

Hyperthermia-Induced Vasoconstriction: A Physiological Counter Mechanism

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ABSTRACT

The paradoxical phenomena of hyperthermia-induced vasoconstriction, hyperthermia-induced hypothermia, and hyperthermia induced arterial vasoconstriction have been observed in animal heatstroke clinical case studies. We attempt to explain the basic mechanism behind such findings in terms of the principle of body heat conservation and natural countermeasure against heat exposure through reduction in the extent of vascular surface area exposed. One study which examined the outcome of heating a rabbit carotid artery produced graded vasoconstriction which is proportional to temperature increase. These interesting results pointed out a spontaneous physiological counteractive measure to minimize organ and/or arterial surface area heat exposure through vasoconstriction which might otherwise prompt excessive heat gain from the ambient environment, or vasodilation, should it occur. When a blood vessel or artery constricts through smooth muscle activation, the amount of vascular surface area being exposed, whether to heat that is external from or internal within the body, is reduced. Since such vasoconstriction is proportional to temperature increase, the speed or rate at which this constriction responds and therefore, the extent of vascular surface area being reduced, may be drastic with extreme means of bodily cooling under a heat wave environment, such as whole-body cold-water bath or shower. The reason being extreme vasoconstriction of both cerebral and peripheral blood vessels, which may result in increased intravascular pressure due to intravascular spatial volume decrease and as an above study concluded, cerebral blood flow decreases and ischemia brain damage.

Keywords: Hypothermia, Hypothermia, Vasoconstriction, Heatstroke, Heat wave, Cooling

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