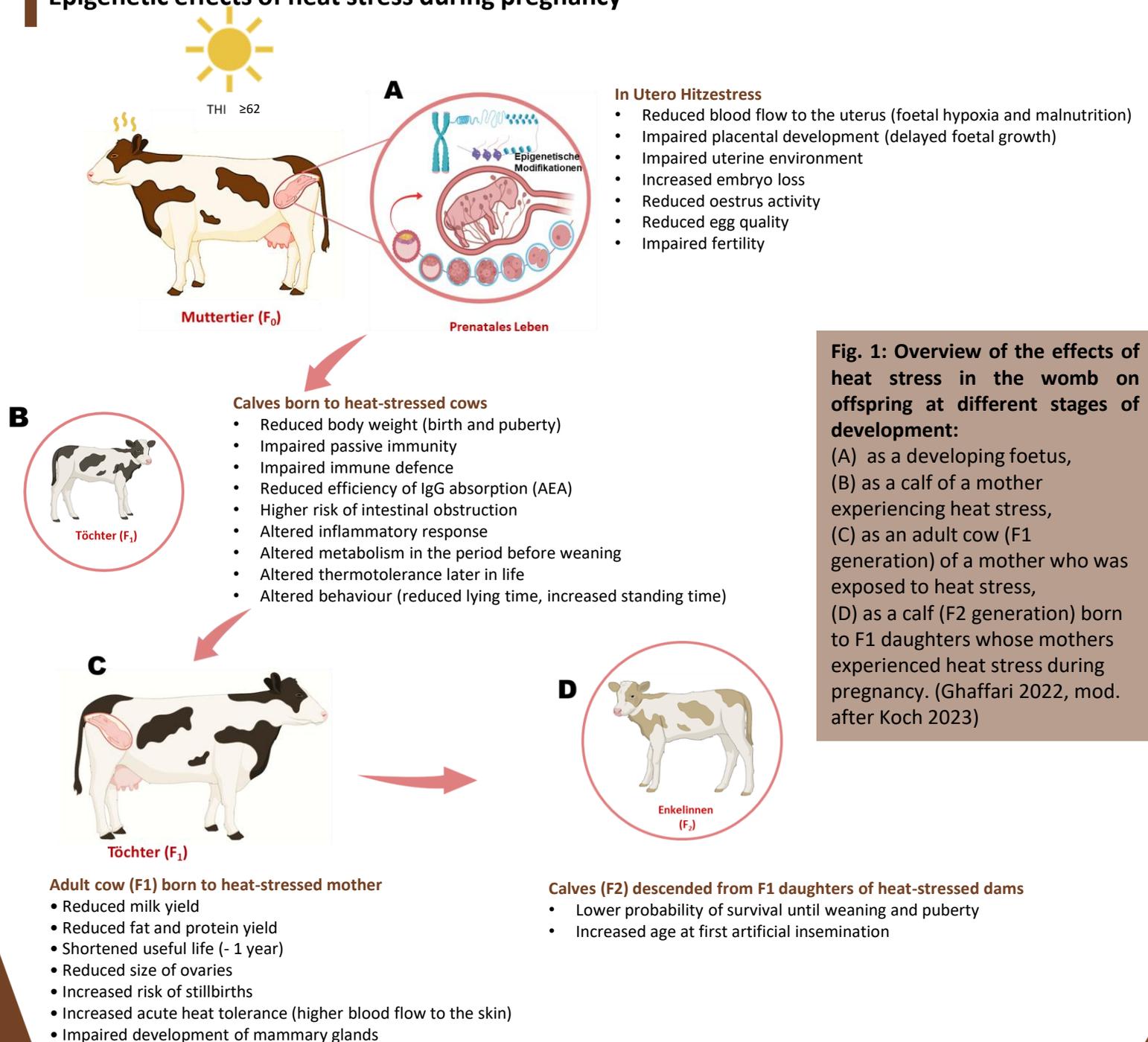


# Recognising and preventing heat stress

## Protecting calves and young cattle

Calves, like adult cattle, suffer from high temperatures, especially when combined with high humidity. Long-term heat stress can have a significant impact on the health, growth and future productivity of animals. This document highlights the consequences of heat stress in calves and offers strategies for mitigating these effects.

### Epigenetic effects of heat stress during pregnancy



**Fig. 1: Overview of the effects of heat stress in the womb on offspring at different stages of development:**  
(A) as a developing foetus,  
(B) as a calf of a mother experiencing heat stress,  
(C) as an adult cow (F<sub>1</sub> generation) of a mother who was exposed to heat stress,  
(D) as a calf (F<sub>2</sub> generation) born to F<sub>1</sub> daughters whose mothers experienced heat stress during pregnancy. (Ghaffari 2022, mod. after Koch 2023)

## Recognising symptoms and assessing conditions

### Symptoms and effects of heat stress in calves

While the negative consequences of heat stress on the productivity, health and reproduction of lactating and dry dairy cows are described in detail in the literature (Bernabucci et al., 2010; Tao and Dahl, 2013), there is less information available on the effects on calves. Calves suffering from heat stress show increased respiratory rate, increased heart rate and increased abdominal breathing. These physiological responses are attempts by the body to lower body temperature. In addition, reduced activity and decreased feed intake can be observed. One consequence of this is lower weight gain.

TH-Index nach Zimbelmann und Collier 2009	Luftfeuchtigkeit [rel %]																
	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
16	60	60	60	60	60	60	60	60	60	60	60	60	60	61	61	61	61
17	61	61	61	61	61	61	61	61	61	62	62	62	62	62	62	62	63
18	62	62	62	62	62	62	62	63	63	63	63	64	64	64	64	64	64
19	63	63	63	63	63	64	64	64	64	65	65	65	65	66	66	66	66
20	64	64	64	64	65	65	65	65	66	66	66	67	67	67	67	68	68
21	65	65	65	66	66	66	67	67	67	67	68	68	68	69	69	69	70
22	66	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71	72
23	67	67	67	68	68	69	69	70	70	70	71	71	72	72	73	73	73
24	68	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75
25	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76	77
26	70	70	71	71	72	72	73	74	74	75	75	76	76	77	78	78	79
27	71	71	72	72	73	74	74	75	76	76	77	77	78	79	79	80	81
28	72	72	73	74	74	75	76	76	77	78	78	79	80	80	81	82	82
29	73	73	74	75	75	76	77	78	78	79	80	81	81	82	83	83	84
30	74	74	75	76	77	77	78	79	80	81	81	82	83	84	84	85	86
31	75	75	76	77	78	79	80	80	81	82	83	84	84	85	86	87	88
32	76	76	77	78	79	80	81	82	83	83	84	85	86	87	88	89	90
33	77	77	78	79	80	81	82	83	84	85	86	87	88	89	90	90	91
34	78	79	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
35	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
36	80	81	82	83	84	85	86	87	88	89	90	91	92	94	95	96	97
37	81	82	83	84	85	86	87	88	90	91	92	93	94	95	96	97	99
38	82	83	84	85	86	87	89	90	91	92	93	95	96	97	98	99	100

■ kein Hitzestress  
 ■ milder Hitzestress  
 ■ mäßiger Hitzestress  
 ■ starker Hitzestress  
 ■ Gefahr

Fig. 2 Temperature and humidity index for lactating dairy cattle (modified according to Zimbelmann & Collier, 2009)

### Thermometer at a glance – interaction between temperature and humidity

The THI (Temperature Humidity Index) is often used to quickly and easily determine heat stress. The THI is used to assess the thermal discomfort of cows. It takes into account not only the temperature, but also the relative humidity, which intensifies the effect of heat. Compared to dairy cows, calves are somewhat more resistant to stress when it comes to high temperatures, but they are less able to regulate their body temperature. Estimates for the thermoneutral zone of calves vary, but the upper critical temperatures of the thermoneutral zone of calves described in the literature range between 26 and 32°C (Neuwirth et al., 1979; Spain and Spiers, 1996), and the physiological range of body temperature for calves is between 38.1 and 39.2°C with daily fluctuations (Moran, 2002; Piccione et al., 2003). In practice, calves should therefore be monitored more closely at a THI value of 65 to 69 in order to minimise the risk of heat stress-related impairments (Dado-Senn et al., 2022).

### Effects of heat stress on calves

- Not only does feed efficiency decrease significantly, but eating behaviour also changes. Heat-stressed calves tend to eat less, especially during the hottest times of the day.
- Studies have shown that calves exposed to heat stress often gain less weight compared to calves kept under optimal conditions or born during the winter months (Hill et al., 2011; López et al., 2018).
- Studies suggest that the development of the mammary glands in calves exposed to heat stress may be impaired. This leads to lower milk production in the adult animals.
- Muscle development may also be impaired. Reduced muscle mass leads to lower slaughter yield and can negatively affect meat quality.
- The reproductive system is affected, which can lead to delayed puberty and reduced fertility in adult animals.
- The body's ability to produce immune cells and fight off infections is impaired by high stress levels, making calves more susceptible to infections and chronic diseases.
- Extreme heat stress can put calves' lives at risk!

### Evaluation of calf data in the ResKuh project

Investigation into whether the time of birth and, in particular, heat stress have an impact on the animals' later productivity.

#### Data:

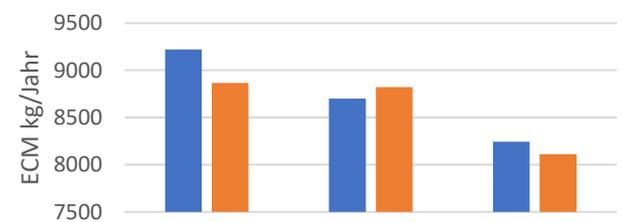
- MLP data from 2012 to 2024 (140,000 animals)
- Farms from the ResKuh project region
- Classification of animals according to whether they were born in summer (under heat stress) or winter (no heat stress suspected).
- Classification according to calving age

#### Conclusion:

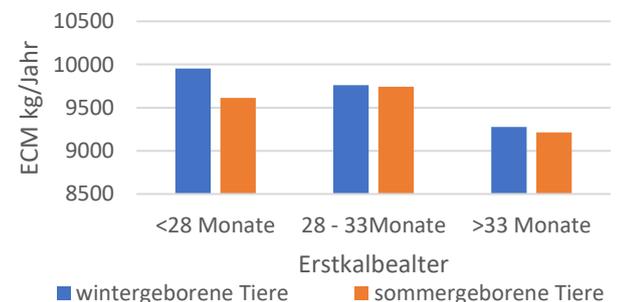
Tendency for heifers born in summer to achieve a lower average annual yield (-340 kg ECM in France; -357 kg ECM in Germany) in their first lactation under 28 months of age.

The results clearly show that heat stress not only has negative consequences for lactating animals. Animals that have been dried off should also be protected against heat stress!

#### Baden-Württemberg



#### Alsace



Figures 3 and 4: Milk loss in first lactation (energy-corrected milk (ECM)) in kg/year in Alsace and BW depending on whether the animals were born in summer or winter.

### Preventive measures

Comprehensive management strategies are required to effectively manage heat stress in calves. These measures aim to minimise the negative effects of high temperatures and ensure the health and well-being of the animals:

- ✓ Prevent heat stress in pregnant cows, as this stress is also transferred to the calf -> Keep the dry cow area and calving box as cool as possible.
- ✓ Minimise direct sunlight by placing igloos, including outdoor areas, in the shade or covering them. If it is not possible to shade the igloos, cover sheets can at least provide a slight improvement (see Fig. 5).

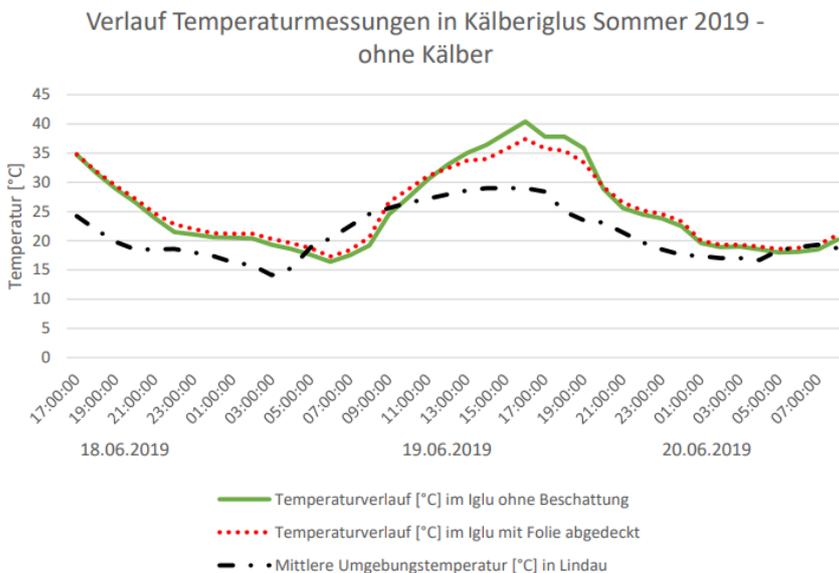


Fig. 5: Temperature curve in igloos with cover foil and without shading. (from KGD-SSV 05/20)



Fig. 6: In summer, temperatures in calf igloos can become dangerously high.

- ✓ Be careful with sprinkler systems, which often increase humidity!
- ✓ Let air into the igloos: Open all openings of the calf igloos. You can also place the igloos on bricks or similar objects, for example, so that cool air can enter from below.
- ✓ Sprinkle with sand: If possible, sprinkle sand on the igloos. Sand quickly dissipates body heat. In addition, dry, clean sand attracts fewer flies than wood shavings or straw.
- ✓ Free access to the outdoors: Calves should always have free access to the outdoors. This allows them to choose their own climate zones.
- ✓ Installation of additional fans. The air velocity should not exceed 2.5 m/sec, or 0.4-0.8 m/sec for small calves, in order to prevent respiratory diseases.
- ✓ Fly control: Control flies in the calf area so that your calves are not subjected to additional stress. In addition to fly control, you can also protect drinking buckets from flies, e.g. with lids or hair nets.

### feeding measures

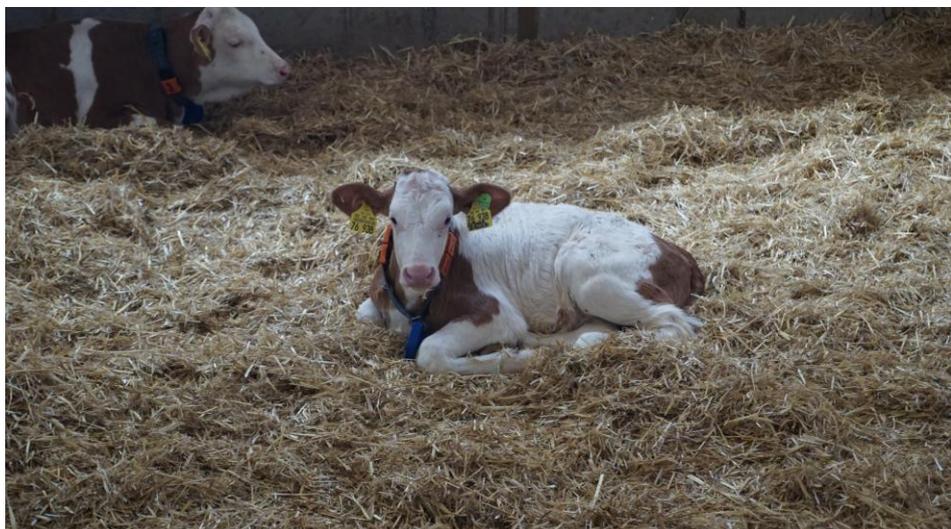
- ✓ Important! You should never run out of fresh water!
- ✓ In warm temperatures, calves prefer liquid feed. To counteract lower feed intake and poorer feed efficiency, milk replacers should be used in higher concentrations or larger quantities during the summer months. 1.68 kg milk replacer per day, 140 g/l (according to the Hofgut Neumühle feeding plan).
- ✓ Increased sweating causes calves to lose minerals and buffer substances, among other things. Additional electrolyte drinks can be offered.
- ✓ Shifting feeding times to the cooler morning or evening hours has additional positive effects.
- ✓ Adjust the ration: Light carbohydrates produce less body heat. Therefore, on hot days, feed hay or grass silage rather than straw.

### Breeding possibilities

The breeding approaches will be compiled in a separate information sheet, which can be downloaded from the project website once it has been completed.

Further information on this topic:

- [Kaelberiglus beschatten\\_D.pdf](#)
- <https://www.fokus-tierwohl.de/de/rind/fachinformationen-mutterkuhhaltung/umgang-mit-hitze-stress-bei-mutterkuhen/haltung-und-anpassung>
- <https://www.nutztierhaltung.de/rind/milch/tiergesundheit-monitoring/hitze-stress-bei-kaelbern/>



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## Protect calves and young cattle



### Literature

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- Schweingruber K., 2020 aus Schweizer Kälbergesundheitsdienst KGD-SSV 05/2020: : [Kaelberiglus beschatten D.pdf](#)