ROLES OF BLOOD VOLUME IN EXERCISE-INDUCED HEAT ACCLIMATION FOR ABLE-BODY AND SPINAL CORD INJURY PERSONS

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Abstract

When an able-body person exercises in the heat, skin blood flow and sweating increase with an increase in body temperature. At the same time, blood pooling in the cutaneous vein and hypovolemia due to large amounts of sweating reduce the venous return to the heart, which is resulting in threatening a maintenance of arterial blood pressure. To avoid it, cutaneous vasodilation is suppressed through baroreflexes.

Previous studies have demonstrated that protein and carbohydrate supplementation during moderate and/or intensive endurance training enhances plasma volume (PV) expansion and thermoregulatory and cardiovascular adaptations in young, healthy elderlies, and also hypertensive elderlies. The adaptations for heat might include an enhanced skin sympathetic nervous activity related with cutaneous vasodilation through baroreflexes. Therefore, the results suggest that an increase in blood volume plays a role in improving thermoregulatory responses. However, none of studies have so far examined whether the same adaptations occur in persons with cervical spinal cord injury (CSCI) who suffer from sympathetic nervous dysfunction.

In CSCI, although thermoregulatory responses during whole body heating are absent, cutaneous vasodilation via local heating in preserved and cardiac function is possibly adapted to exercise. We have recently observed that a trained CSCI person has relatively higher VO_{2peak} [30 ml/min/kg] measured by hand ergometer than untrained persons [~20 ml/min/kg] and his cardiac volume was approximately two times greater than that in the untrained group, while ejection fraction was normal level. Thus, PV expansion may be associated with the adaptation even in CSCI persons, which is favoring the adaptation to exercise in the heat.

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Education:

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Experience:

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Academic societies:

Physiological Society of Japan

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