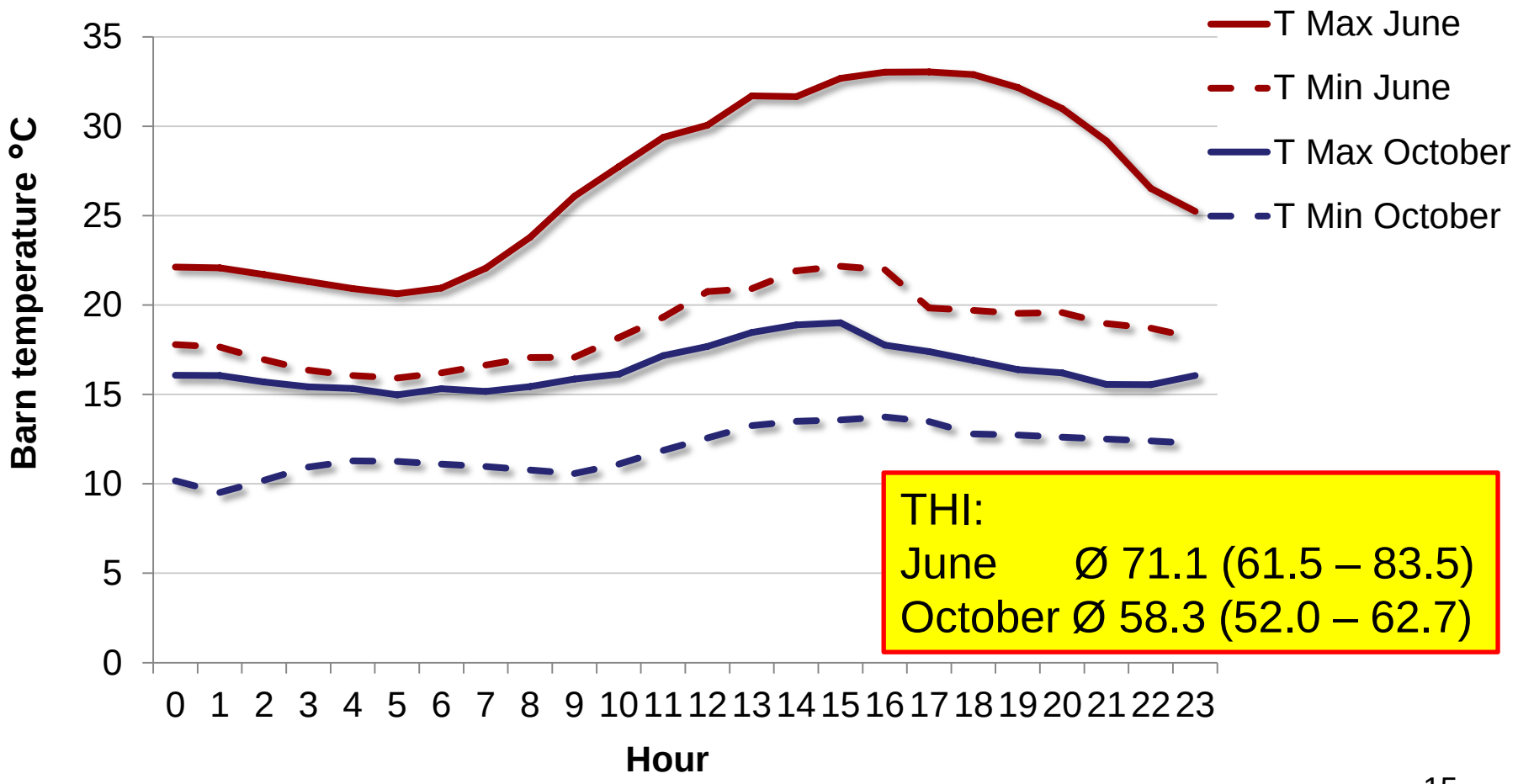
Lower RET-MEAN values - Effect of water intake

Correlations between measurement methods during the study period

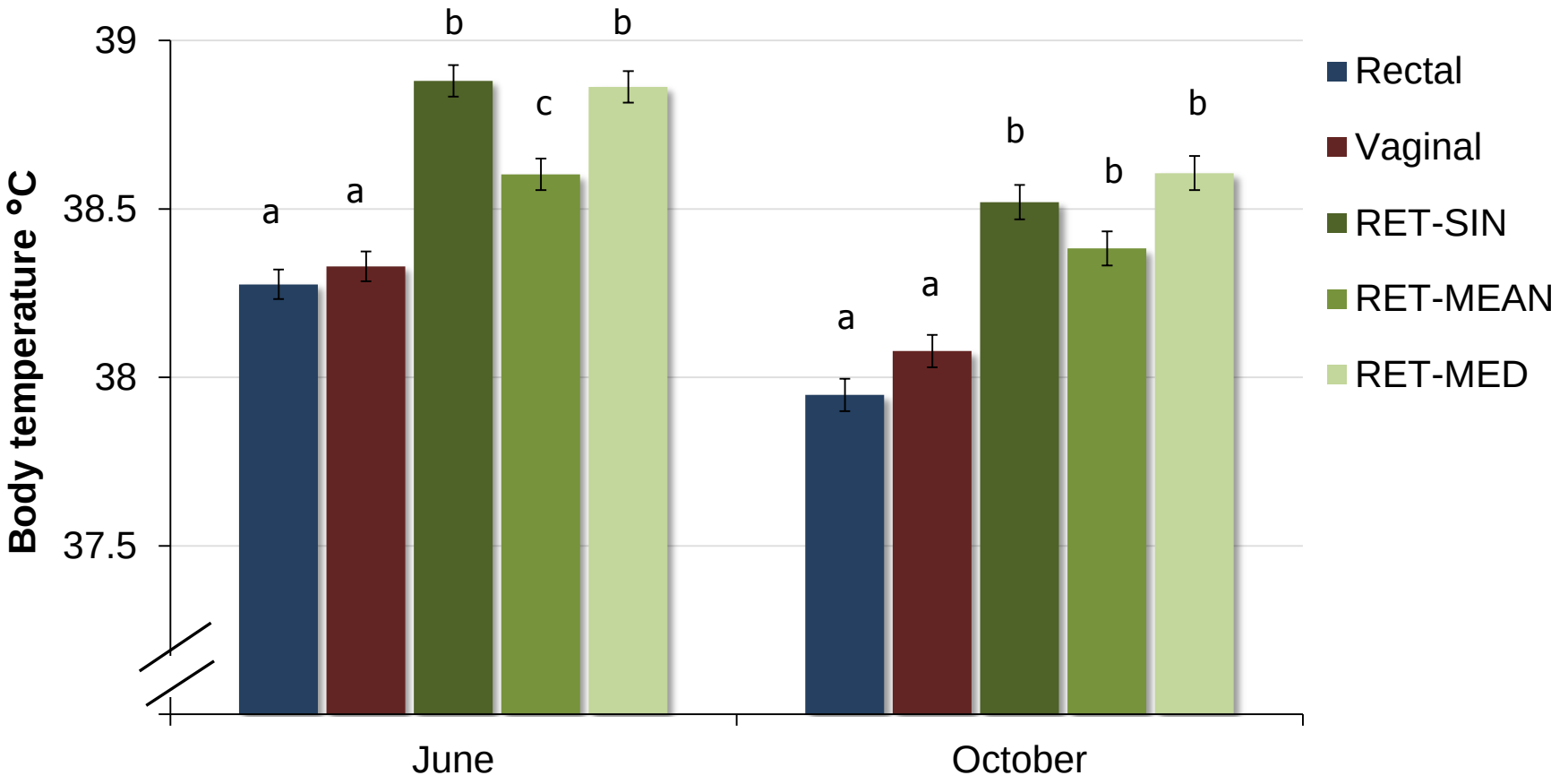
	Vaginal	RET-SIN	RET-MEAN	RET-MED
Rectal	0.75 ***	0.40 ***	0.43 ***	0.48 ***
Vaginal	-	0.48 ***	0.46 ***	0.53 ***

Effect of month on BT-measurements

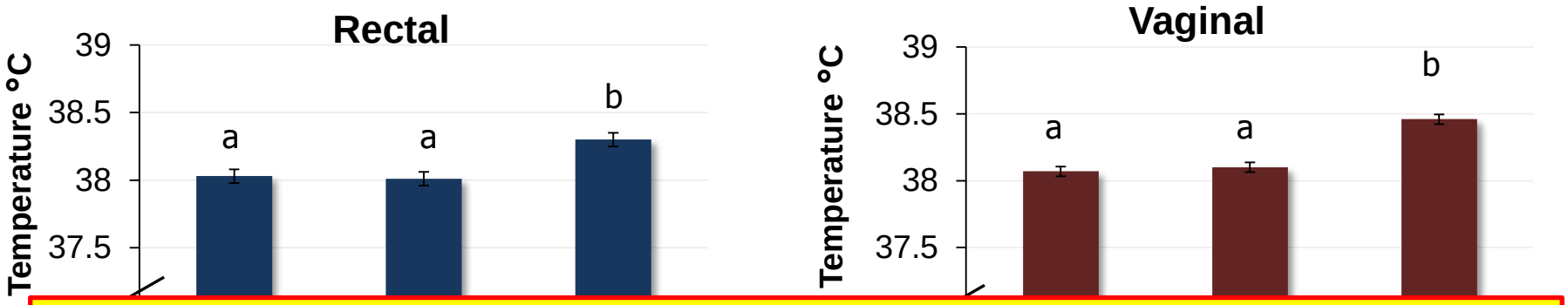
- Climatic conditions -



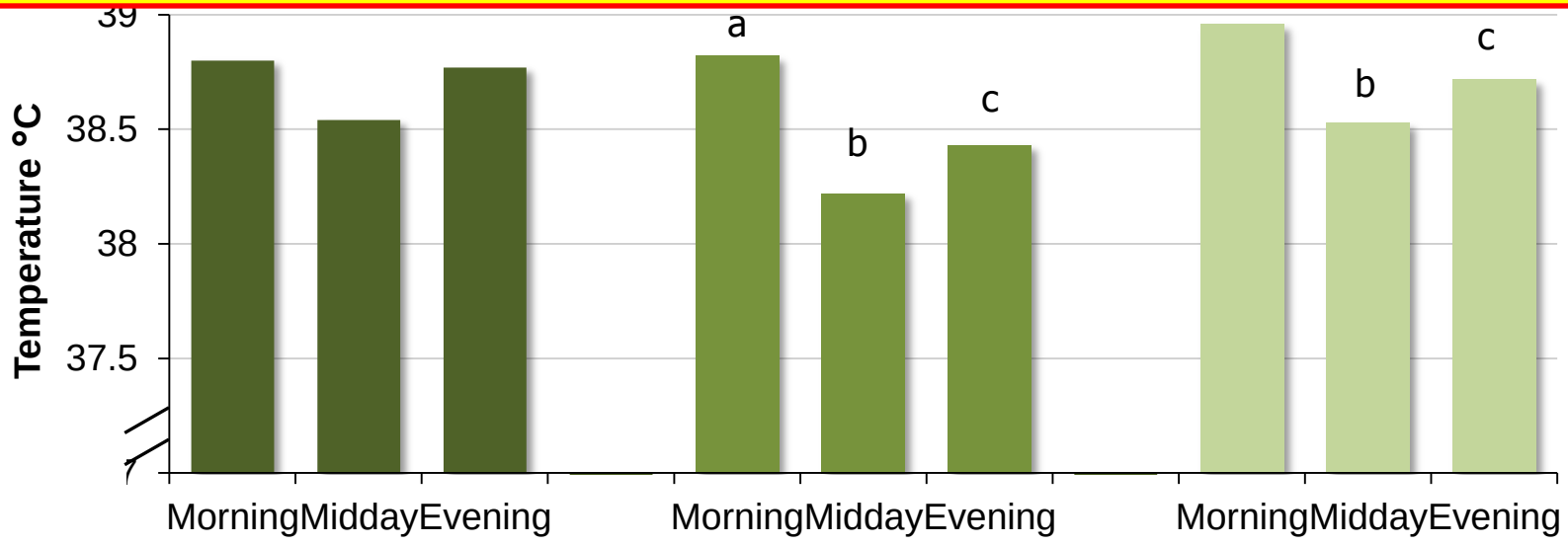
Effect of month on BT-measurements



Effect of day time



- Water intake more frequent during the day (Cardot et al., 2008) → lowest RET values at midday and evening
- Highest RET values in the morning – rumination while resting



Conclusions

- Highest correlation between rectal and vaginal temperatures; lower correlation values to RFT

What temperature reflects the physiological status of the cow best ?

But:

measurement of RET is operator independent with the possibilty of a high daily recording frequency.

Thank you for your attention !

Niedersächsisches Ministerium
für Wissenschaft und Kultur

Effect of ambient temperature on BT-measurements

Correlations between barn temperature and

- rectal (r = 0.41, *P* < 0.001) and
- vaginal (r = 0.48, *P* < 0.001) temperatures.

➢ no relation to RET-values (*P* > 0.05)

- Rectum and vagina are peripheral organs, reticulum is located in the core → rectal and vaginal temperatures might be more affected by barn climate (Bewley et al., 2008)