# Animal-specific Heat Stress in Dairy Cattle - Abstract

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**Summary**

Due to climate change, the associated increase in temperatures and simultaneously high milk yields, dairy cows are increasingly exposed to heat-related stress situations. High metabolic performance of high-performance animals additionally shifts their thermoneutral zone to lower temperatures. Often only climatic parameters such as the temperature-humidity index are used to assess the heat stress in dairy cattle.

Different studies additionally use animal-specific parameters for an earlier detection of heat stress. Geischeder, 2017 identified the physiological parameters respiratory rate and body temperature as suitable indicators for individual animal heat load. In another study, the behavioural parameters rumination and locomotor activity showed a correlation with heat load (Heinicke et al. 2020).

For the detection of heat stress in dairy cattle, animal-specific parameters recorded via sensor systems (automatic milking system, weighing troughs, pedometers and boli) on one experimental farm will be used in the first step to identify suitable behavioural and physiological parameters. The respiratory rate, which is recorded by visual animal observation of focus animals, serves as a reference value. For the prediction model, data from different sources were combined. The identification data of 12 focus animals (age, lactation status, lactation number, breed) were combined with data from pedometers (ENGS Dairy Solutions), that are used to record locomotor activity, lying and feeding behavior. The rumen boli (SmaxTec) continuously record locomotor activity, rumination activity, body temperature, and drinking cycles. Likewise, the barn climate and environmental data were recorded by a weather station. Furthermore, animal-specific feed intake can be recorded at this experimental farm via weighing troughs.

Visual recording of respiration rate was performed on 3 days each in July and September 2021. Breathing rate was counted once per hour for 15 seconds in all focal animals, using lateral flank movement. These data are then extrapolated to 1 minute. This results in one value per hour per focal animal. A further data collection will take place in 2022, starting in June 2022 until the end of August 2022. All recorded parameters will be compiled in a database to form a complete data set and analysed with the statistics program Rstudio to find relevant parameters that individually change during heat stress. First results are expected in summer 2022. In addition, the data collected by the various sensor systems will be used to create prediction models for recognizing individual animal heat load. These models will essentially incorporate behavioral, physiological and environmental data.

**Keywords**

Animal-specific sensor, heat stress, dairy cattle

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