Extreme Physiology & Medicine

MEETING ABSTRACT Open Access

Heat stress and workload associated with sugarcane cutting - an excessively strenuous occupation!

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Introduction

Chronic kidney disease not associated with traditional risk factors (sometimes called Mesoamerican nephropathy) is prevalent in male agricultural labourers, particularly sugarcane cutters, in Central America and Mexico regions [1]. Strenuous work in a hot environment with dehydration is believed to be a key causal factor [1]. The aim of this study was to assess the level of heat stress and workload in sugarcane cutters.

Methods

45 sugarcane cutters (34(12) y; range 18 - 57 y) from El Salvador were studied during the 2015 harvest (Feb-April). Heart rate (HR, Polar) was recorded in 10-11 workers per day, during 7 workdays. Weather data was collected using two weather stations (Weatherhawk, QuesTemp °34). Outdoor Wet Bulb Globe Temperatures (WBGT) was calculated (WBGT (outdoor) = 0.7WB + 0.2G + 0.1DB) via the QuesTemp °34. HR data were expressed a percentage of maximal HR (%HR_{max}). A regression equation was used to predict HR_{max} (208 - 0.7 × age) [2].

Results

Sugarcane cutters worked on average for 7:30 hours (range 3:20 - 9:36 hours). In the field, WBGT reached 32.1°C (95% confidence interval [CI]: 33.0°C to 31.1°C), with 79 % (95% CI: 87 to 71%) of the day spent working at a WBGT above 26°C (threshold limit for continuous harvesting at 100 % [3]). Heart rates averaged 54 % HR_{max} (95% CI: 57 to 52 %HR_{max}) across all workdays. Workers spent 4:44 hours (95% CI: 5:19 to 4:09 hours) working at ≥50%HR_{max} and 2:48 hours (95% CI: 3:21 to 2:15 hours) working <50%HR_{max}.

Discussion

Sugarcane cutting is repetitive high-intensity work carried out in high heat stress conditions. Workers spent over half the workday (including rest breaks) working at and above 50% of their HR_{max}. This HR intensity is similar to that exhibited in the first 12 hours of adventure racing (64%HR_{max} [4]) and higher than that maintained by soldiers during multi-day operations (30 - 40% of aerobic power [5]).

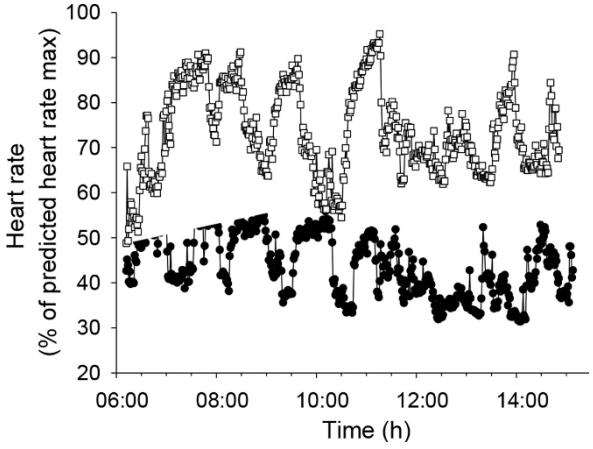

Figure 1 Heart rate (1 min intervals) during one workday for two sugarcane workers.

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Conclusion

The cardiac strain of sugarcane cutting is similar to that associated with very prolonged, competitive exercise and higher than that typically associated with self-paced hard work. Yet, sugarcane cutters maintain this work intensity daily throughout the harvest (~6 months).

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