ENVIRONMENTAL CONTROL OF SWEATING MECHANISMS: MODIFICATIONS BY THERMAL ACCLIMATIZATION AND PHYSICAL TRAINING

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In the present paper, the following findings on: (1) an overview of central and peripheral mechanisms of thermal and sweating regulation (Kosaka *et al.*, 2001); (2) modification of sweating activities resulting from short- and long-term heat exposure (Lee *et al.*, 1997); (3) effect of cold acclimation on sweating activities (Kosaka *et al.*, 1988); and (4) modification of sweating activities by long-term physical training (Yamauchi *et al.*, 1997) are reported from the concept of thermal adaptation. Namely, sweating is a heat loss response that is critical for improved physical performance and safety in extremely hot conditions. It is centrally regulated by the preoptic area and anterior hypothalamus (PO/AH) and peripherally transmitted by sympathetic sudomotor innervation, with acetylcholine as the primary neuroglandular transmitter. Modification of sweating activity through heat exposure or physical training is a physiological tactic for improved tolerance when individuals are challenged with exogenous or endogenous heat. A short-term heat challenge produces a lower resting and slower increase in body temperature as well as enhanced sweating response, while long-term heat exposure results in decreased sweat output. Cold acclimation results in reduced thermoneutral and skin temperature, lowered cold sensation, and reduced metabolic heat production. Physical training induces higher sweat output by means of greater sweat output per activated sweat gland, and a higher rate of skin blood flow.

Kosaka, M. *et al.* (2001) Central and peripheral control of sweating mechanisms: modifications by thermal acclimatization and physical training. In Thermotherapy for Neoplasia, Inflammation, and Pain (Eds. M. Kosaka *et al.*), Springer, Tokyo, 95-106.

Lee, J-B. te al. (1997) Suppression of sweat gland sensitivity to acetylcholine applied iontophoretically in tropical Africans compared to temperate Japanese. *Trop. Med.* 39(3/4):111-121.

Kosaka, M. *et al.* (1988) Central and peripheral mechanisms of thermal acclimation. In: Hyperthermic oncology, proceedings of the 5th annual international symposium on hyperthermic oncology, 29August-3 September, Kyoto, Japan, 330-333.

Yamauchi, M. *et al.* (1997) Sweating economy by graded control in well-trained athletes. *Eur. J. Physiol.* 433:675-678.

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