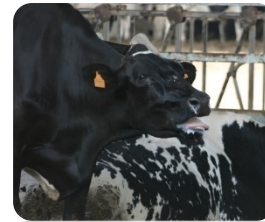
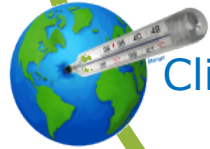


Heat stress relief of dairy cows by evaporative cooling under Mediterranean summer conditions

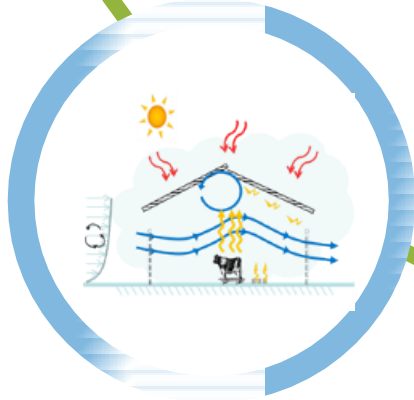
Severino Pinto, Christian Ammon, Fernando Estellés,
Arantxa Villagra, Thomas Amon, Gundula Hoffmann



Heat stress in dairy sector



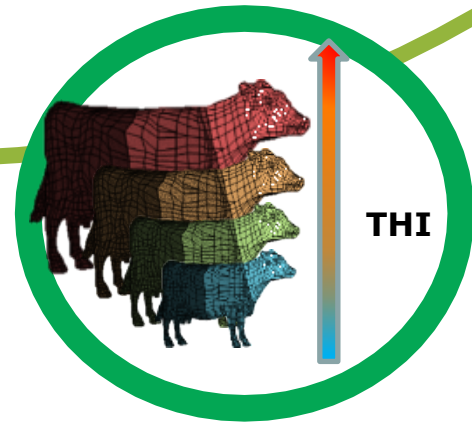
Climate change



Emissions

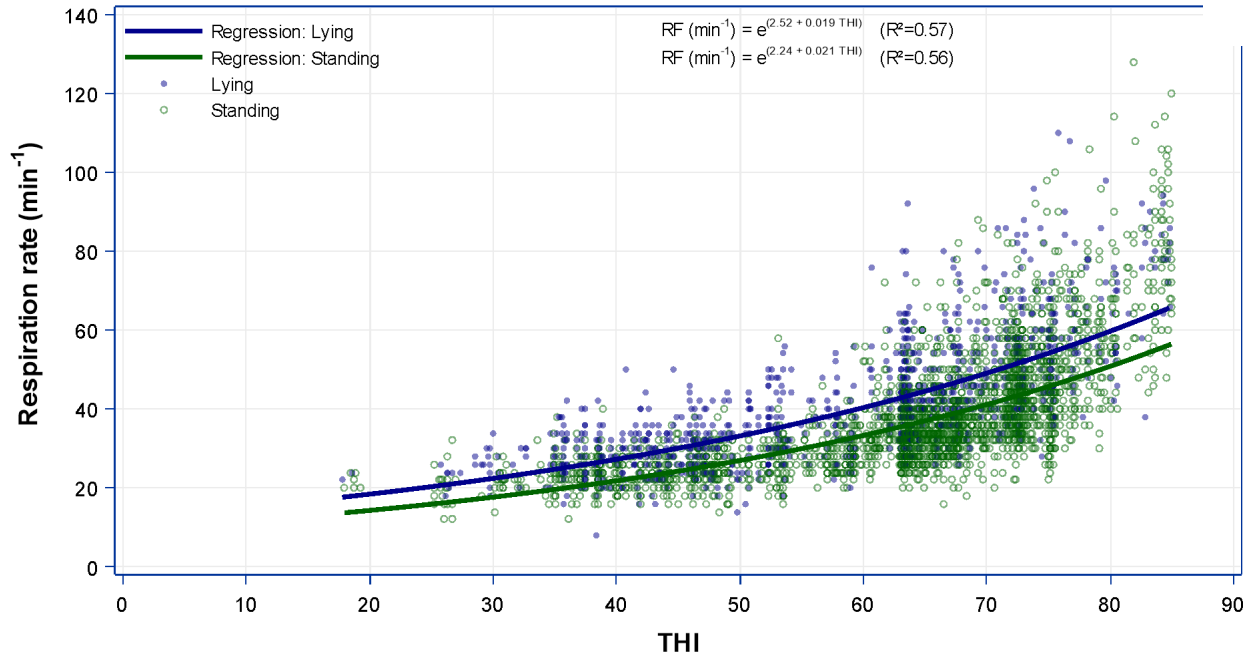


Animal welfare



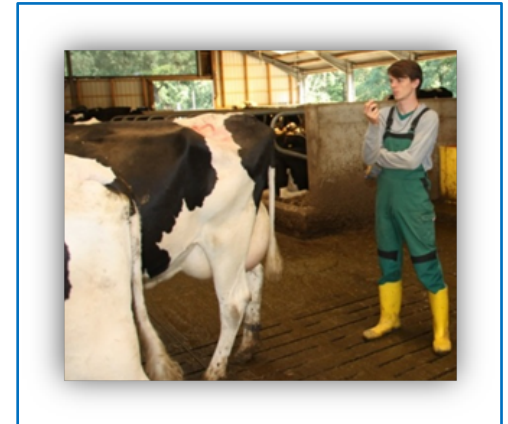
Economic sector





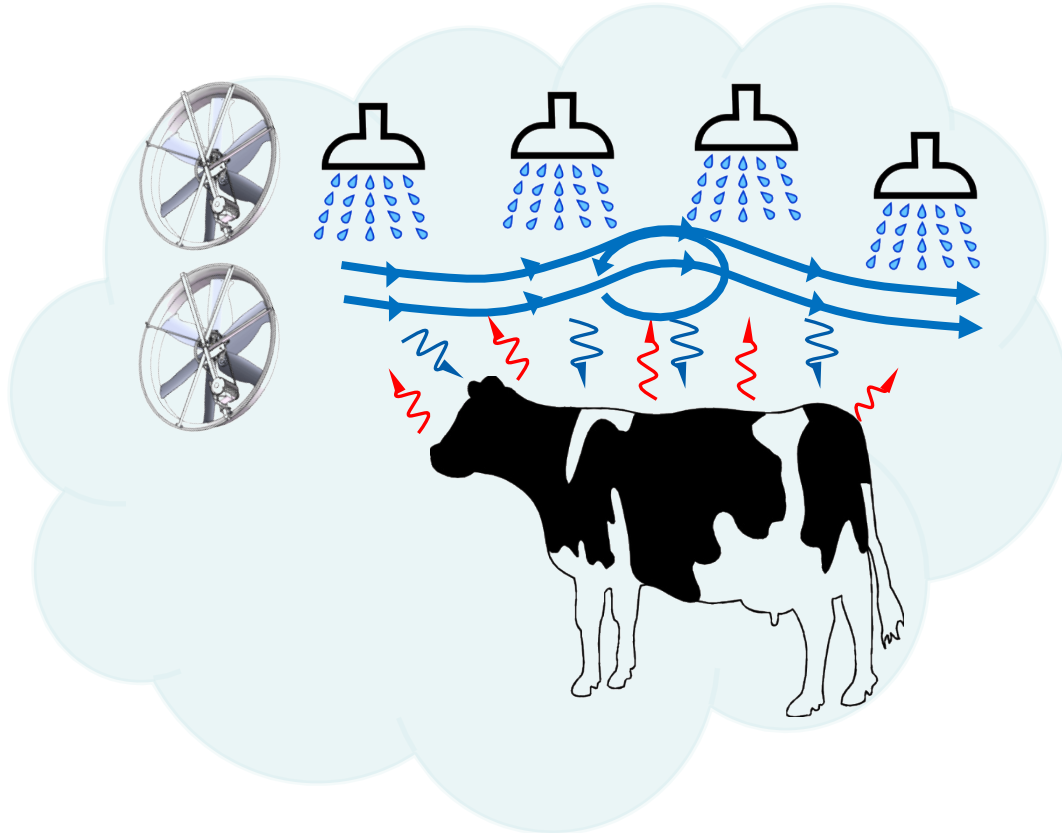
INFLUENCE OF BARN CLIMATE, BODY POSTURES AND MILK YIELD ON THE RESPIRATION RATE OF DAIRY COWS*

Severino Pinto^{1,2}, Gundula Hoffmann³, Christian Ammon³, Barbara Amon^{1,3}, Wolfgang Heurwieser⁴, Ilan Halsehmi², Thomas Banhazi², Thomas Amon^{1,3}



Source: Pinto/ATB

Cooling Effect



- Fans and sprinklers
- Heat relief



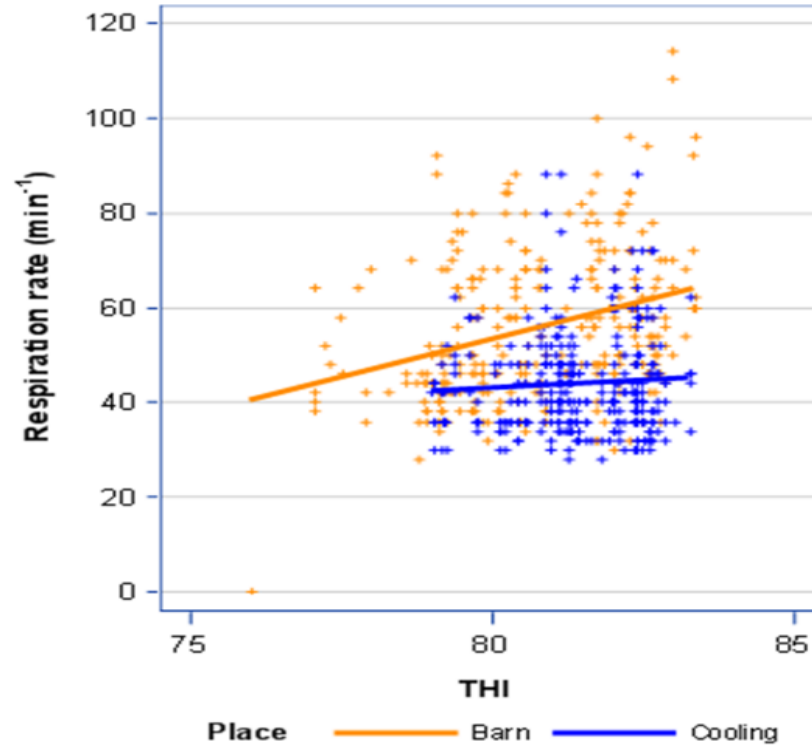
Source: Pinto/ATB

Overview



EFFECT OF TWO COOLING FREQUENCIES ON RESPIRATION RATE IN LACTATING DAIRY COWS UNDER HOT AND HUMID CLIMATE CONDITIONS*

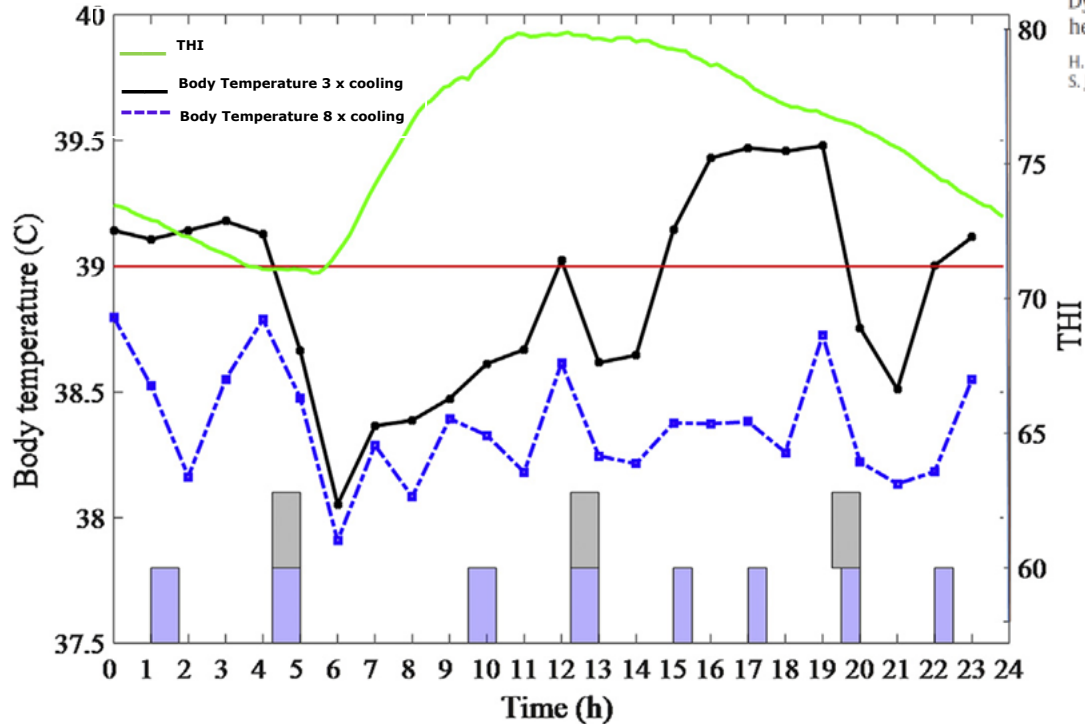
Severino Pinto^{1,2}, Gandala Hoffmann³, Christian Ammon¹, Wolfgang Heuwieser¹, Harel Levit⁴, Ilan Halachmi⁴, Thomas Amon^{1,2}



Source: Pinto/ATB



Overview



Dynamic cooling strategy based on individual animal response mitigated heat stress in dairy cows



H. Levit^{ab}, S. Pinto^{cd}, T. Amon^{cd}, E. Gershon^e, A. Kleinjan-Elazary^{bc}, V. Bloch^a, Y.A. Ben Meir^{bce}, Y. Portnik^b, S. Jacoby^b, A. Armin^f, J. Miron^e, I. Halachmi^{4*}



Source: Pinto/ATB



Objective



- The present study aimed to investigate the effect of evaporative cooling on respiration rate (RR) of lactating dairy cows, considering individual animal factors (standing vs. lying).



Source: Pinto/ATB

Facilities – Valencia, Spain

- Naturally ventilated compost barn: - NE-SW oriented
- 18 Holstein Friesian randomly selected
 - 1st – 5th lactation
 - DIM 150 ± 4.7
- Total mixed ration
- Carousel milking parlour (50 places) GEA®
 - Daily milk yield 41.64 ± 4 kg



Source: Pinto/ATB



Facilities – Valencia, Spain



Cooling management

- 3 times per day, before milking
 - 45 min duration: 1 min sprinkler and 4 min fan x 9 times
 - At 5:15h, 13:15h and 21:15h



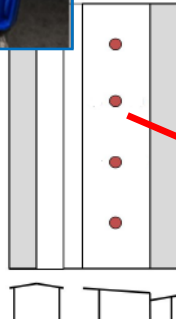
Cow related variables

● Respiration Rate

- Hourly visually counted in bpm

● Body posture

- Standing vs. Lying
- IceTag3D™ Sensor (IceRobotics, Edinburgh, UK)



● Measurement

- 07:00h to 15:00h
- 5 randomly days July 2016



Climate related variables

● T in °C and RH in %

- Every 5 min 24 h a day
- 4 EasyLog sensors (Lascar Electronics Inc, USA)

$$THI = (1.8 * Tdb + 32) - (0.55 - 0.0055RH) * (1.8 * Tdb - 26) \quad \text{NRC, 1971}$$

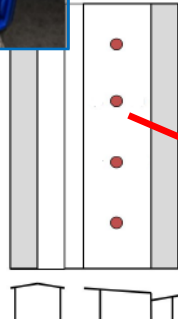
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Climate related variables

● T °C and RH %

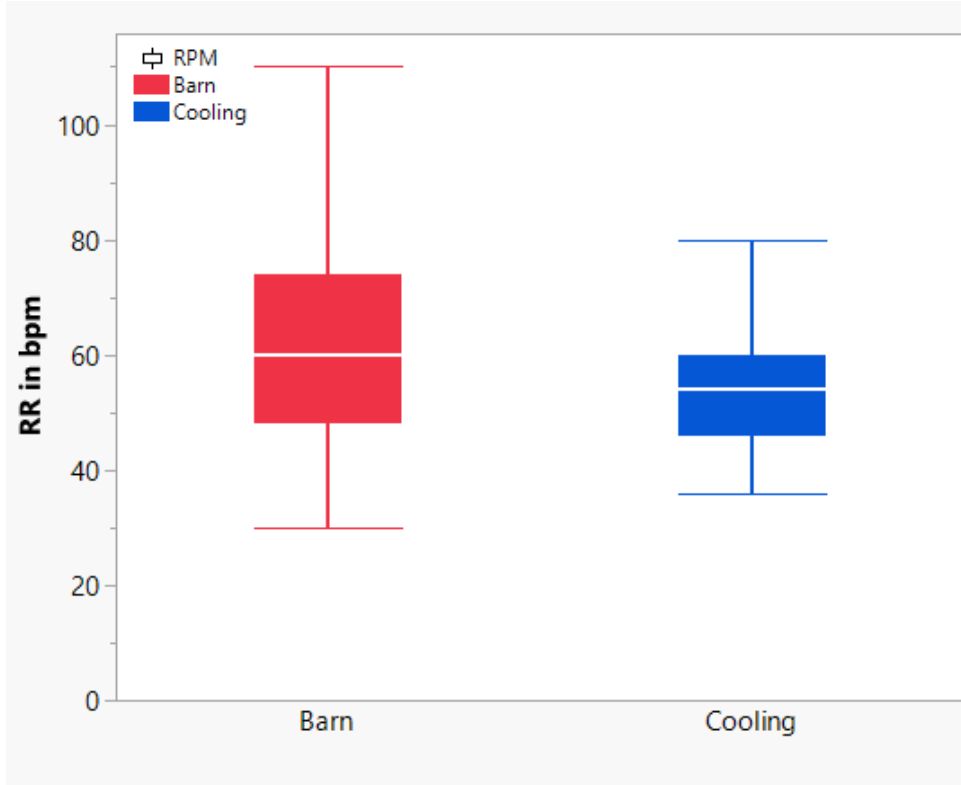
- Every 5 min 24 h a day
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$$THI = (1.8 * T + 32) - (0.55 - 0.0055RH) * (1.8 * T - 26) \quad \text{NRC, 1971}$$

Source: Pinto/ATB



Results



Source: Pinto/ATB

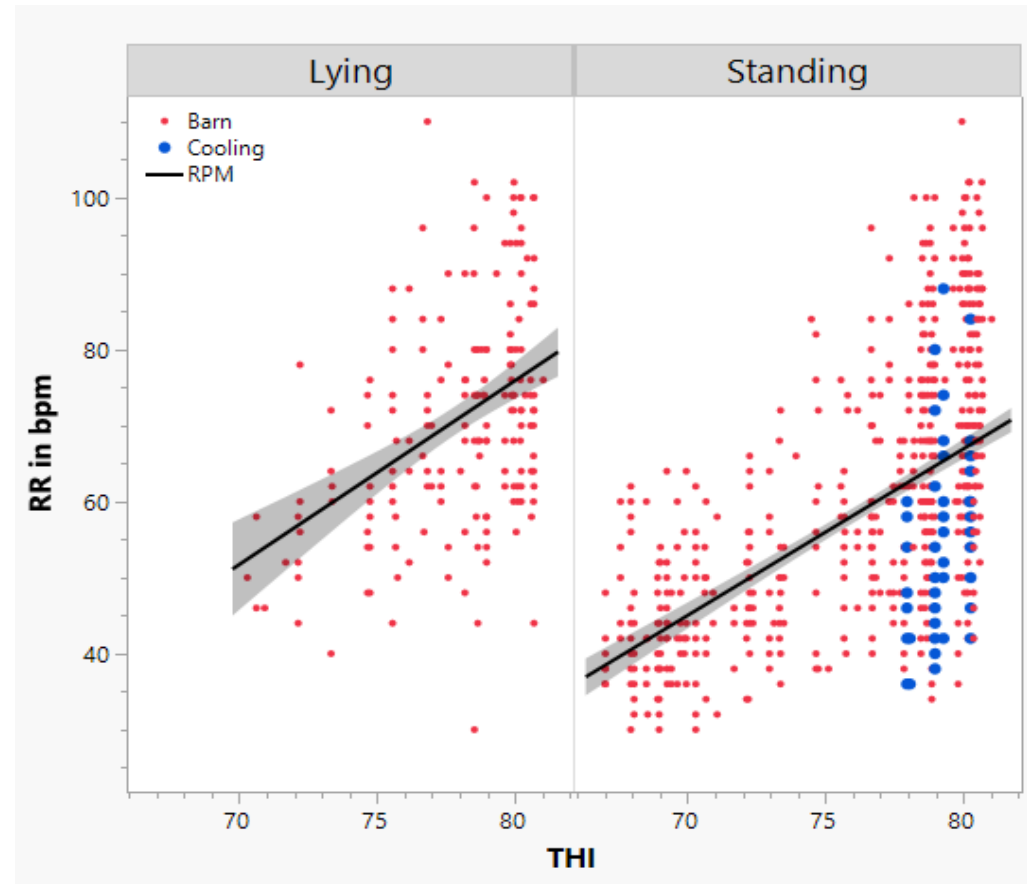
- **Place effect: $p < 0.001$**
 - RR of 54 ± 11.8 bpm in the cooling
 - RR of 60 ± 18.9 bpm in the barn

Results

● **Body posture** effect on RR in the barn: $p < 0.001$

● Lying cows: 71 ± 14.8 bpm

● Standing cows: 54 ± 11.8 bpm

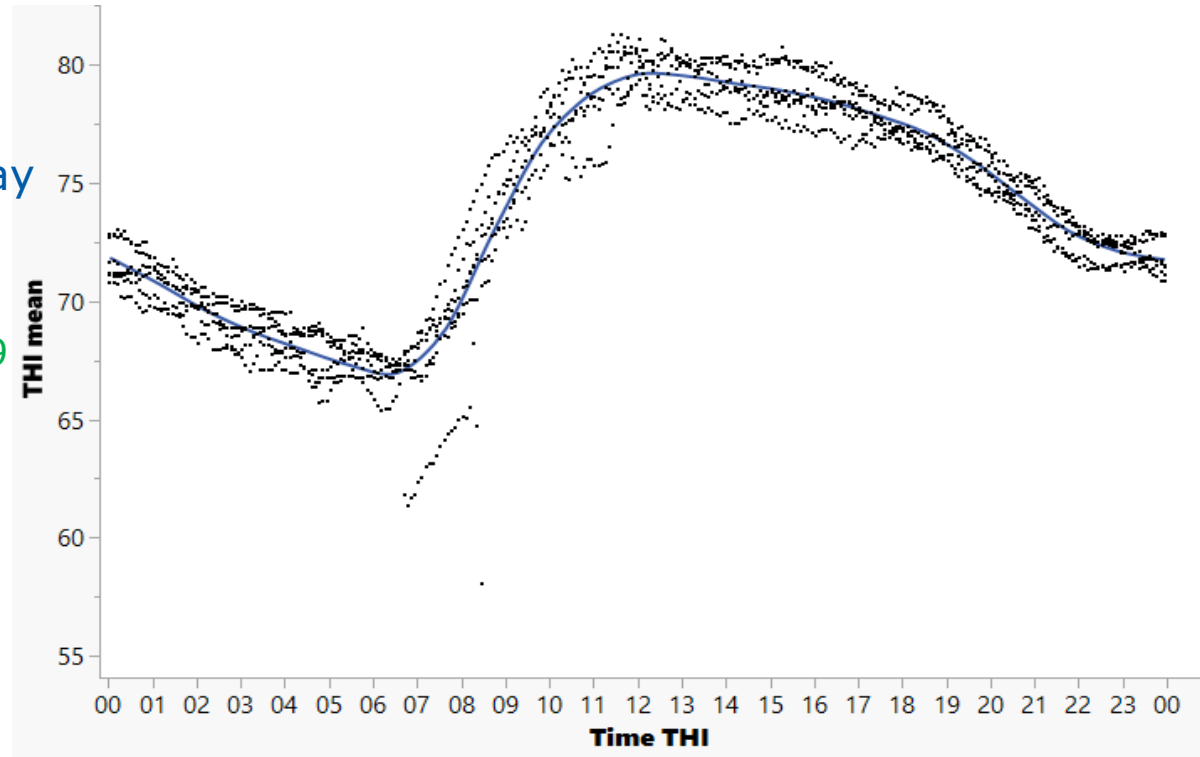
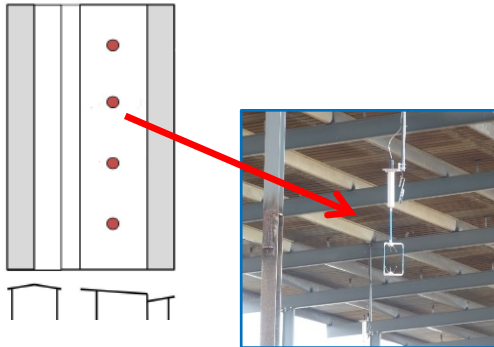


Source: Pinto/ATB

Results

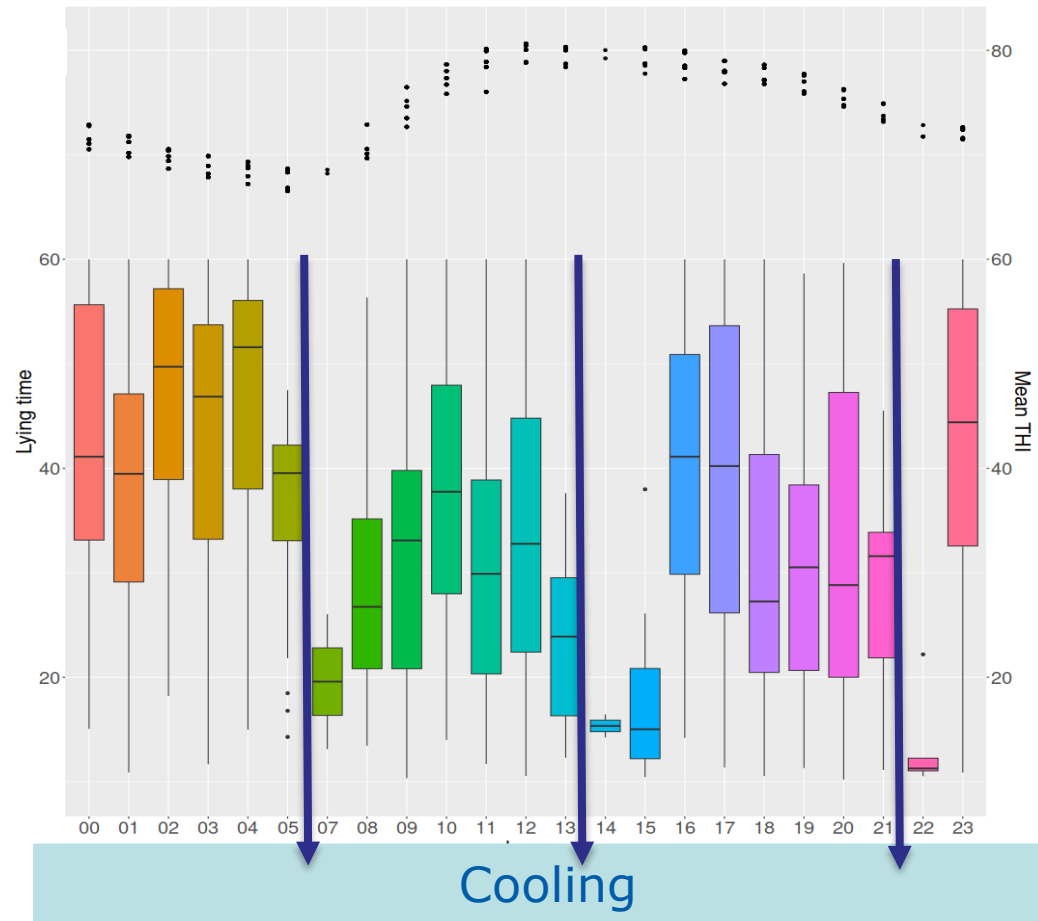
- THI increased along the day and dropped during the night.

- Mean THI: 73.79 ± 4.49
- Min THI: 58
- Max THI: 81



Results

- The cows increase the **lying time** after the cooling session $p < 0.001$



Source: Pinto/ATB

Conclusion

- Lying cows presented higher RR than standing cows
- RR of cows decreased during cooling, indicating improved cow comfort
- Cooling had a direct positive influence on the lying time of the cows
- Implementing heat relief strategies, such as evaporative cooling, reduced the pressure on lactating dairy cows under hot climate conditions



„Optimized animal specific barn climatization facing temperature rise and increased climate variability“



Bundesanstalt für
Landwirtschaft und Ernährung

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And scholarship CAPES - Brazil





spinto@atb-potsdam.de Source: Pinto

