THERMAL ADAPTATION IN INDIGENES: IS IT GENETICALLY DETERMINED?

Nigel A.S. Taylor

School of Health Sciences, University of Wollongong, Wollongong, NSW 2522, Australia.

Homoeothermic species respond to thermal stress via behavioural and inherited or acquired physiological (autonomic) responses. The central theme of this review is the possibility that ethnic differences in the modulation of thermal balance represent acquired rather than genetic differences. While the focus is upon heat adaptation, examples shall also be drawn from cold adaptation. Chronic heat exposure lowers the sweat threshold, increases glandular sensitivity and elevates glandular flow. However, ethnic differences in sweat gland distribution are generally not evident, and differences in the sweat threshold appear not to exist among heat-adapted individuals. Nevertheless, many have reported lower steady-state sudomotor responses in indigenes relative to Caucasians exposed to equivalent thermal stress, and there appears to be a simultaneous reduction in skin blood flow in the former, with a concomitant rise in skin temperature. This temperature increase buffers against heat gains and enhances cutaneous evaporation. These changes represent a physiologically efficient adaptation to hot-humid environments, by optimising both dry and evaporative heat loss mechanisms, and are observable within some ethnic groups. However, these differences are believed to represent forms of thermoregulatory habituation, being indicative of a superior, long-term stage of heat adaptation that can occur across racial groups. It is therefore postulated that such ethnic differences are not of genetic origin, but represent unique negative, phenotypic adaptations associated with lifestyle diversity and climatic exposures. Whilst expressed as apparent racial variations in thermal tolerance, they appear more related to adaptation opportunities than to genetic factors.