EFFECT OF HYPERTHERMIA AND DEHYDRATION ON CIRCULATING GROWTH HORMONE CONCENTRATION

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Objective – The aim of this study was to differentiate the effects of dehydration and increased body temperature on growth hormone (GH) secretion during exercise or during passive sitting in either heat or in thermo-neutral conditions.

Methods – Nine healthy volunteer adults (males, 24 ± 16; 2 yrs, 68 ± 16; 3 kg, 177 ± 16; 3 cm, 16 ± 16; 2 % body fat) performed two 40 min exercise trials and two 50 min passive exposure trials. The exercise trial was 40 min submaximal run on 400 m Astroturf athletic track. It was performed under two conditions: either in thermo-neutral conditions (N-Ex, air temperature 18 °C, air humidity 40%) or in hot environmental conditions (H-Ex, air temperature 33 °C, air humidity 33%). The passive exposure trials were also performed under two conditions: either in comfortable (N-S, air temperature 18 °C, air humidity 40%) or in hot climatic chamber (H-S, air temperature 40 °C, air humidity 100%). Plasma growth hormone (GH), plasma volume (PV), tympanic temperature (Tty) and body mass loss (BML) were measured pre and post each trial. Results – The decrease in plasma volume was significantly higher during H-Ex (-9.6 ± 1617; 3%) and H-S (-10.4 ± 1617; 4%) sessions compared to N-Ex and N-S sessions (-4.5 ± 1617; 2%, p<0.05) and (-0.4 ± 1617; 0.42%, p<0.001) respectively. The rise in Tty was significantly higher during H-S session (2.9 ± 1617; 0.4 °C) (p<0.001) when compared to the other sessions. Plasma GH concentration increased significantly in all trials; only one significant level was reached, that of the H-Ex session (45 ± 1617; 7 ng.ml-1) (p<0.01). Plasma GH rise was significantly correlated to the increase in Tty, to the increase of BML and the decrease of PV (p<0.01). Conclusions – Our results suggested that core temperature increase has a greater effect on the GH release than water loss and/or plasma volume decrease. Discussion- Although the rise of temperature in the present study was higher in H-S (+2.5 °C) as compared to the N-Ex session (+0.8 °C), the increases in GH were statistically the same. Similarly, the rise in GH was higher after H-Ex than after H-S whereas the core temperature was lower (+2.1 vs. .9 °C). This suggests that core temperature increase (might be associated with other factors) has a greater effect on the GH release than water loss and/or plasma volume decrease. In this line, Stosky et al. (1989) suggested that metabolic factors play a role in the exercise-induced GH release even in the absence of hypoglycemia. Furthermore, a positive correlation between maximal difference in glucose level and maximal difference in GH secretory rate was found during 3-h submaximal cycling exercise (Scheen et al., 1998).


Keywords: Body Temperature, Hormones, Dehydration

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