27. SWACSM Abstract

Local Skin Temperature and Local Sweat Rate

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ABSTRACT

Local skin temperature may be a modulator of sweat gland function but the mechanism is unclear. **PURPOSE**: To examine the role of local skin temperature in modulating local sweating rate (LSR) using a model of sweat gland activation that produces a moderate, physiologically based sweating response. **METHODS**: Each subject (n=15) was instrumented with 7 skin temperature probes ($\bar{T}_{skin}$), an esophageal probe (T_{core}), and a sweat rate capsule (dorsal forearm). A LSR was produced by 30 s of intradermal electrical stimulation (5 mA, 0.2 to 64 Hz) that resulted in release of ACh from the sudomotor nerve and produced a transient sweating response lasting 60 to 90 s. To modify local skin temperature the subjects sat in an environmental chamber for 60 min at three different ambient temperatures (T_a): 21, 27, and 34 °C, on the same day without moving the sweat capsule. Subjects acclimated to the chamber temperature for 45 min prior to producing the LSR. The LSR was quantified as the area-under the sweat rate-time curve (LSR AUC, normalized to peak LSR AUC at 21°C) and curve fit using a four parameter logistic model. **RESULTS**: Local skin temperature averaged 29.3 ± 1.2, 31.3 ± 0.8, and 34.6 ± 0.8°C, baseline sweat rate (SR) averaged 0.127 ± 0.05, 0.142 ± 0.065, and 0.124 ± 0.083 mg • min^{-1} • cm^{-2} and T_{core} averaged 37.1 ± 0.7, 36.8 ± 0.6, and 36.6 ± 0.5°C at 21, 27, and 34°C T_a, respectively. Comparison of the models indicated that the both the plateau LSR AUCX and the EC_{50} at 21, 27 and 34°C were not the same (p=0.0022). The onset of sweating occurred sooner at 34°C (4.6 ± 2 s) than at 21°C (7.3 ± 3.0 s) or 27°C (6.1 ± 2.0 s) and was linearly related to local skin temperature (p = 0.0002). Finally, the increase in sweating rate at 34°C (0.032 ± 0.027 ΔSR•s^{-1}) was also faster than at 21 or 27°C (p<0.05). **CONCLUSION:** The observed change in the stimulus-response characteristics of the LSR induced by intradermal electrical stimulation (decreased EC_{50} and increased plateau LSR AUC) supports the hypothesis that an increased local skin temperature improves the sweat gland responsiveness to ACh released by the sudomotor nerve during intradermal electrical stimulation.