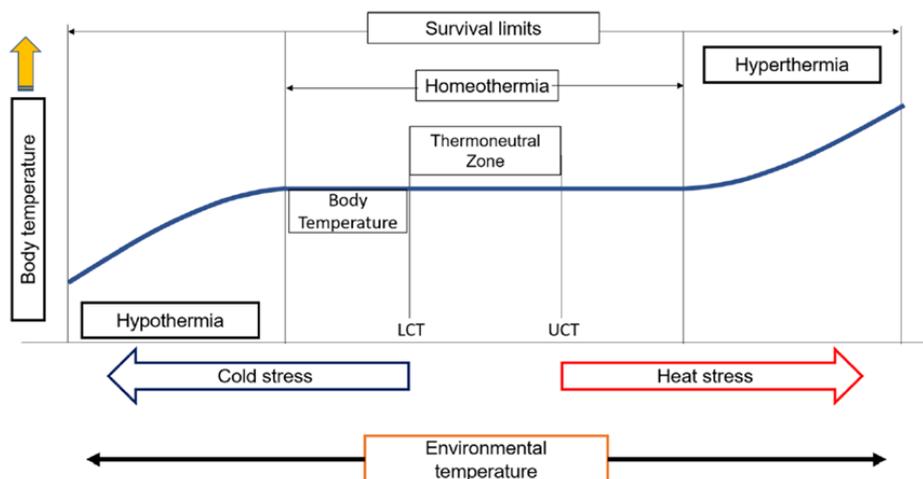


Thermoneutrality in dairy cattle and its effect on productivity

The barn climate is a vital determinant of animal welfare and productivity. Ideally, the barn is climatized such that the heat produced during metabolism can be fully dissipated by the animal. When thermal balance is disturbed, e.g. by high ambient temperature or still air, certain physiological responses (e.g. panting, sweating) are triggered to adjust heat dissipation and/or production and restore the balance. Nevertheless, there is a limit to the efficacy of such responses, beyond which thermal stress occurs, leading to productivity loss and, in extreme cases, mortality. Dairy cattle are generally resistant to cold stress, but susceptible to heat stress, reportedly even at temperatures as low as 20°C. Heat stress is a significant challenge to sustainable dairy farming in the 21st century, especially in light of climate change and with continual genetic selection for higher productivity. Accurate criteria for when heat relief is needed remain the subject of ongoing scientific debate. In addition, while both practice and research have historically focused on the effects of temperature and humidity, there is growing awareness of the importance of air speed, with crucial implications for ventilation in dairy barns.

In this context, RES4LIVE seeks to adapt and implement technologies that, while reducing reliance on fossil



Thermal zones of homeotherms, including cattle (dos Santos et al. 2021, Environ Sci Pollut Res. 28)

with mechanical cooling of intake air in preventing and alleviating heat stress will be examined.

fuels, ensure effective prediction, prevention and mitigation of heat stress in dairy cattle as well. Data from pilot farms will be used to identify conditions of potential heat stress in various stages of growth and production. A smart control system will then use these models for proactive control of the barn climate. The effectiveness of tube ventilation augmented