

Livestock managers know that high temperatures affect cows but, the real impact of heat stress is not so well understood. The negative impact on reproduction, production, rumination, health and welfare is significant and mitigation management is key to reducing these impacts. SenseHub™ cow monitoring solutions play an important role in helping to identify those animals affected by heat stress and in turn help you to make informed management decisions.

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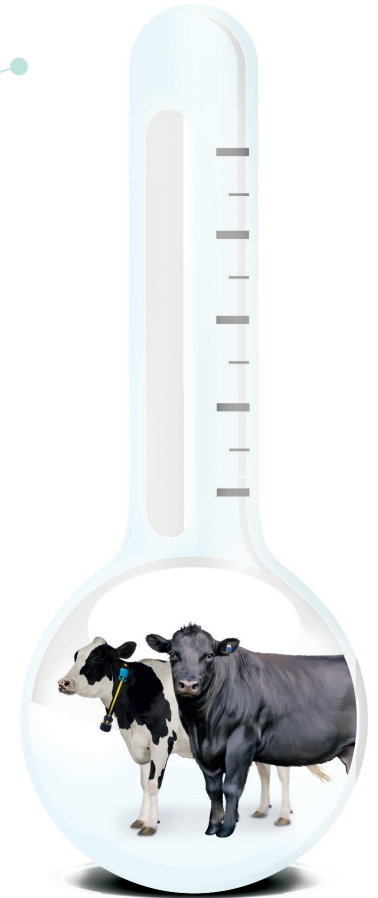
An **Antelliq** company



Managing Heat Stress in Dairy & Beef Cattle

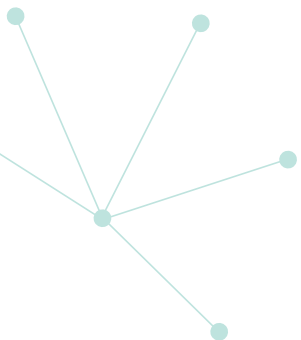


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What is *heat stress*?



The sum of external forces acting on an animal that causes an increase in body temperature and evokes a physiological response.

(Dikmen and Hansen 2009)

Exposure to uncomfortable thermal conditions (due to the combination of high temperature and humidity) overcomes the capacity of cattle to dissipate heat and leads to an increase in body temperature that exceeds the physiological limits.

(Ronchi et al., 1997)

Heat stress impairs the welfare and productive performance of **DAIRY** and **BEEF** cattle.

(Andrea Summer et al., 2018)



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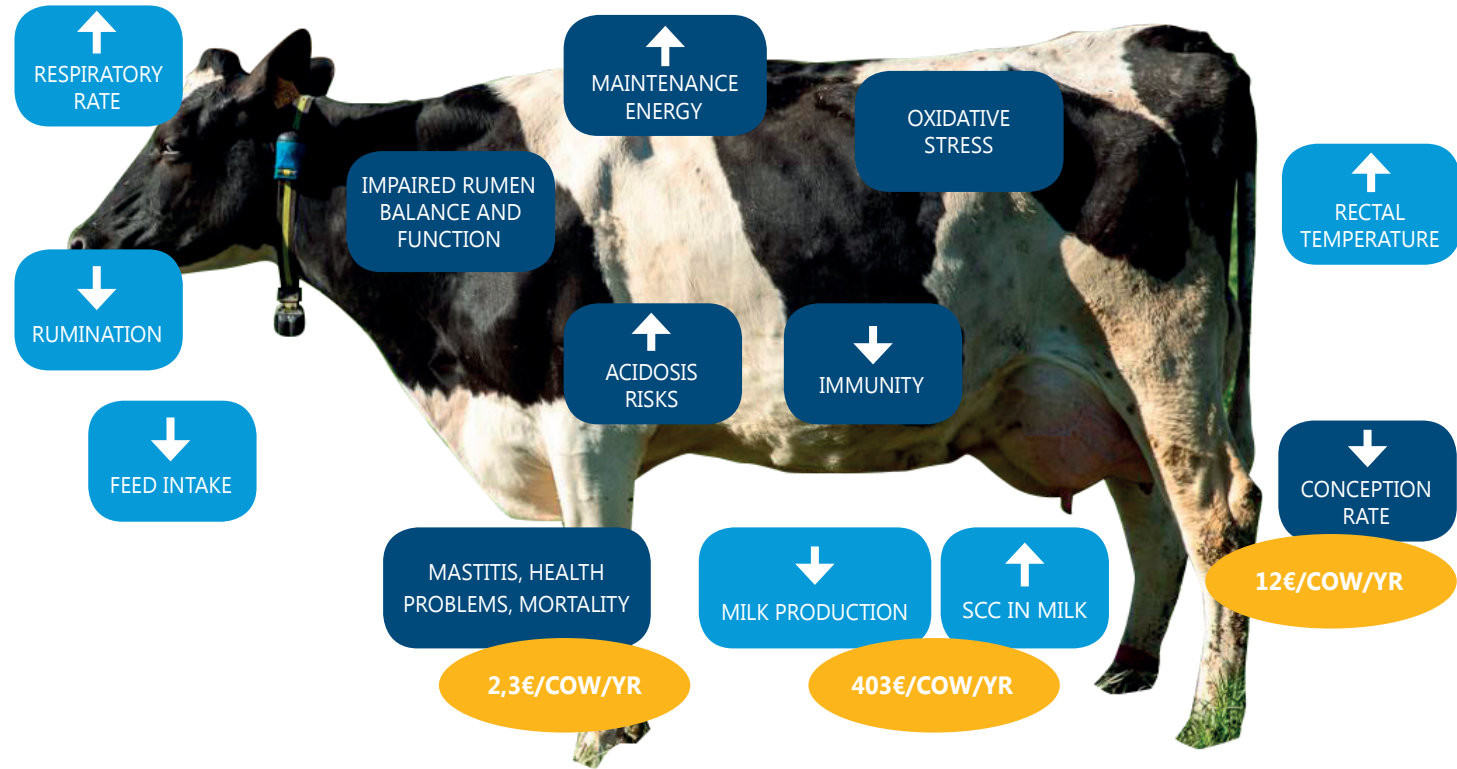
What is the *impact* of *heat stress*?



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- Visible signs of heat stress
- Invisible consequences of heat stress
- Estimated costs under severe heat stress

Environment: **THI > 68** THI = Temperature Humidity Index



Thatcher WW et. al, 2010

How heat stress impacts **reproductive** performance, resulting in huge **economic** loss





MALE

- Disturbed Testicular Thermo Regulatory Mechanism
- Increased Testicular Temperature
- Impaired Spermatogenic Cycle
- Decreased Semen Volume & Sperm Concentration
- Increased Sperm Abnormality & Cytoplasmic Droplet
- Decreased Sperm Mobility
- Increased Dysfunction of Sperm Membrane & Mitochondria
- Poor Semen Quality & Decreased Fertility



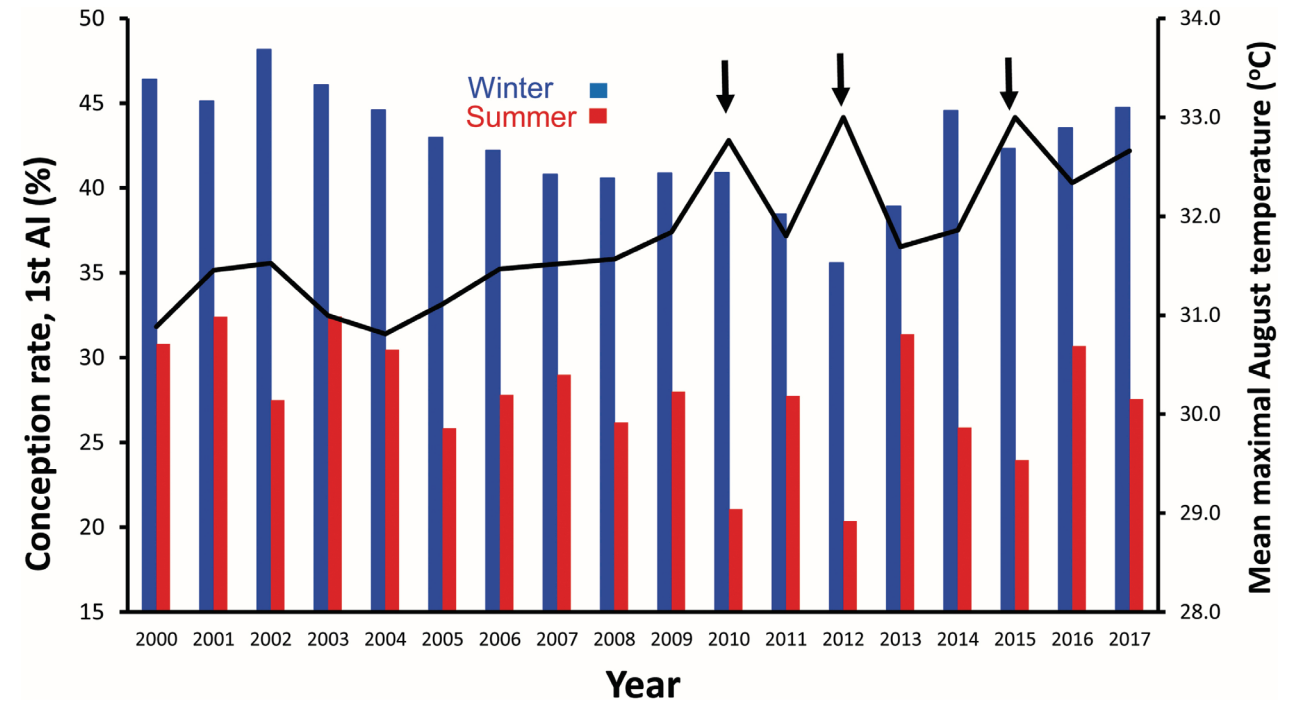
FEMALE

- Compromised Physiological Function of the Reproductive Tract
- Disturbances in Hormonal Balance
- Decreased Estrus Intensity & Sexual Behaviour
- Decreased Follicular Development & Growth
- Poor Quality Oocyte
- Decreased Fertility & Conception
- Decreased Embryo Development
- Decreased Embryo Survival
- Infertility & Increased Days Open

HUGE ECONOMIC LOSS

Govindan Krishnan, Madijagan Bagath, Prathap Pragna, Mallenahally Kusha Vidya, Joy Aleena, Payyanakkal Ravindranathan Archana, Veerasamy Sejian and Raghavendra Bhatta (September 6th 2017). Mitigation of the Heat Stress Impact in Livestock Reproduction, Theriogenology, Rita Payan Carreira, IntechOpen,

1st AI Conception Rate

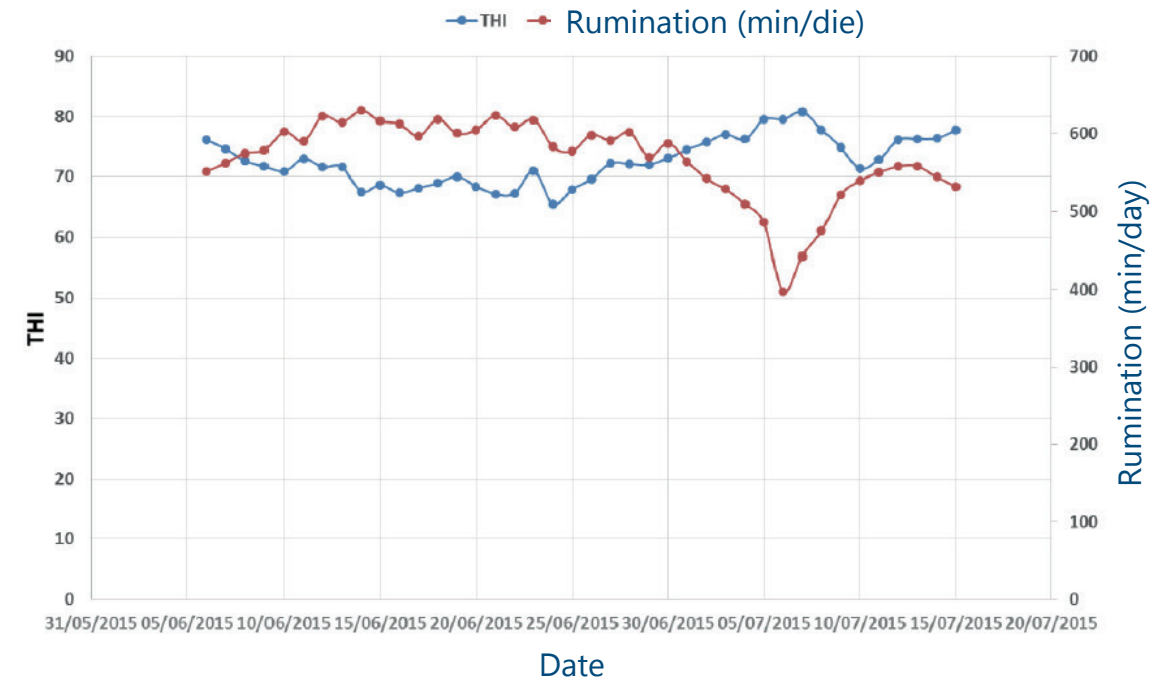


Adapted from Y. Lavon and E. Ezra, Israel Herd Book

Heat stress can impact ***rumination***, ***feed intake*** and ***milk production***



Rumination and THI

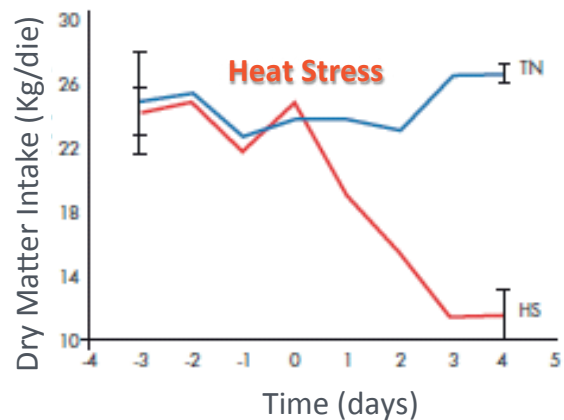


Abeni Fabio, Galli Andrea Monitoring cow activity and rumination time for an early detection of heat stress in dairy cow. *Int J Biometeorol.* 2017 Mar;61(3) 417-425. doi:10.1007/s00484-016-1222-z. PMID: 27498881.

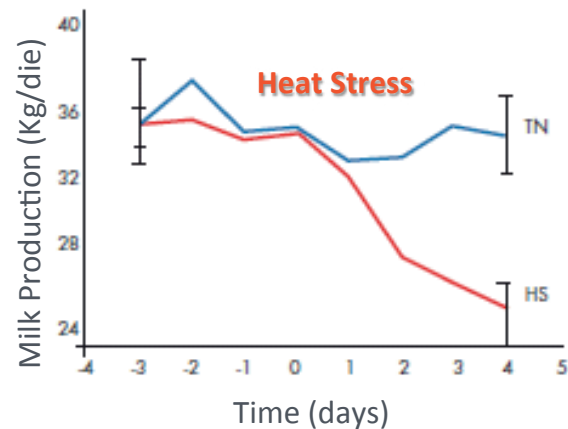
Reduced intake and milk production



Dry Matter Intake (DMI Kg/day)

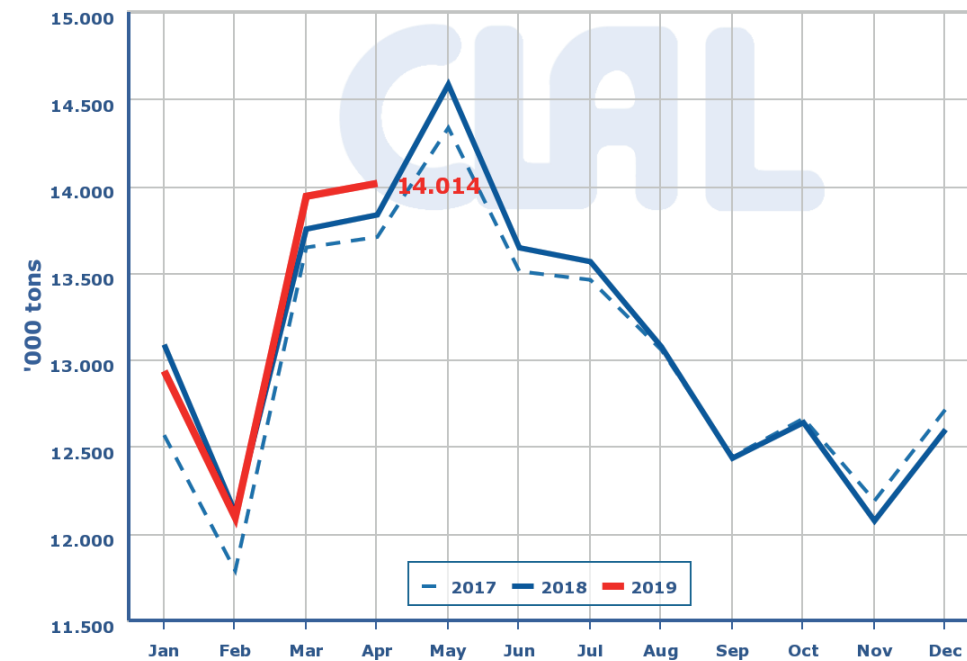


Milk Yield (Kg/day)



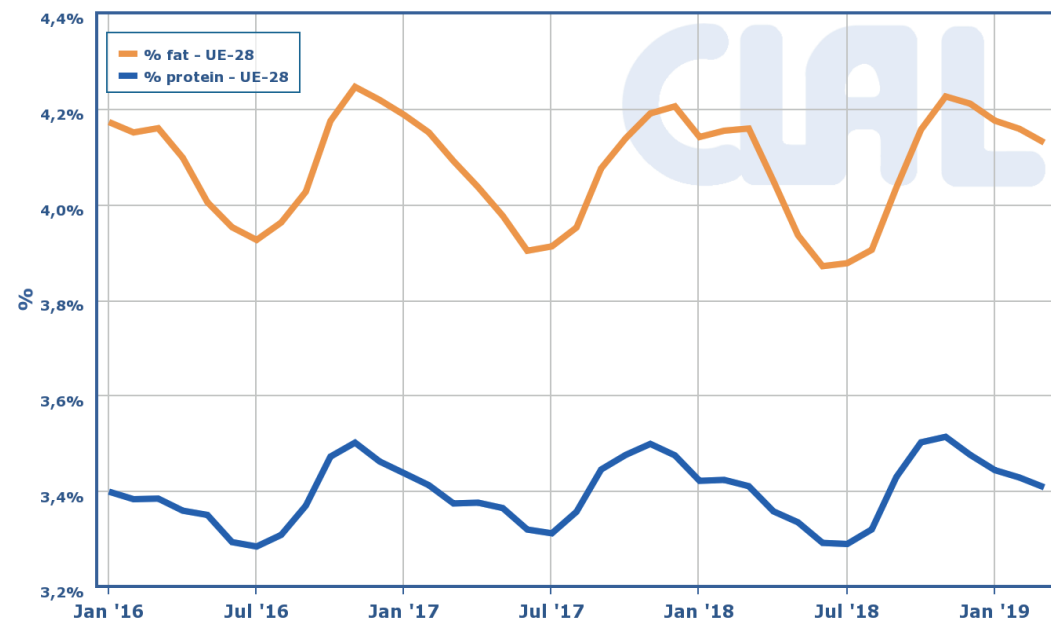
SOURCE: SPIERS ET AL., 2004

EU-28: Cow's milk deliveries monthly



Source: Processed by CLAL based on Eurostat, FEAGA, DEFRA, AGEA, CLAL data

UE-28: Average milk quality (fat and protein %)



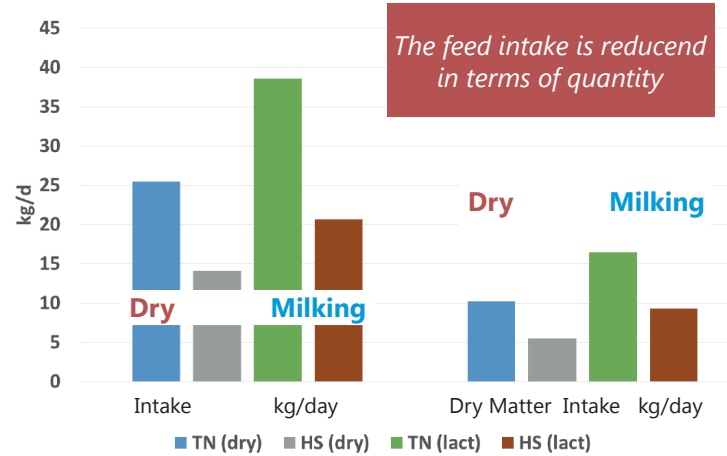
Source: Processed by CLAL based on Eurostat data

Heat stress can have an impact on ***dry cows***

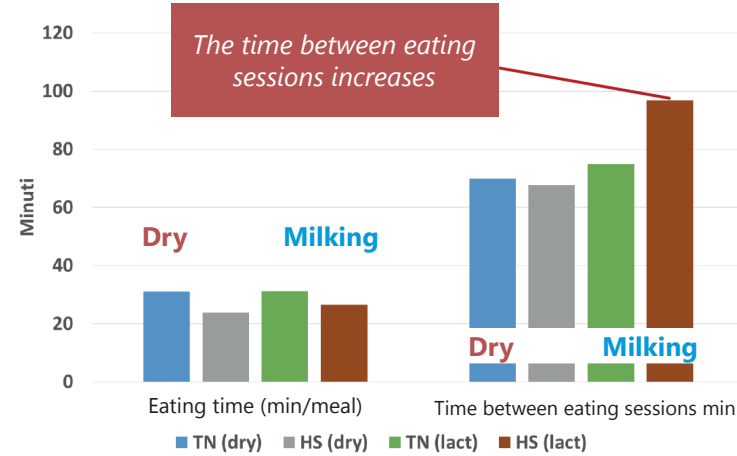


Dry Cows

Dry Matter Intake



Eating Sessions



Eslamizad M, Lamp O, Derno M, Kuhla B (2015) The control of short-term feed intake by metabolic oxidation in late-pregnant and early lactating dairy cows exposed to high ambient temperatures. *Physiol Behav* 145:64–70. doi: 10.1016/j.physbeh.2015.03.044CrossRefGoogle Scholar

Dry Cows

Under commercial settings, cows **dried off** during hot months have a

- Significant increase in times bred,
- DIM to first breeding and
- DIM to pregnancy diagnosis in the first 150 DIM of the subsequent lactation.



Heat stress can have an impact on **calves**



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Calves

Calves attempt to maintain a constant body temperature regardless the outside temperature.

The boundaries of their thermoneutral zone are affected greatly by the effective ambient temperature, which depends on:

- air movement
- moisture
- hair coat
- sunlight
- bedding
- rumination

Heat stress in calves will **increase dehydration**, **reduce feed intake** and **lower the immune system**.

Heat Stress in Dairy Calves; Coleen Jones and Jud Heinrichs, Penn State

The nutrients consumed during this time will go more toward trying to drive off heat rather than using the nutrients to grow.

Short term: this could have effects on average daily gain, disease incidence, and morbidity.

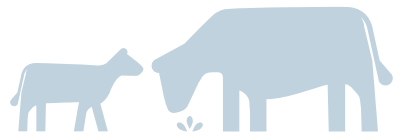
Long term: this could have effects on breeding size and age at first calving or possibly even death.

Important visible signs of heat stress include:

- **Reduced movement**
- **Faster breathing rate**
- **Open-mouthed panting**
- **Decreased feed intake**
- **Increased water consumption**

Baby calves and heat stress; Jennifer Bentley, Dairy Specialist, Iowa State University Extension And Outreach

Heat stress in *beef cows*



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Heat Stress in Beef Cows



Heat stress in beef cattle is usually considered **less severe** than in dairy cattle because beef cattle have a **higher average temperature-humidity index threshold** due to their lower metabolic rate and lower body heat production.

(St. Pierre et al, 2003; - Nardone et al, 2010)

Effects of imposed heat stress on reproduction in beef cows

Treatment Group	Control	Moderate Stress	Severe Stress
Daytime Temp (C°)	71	97	98
Night time Temp (C°)	71	91	91
Relative Humidity %	25	27	40
Rectal Temp (C°)	102.0	102.7	103.6
Pregnancy %	83	64	50
Conceptus Weight (g)	0.158	0.111	0.073

(Biggers 1986; OSU)

- Impairs reproductive performance of nursing cows
- Impairs growth rates
- Impairs carcass weight
- Impairs fat thickness
- Impairs meat quality in terms of pH, tenderness and colour

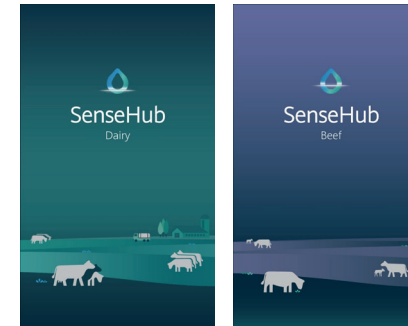
(Mitlöhner et al. 2001; Nardone et al., 2010; Marchesni et al., 2018)

Management of heat stress using the Allflex SenseHub™ cow monitoring solutions



Allflex Monitoring Solutions including Heat Stress Monitoring

SenseHub™



Heatime® Pro+



DataFlowII+



SenseHub™ Group Monitoring

Premium Reproduction + Health + Group



Group Monitoring



Reproduction



Health



Group routine



Consistency



Heat Stress

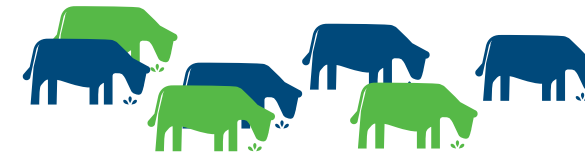
SenseHub™ Group Monitoring

SenseHub Dairy Group Applications provide immediate visibility of key indicators at the group level, with the ability to drill-down and investigate as needed.

There are two types of group graphs

Group Routine

- It measures the current Group behaviour compared with historic behaviour. This helps to underscore exceptional behaviours.
- A group is considered a minimum of 10 animals with assigned tags.

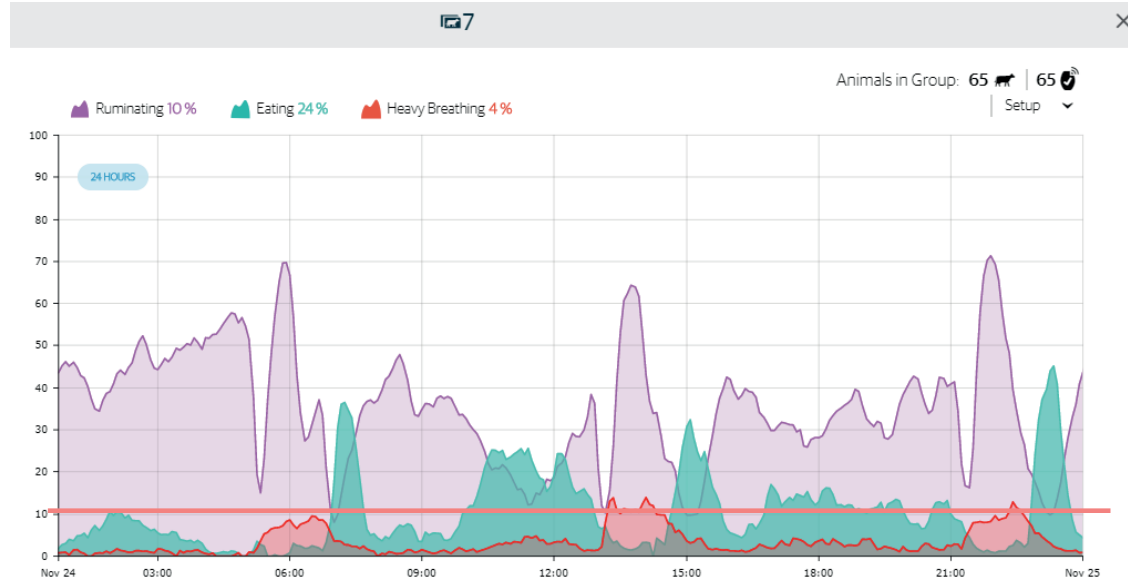


Group Trend

- It displays unusual group behaviour over time
- A group is considered a minimum of 10 animals with assigned tags.



Group Routine - Heat Stress

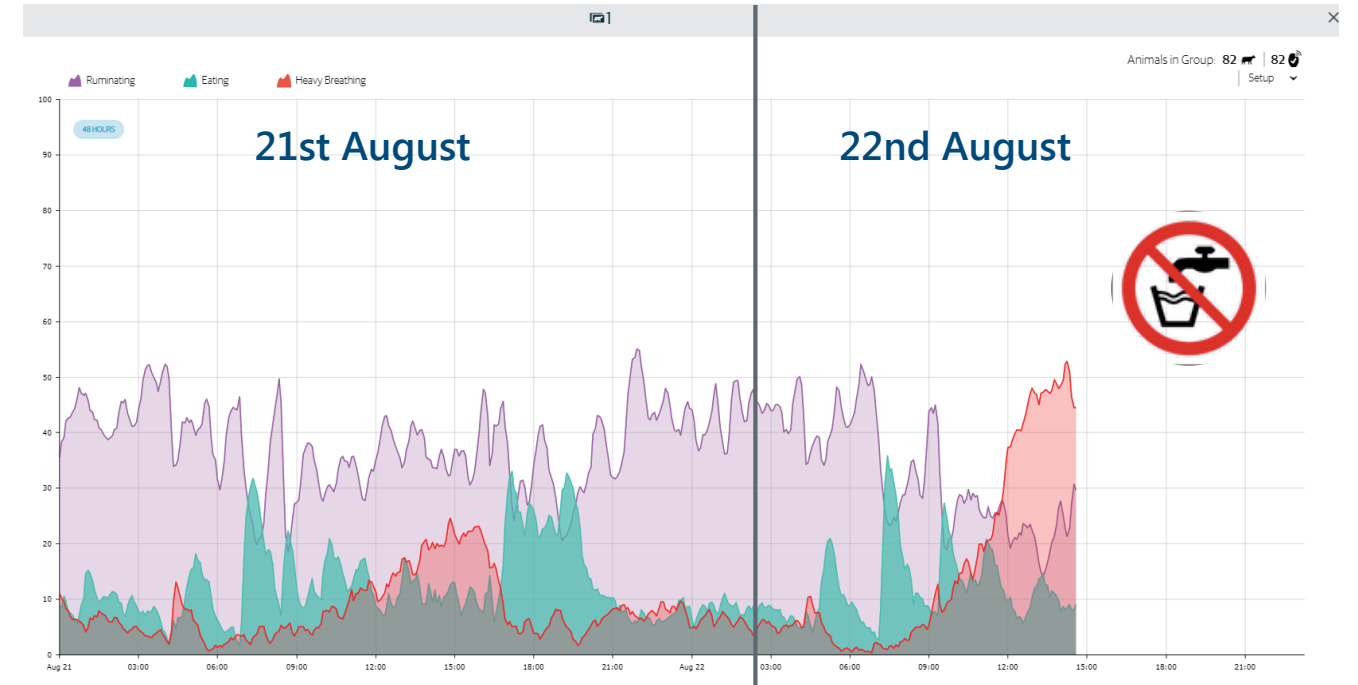


Panting Series
 The percentage of cows that are breathing heavily.

Eating Series
 The percentage of cows that are eating/seeking food in feed bunker.

Rumination Series
 The percentage of cows that are ruminating.

Group Routine Heat Stress - Farm Case

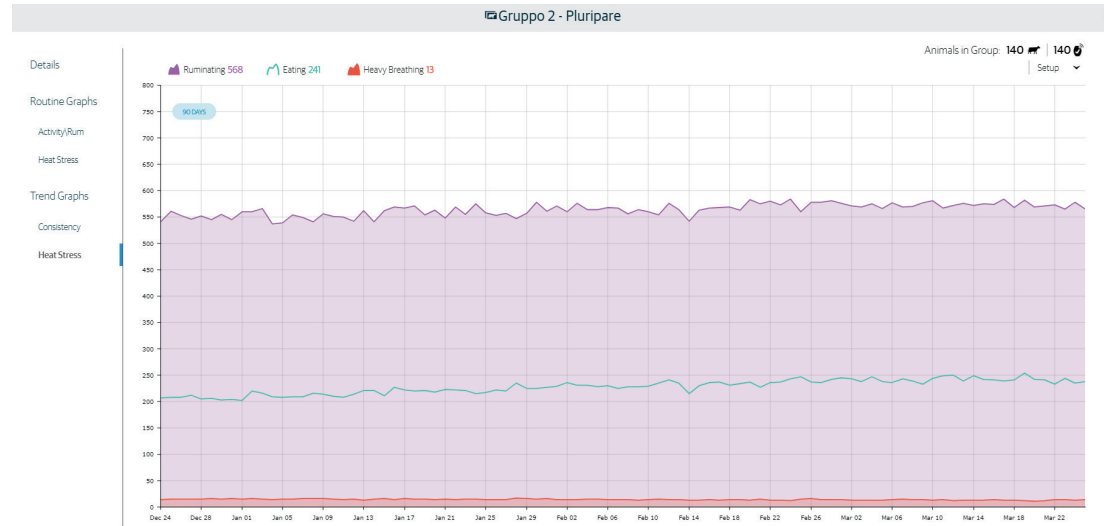


Group Trend Graphs - Heat Stress

Rumination Series
The daily avg. (min) that the cows are ruminating

Eating Series
The daily avg. (min) that the cows are eating/seeking for food in feed bunker

Panting Series
The daily avg. (min) that the cows are breathing heavily



Group Trend Graph Heat Stress - Farm Case

