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Lymphocyte and monocyte Hsp72 responses to exercise in athletes with prior exertional heat illness

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ABSTRACT

Introduction. Exertional heatstroke is a serious disorder that can be fatal especially if treatment is delayed. Heat shock protein 72 (Hsp72) is strongly induced by heat, and can be protective against a subsequent stress that may be the same or of a different form. In animal models it has been shown that upregulation of Hsp72 is protective against heatstroke. There is a natural variability in the amount and/or inducibility of Hsp72 in cells and tissues between individuals, and it is possible that impaired expression levels could make some athletes more prone to heat illness. The purpose of this study was to examine Hsp72 expression in lymphocytes and monocytes of young (<40 years) athletes who had previously experienced, but recovered from serious heatstroke during exercise in the heat.

Methods. Fourteen athletes ran on a treadmill for 60 min at 72% maximal oxygen uptake ($\dot{V}O_{2max}$) in warm conditions (30°C, 40% relative humidity). One group consisted of athletes who had a previous history of exertional heat illness (EHI), while the control group (CON) had no previous history of EHI. Both groups were of similar age (29.7 ± 1.2 and 29.1 ± 2 years, CON vs EHI) and fitness ($\dot{V}O_{2max}$ 65.7 ± 2 and 64.5 ± 3 ml.kg⁻¹.min⁻¹, CON vs EHI). Rectal temperature was measured using a thermistor inserted to a depth of 10 cm past the anal sphincter. Hsp72 levels were measured in both monocytes and lymphocytes by flow cytometry before and immediately after the 60-min run, then after 60 min of recovery at an ambient temperature of 24°C.

Results. Rectal temperature increased during the exercise period but there was no difference between groups, demonstrating that the EHI group had recovered from their heat illness and were not heat intolerant. Lymphocyte Hsp72 was lower in the EHI group after 60 min of exercise ($p < 0.05$), while monocyte Hsp72 was not different between groups.

Conclusion. Our study found a lower lymphocyte Hsp72 concentration during exercise in athletes who had previously collapsed with serious EHI. Further research is needed to determine whether lower lymphocyte Hsp72 is a factor that may predispose athletes to develop EHI.