1-B-02 Arterial blood pressure response to severe passive heating at rest relates to hyperthermia-induced hyperventilation

Naoto FUJII[1], Masashi ICHINOSE[2], Bun TSUJI[3], Kazuhito WATANABE[3], Narihiko KONDO[4], Takeshi NISHIYASU[3]

[1] *JSPS,* [2] *Meiji University,*

[3] *University of Tsukuba,* [4] *Kobe University*

Purpose :

The purpose of this study was to investigate that whether the mean arterial blood pressure (MAP) change during passive heating at rest is associated with hyperthermia-induced hyperventilation in humans.

Methods:

Eighteen healthy males were subjected to passive heating using legs-only hot water immersion and a water-perfused suit until the subject could no longer endure the heat. We then divided the subjects into two groups: in MAP_{NOTINC} (n = 8) MAP did not increase by >3 mmHg (-11.5 to 2.3 mmHg), and in MAP_{INC} (n = 10) MAP increased by >3 mmHg (9.7 to 32 mmHg).

Results and Discussion:

Heating-induced increases in esophageal temperature were similar in MAP_{NOTINC} and MAP_{INC} (+2.3±0.3 vs. +2.4±0.4 °C). However, subjects in MAP_{NOTINC} showed significantly greater increases in minute ventilation ($\dot{V}_E$) (+19.1±7.8 vs. +7.1±4.7 l min^{-1}, $P < 0.05$) and greater decreases in end-tidal CO_2 pressure (-15.6±4.3 vs. -5.1± 4.3 mmHg, $P < 0.05$) than those in MAP_{INC}. Among all subjects, heating-induced changes in $\dot{V}_E$ significantly and negatively correlated with heating-induced changes in MAP ($r = -0.74$, $P < 0.05$). Our results suggest the extent of the MAP response to passive heating at rest is associated with the degree of hyperthermia-induced hyperventilation.

Key words: hyperthermic hyperpnea; respiratory alkalosis, systemic blood pressure

1-B-03 Effect of pre-exercise core temperature on circadian variation in hyperthermic hyperventilation during exercise

Bun TSUJI [1], Naoto FUJII [2], Narihiko KONDO [3], Takeshi NISHIYASU [1]

[1] *Graduate School of Comprehensive Human Sciences, University of Tsukuba,* [2] *JSPS Fellow,* [3] *Faculty of Human Development, Kobe University*

Purpose: Hyperthermia during exercise leads to hyperventilation. We recently reported that core temperature (T_c) threshold for hyperventilation as well as pre-exercise resting T_c was higher by 0.6°C in evening (PM) than morning (AM) However, the change in T_c from resting to the threshold was same between AM and PM. We therefore tested the hypothesis that even though higher resting T_c at PM is adjusted to the level at AM before exercise, T_c threshold for hyperventilation is still higher at PM than AM.

Methods: Nine male subjects performed cycle exercise at 50% of peak oxygen uptake in the heat (37°C) at AM (6:00) and PM (18:00). Before each exercise, subjects were immersed in water (18°C) for 25-min at AM and 50-min at PM to detect esophageal temperature (T_{es}) threshold for hyperventilation (Tsuji *et al.* 2009) and to adjust T_{es} to same level.

Results and Discussion: Despite same resting T_{es} before exercise after the immersion at AM and PM (35.6 ± 0.7 vs. 35.7 ± 0.7°C), T_{es} threshold for hyperventilation was significantly higher at PM than AM (37.2 ± 0.7 vs. 36.5 ± 0.7°C). The finding suggests that even though elevated T_c in evening is adjusted to the level in morning, T_c threshold for hyperventilation is higher in evening than morning.

Key Words: Hyperpnea; Hyperthermia; Thermoregulation; Circadian rhythm; Precooling