Thermoregulatory ability of beef heifers following intake of endophyte-infected tall fescue during controlled heat challenge

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Consumption of endophyte-infected tall fescue during summer months can result in severe hyperthermia in cattle. Six heifers (296+/-8.3 kg BW) were used to determine changes in body temperature control that occur with consumption of an endophyte-infected tall fescue diet during controlled heat challenge. All animals were exposed in five separate periods to a step increase in ambient temperature (Ta) from 21 to 31 degrees C while fed E+ (5 microg ergovaline x kg(-1) x d(-1)) or endophyte-free (E-) diets. Core body temperature (Tcore) was monitored continuously using implanted, telemetric temperature transmitters. Heat production and heat loss were also measured at selected times to identify primary effects of E+ on thermal balance. Pretreatment Tcore exhibited a diurnal rhythm at a constant Ta of 21 degrees C, with high and low values at 2300 and 1300, respectively. An increase in daily averaged Tcore ($P < 0.001$) occurred with an increase in Ta from 21 to 31 degrees C. Likewise, all phases of the daily cycle increased equally during this challenge. This increase at 31 degrees C was associated with higher levels of respiration rate, skin temperature, respiratory vaporization, and skin vaporization ($P < 0.05$) and lower blood levels of thyroxine ($P < 0.05$). Intake of the E+ diet further elevated Tcore in heifers during the short-term heat challenge (2 d), and the effect was most pronounced at 0000 to 0300 and declined thereafter. The increase in Tcore during E+ treatment was associated with an increase in respiration rate ($P < 0.05$), whereas metabolic heat production, skin temperature, skin vaporization and respiratory vaporization were unaffected. These results show that consumption of an E+ diet during continuous heat challenge results in a marked increase in core body temperature, especially during nighttime exposure to heat stress, due primarily to a reduction in cutaneous heat transfer, with no effect on heat production or other measured avenues of heat loss.