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Effect of an acclimation protocol to environmental heat and humidity stress on physiological and inflammatory markers.

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## INTRODUCTION:

Exercise under environmental conditions of severe heat and humidity stress can lead to poor performance and many athletes experience exertional hyperthermia during training and competition. Due to the increase of competitions in countries with adverse climate conditions, acclimation of the athletes is becoming more frequent. However, little is known on the effects of acclimation training on the athlete's inflammatory response and health.

This study main objective was to determine the effect of exercise in classic laboratory environmental conditions (NC), as well as in conditions of environmental heat and humidity stress (HS), in physiological and inflammatory (IL-6, IL-15, IL-10, TNF- $\alpha$ , IL-1 $\beta$ , IL-1ra, sCD14) markers in athletes, before and after a heat acclimation (HA) protocol.

## METHODS:

Eight endurance athletes, who compete at the Portuguese national level ( $37.5 \pm 11.21$  years) underwent an acclimation training protocol, in an indoor climate chamber, consisting of 2 weeks of training under 35°C and 55% humidity, with 3 sessions/week of increased duration (40, 60, 80, 90, 100 and 110 mins). The week before a progressive 4 min step VO<sub>2</sub>max test at 21°C and 55% humidity and another one at 34°C and 55% humidity were performed with 2 days interval. The same tests were repeated the week after the acclimation protocol. Physiological variables were evaluated during the VO<sub>2</sub>max tests at two intensities (moderate LAC= 2mmol/l and high LAC= 4mmol/l). Inflammatory markers concentrations were determined by ELISA (Thermofisher, UK) before and after the VO<sub>2</sub>max tests.

## RESULTS:

Although there were no significant differences in speed ( $p = 0.58$ ), a small improvement in running speed was obtained for the HS environment at moderate intensity (2mmol/l), after acclimation ( $ES = -0.2$ ). In the physiological variables, significant differences were found for VO<sub>2</sub>max, total energy expenditure and RPE ( $p < 0.05$ ) (NC x HC at 2mmol/l). Important differences in effect sizes were identified for cardiovascular (HR; SBP; DBP), and thermoregulatory (body temperature; dehydration) adaptations. For the inflammatory markers, IL-6 and IL-15 showed decreases in their concentrations after HA compared to previous values under the same environmental conditions ( $p < 0.05$ ). Significant differences in the sCD14 soluble endotoxin receptor ( $p < 0.01$ ) were found in the HS environment after acclimation. A percentage of dehydration of at least 1.25% of total body weight can cause increases in IL-1 $\beta$  concentrations and, associated to this, an increase in endotoxin leakage from the gut, manifested by increases in sCD14 plasma concentrations.

## CONCLUSION:

Acclimation training was effective in promoting several physiological adaptations. Although IL-1 $\beta$  levels were increased in athletes at the time of HS after acclimation, IL-1ra levels were also higher at that time, suggesting a trend for athletes to maintain their inflammatory balance and immune system functionality.

Topic: Physiology

Presentation E-poster

