The acclimatisation process in dairy cows with different milk yield potential - searching for reliable biomarkers

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In dairy cattle, heat thermal stress is a major concern environmental stress that limits animal growth, metabolism, and productivity. Facing global warming tendency, the current increased environmental temperatures, the joint selection for productivity and adaptability should be an objective for dairy farms. This study aimed to evaluate the acclimatisation process of cows with different milk yield potential during summer and winter periods. 13 Holstein-Friesian cows were chosen from a dairy farm located in Alentejo, Portugal, 7 of those with high milk yield potential (HMP) and 6 with low milk yield potential (LMP). All cows were evaluated during summer and winter periods in respiratory frequency (RF), sweating rate (SR) and rectal temperature (RT) as well as milk, blood and saliva parameters. RF, SR and RT values were significantly higher in summer (64.13±12.78 mov./min., 76,89±46.77 g/m^2/h and 38.82±0.68 °C) than in winter (36.13±7.67 mov./min., 24.69±7.30 g/m^2/h and 38.06±0.52 °C), without differences between the two groups (HMP and LMP). Haematocrit and triiodothyronine levels were significantly lower in summer (23.80±9.39 % and 142.00±13.77 ng/dL) than in winter (30.70±5.00 % and 170.69±17.78 ng/dL) for both groups. However, in summer, HMP cows presented triiodothyronine blood concentrations (133.33±8.14 ng/dL) significantly lower than the LMP (152.40±11.97 ng/dL). Concerning salivary parameters, only HMP cows showed higher HSP70 concentrations during summer, without major changes in cortisol. Regarding milk analysis, urea levels were the only milk compound significantly different between groups ($P<0.05$): during summer the HMP group (293.62±35.97 mg/kg) had milk urea levels higher than LMP (253.69±33.81 mg/kg). These results showed that although HMP cows did not differed significantly in the first responses to heat (RF, SR and RT) from LMP cows, with the acclimatisation process, they showed higher physiological modifications, decreasing the metabolism, increasing HSP expression and changing milk composition. These results seem to indicate the potential use of HSP70 in saliva and urea in milk as potential biomarkers of heat stress.

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