Feeding and drinking behaviour of dairy cows at heat stress

Karatzia M.A.¹, Sossidou E.N.²

¹ Research Institute of Animal Science
HAO-DEMETER
Paralimni-Giannitsa, Greece

² Veterinary Research Institute
HAO-DEMETER
Thessaloniki, Greece

E-mail: karatzia@rias.gr
Introduction

Heat stress in dairy cattle

- Increased body temperature
- Panting
- Drooling
- Profuse sweating
- Lethargic or restlessness
- Search for shade
- Increased standing time
- Increased water intake
- Reduced dry matter/feed intake
- Reduced rumination
- Reduced milk production
- Reduced reproductive performance

- over 400€/cow/year
Introduction

Thermal Heat Index (T.H.I.)


Adapted from: http://www.bom.gov.au/
Introduction

Heat stress in dairy cattle in Greece

- Period of Heat Stress risk: April to October
- 61.8% of Greek dairy farms located in Central Macedonia (Northern Greece)
- Rural area – Rice cultivation
- By 2021: av. Max Temperature (summer) +2.5°C
  +40 “tropical nights” per year
  (nights when av. temp.>20°C)

Adapted from: National Climate Change Adaptation Strategy (NCCAS), 2015
Objective

Effects of cows’ heat stress on nutritional behavior?
Materials and methods

- Free-stall system with individual beds
- 12 healthy Holstein cows
- 24h video recording for 5 months (March to August to cover HS crucial period)
- Temperature and relative humidity recorded at 5min. intervals
- Statistical analysis: SPSS® v.21 (a=0.05)
Materials and methods

- Two experimental groups

**Controls-C**
- \( n=12 \)
- Within the thermo-neutral zone
- av. T.H.I. = 54.6

**Heat Stressed-HS**
- \( n=12 \)
- Under heat stress
- av. T.H.I. = 87.6
Materials and methods

- Two 24h recordings were evaluated
- Behavioral aspects of feeding and drinking
• Analysis for 3 time zones:
  (following feeding schedule and HS intensity)

- **M** Morning: 8.00-12.00,
- **A** Afternoon: 16.00-18.00 and
- **E** Evening: 19.00-20.30
<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Activity (minutes)</th>
<th>Group</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>M + A + E</td>
<td>Feeding</td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39.28*</td>
<td>4.955</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70.43*</td>
<td>11.993</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.63</td>
<td>4.752</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.72</td>
<td>2.477</td>
</tr>
</tbody>
</table>

In all time zones HS animals spent significantly more time eating, while their drinking behavior did not differ to the controls’
## Results

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Activity (minutes)</th>
<th>Group</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td>M</td>
<td>Feeding</td>
<td>60.62*</td>
<td>9.276</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
<td>26.57</td>
<td>12.359</td>
</tr>
</tbody>
</table>

In the Morning, HS cows spent more than twice the time eating compared to the controls, while they spent half the time drinking.
## Results

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Activity (minutes)</th>
<th>Group</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Feeding</td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.95*</td>
<td>6.093</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.78*</td>
<td>1.316</td>
</tr>
<tr>
<td>A</td>
<td>Drinking</td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.86*</td>
<td>0.596</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.76*</td>
<td>5.968</td>
</tr>
</tbody>
</table>

In the Afternoon, when HS is acute, HS cows spent **significantly** less time eating and **significantly** more time drinking.
# Results

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Activity (minutes)</th>
<th>Group</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>±SE</td>
</tr>
<tr>
<td>E</td>
<td>Feeding</td>
<td>32.33</td>
<td>5.383</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
<td>4.57</td>
<td>0.785</td>
</tr>
</tbody>
</table>

In the Evening, feeding duration was similar for both groups, with HS animals spending less time drinking water.
Conclusions

• HS cows spent significantly more time feeding in total, while their drinking activity was limited.

• HS cows compensate for low feeding activity during the day, by feeding at early morning.
Conclusions

More feeding (P≤0.05)

53.4% less drinking
Conclusions

79.15% less feeding

80.45% more drinking (P≤0.05)
Conclusions

Similar eating and drinking time (P≥0.05)
Conclusions

Nutritional behavior and welfare are affected by Heat Stress and Microclimate.

What nutritional management is suitable at farm level.
This research project was funded under the Action ‘Research & Technology Development Innovation Projects’-AgroETAK, MIS 453350, in the framework of the Operational Program ‘Human Resources Development’.

It is co-funded by the European Social Fund through the National Strategic Reference Framework (Research Funding Program 2007-2013) coordinated by the Hellenic Agricultural Organization – DEMETER (Veterinary Research Institute / Scientific supervisor: Dr. E. N. Sossidou).

Thank you for your attention!