

University of Wollongong

Research Online

Faculty of Health and Behavioural Sciences -
Papers (Archive)

Faculty of Science, Medicine and Health

January 2010

The local dynamics of thermal sweat suppression following a systemic cholinergic blockade

Christiano A. Machado-Moreira
University of Wollongong, cam313@uow.edu.au

Peter L. McLennan
University of Wollongong, petermcl@uow.edu.au

Stephen Lillioja
University of Wollongong, lillioja@uow.edu.au

W van Dijk
University of Maastricht, wvd646@uow.edu.au

Joanne N. Caldwell
University of Wollongong, joc@uow.edu.au

See next page for additional authors

Follow this and additional works at: <https://ro.uow.edu.au/hbspapers>



Part of the [Arts and Humanities Commons](#), [Life Sciences Commons](#), [Medicine and Health Sciences Commons](#), and the [Social and Behavioral Sciences Commons](#)

Recommended Citation

Machado-Moreira, Christiano A.; McLennan, Peter L.; Lillioja, Stephen; van Dijk, W; Caldwell, Joanne N.; and Taylor, Nigel A. S: The local dynamics of thermal sweat suppression following a systemic cholinergic blockade 2010.
<https://ro.uow.edu.au/hbspapers/648>

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

The local dynamics of thermal sweat suppression following a systemic cholinergic blockade

Keywords

local, cholinergic, dynamics, blockade, thermal, sweat, suppression, following, systemic

Disciplines

Arts and Humanities | Life Sciences | Medicine and Health Sciences | Social and Behavioral Sciences

Publication Details

Machado-Moreira, C. A., McLennan, P. L., Lillioja, S., van Dijk, W., Caldwell, J. N. & Taylor, N. A.S. (2010). The local dynamics of thermal sweat suppression following a systemic cholinergic blockade. In AuPS/ ASB 2010 Adelaide Meeting, 28/11-1/12/2010, Adelaide, South Australia. Proceedings of the Australian Physiological Society, 41 (N/A), 82P-82P.

Authors

Christiano A. Machado-Moreira, Peter L. McLennan, Stephen Lillioja, W van Dijk, Joanne N. Caldwell, and Nigel A. S Taylor



The local dynamics of thermal sweat suppression following a systemic cholinergic blockade

C.A. Machado-Moreira,¹ P.L. McLennan,² S. Lillioja,¹ W. van Dijk,¹ J.N. Caldwell¹ and N.A.S. Taylor,¹ ¹School of Health Sciences, University of Wollongong, Wollongong, NSW 2522, Australia. and ²Graduate School of Medicine, University of Wollongong, Wollongong, NSW 2522, Australia..

Human eccrine sweat secretion can be fully inhibited by atropine, systemically administered in the correct dose. However, the dynamics of this suppression have not been thoroughly described. Therefore, using very sensitive methods, local sweat rates were measured simultaneously across several body segments, before and after a cholinergic blockade. Herein are described the temporal characteristics of thermal sweat suppression following atropine infusion. Eight males were passively heated (feet immersion (42-43°C), water-perfusion suit (48°C)). After core temperature increased ~0.5°C, and steady-state thermal sweating was established, the core temperature was clamped and atropine sulphate was gradually (over ~1 min) and intravenously infused (dorsal hand: 0.04 mg.kg⁻¹). Sweat rates were measured at 1s intervals using ventilated capsules positioned at the forehead, the dorsal surfaces of the forearm and hand, the palm and calf. Three variables were estimated: the phase delay between the start of the infusion and the first evidence of sweat reduction; the time required for full suppression of sweating; and the time constant for this decay. The blockade completely inhibited thermal sweating from all regions ($p < 0.05$), and this occurred, on average, within 5 min (Table: data are means with standard deviations). Indeed, the first evidence of suppression appeared within 60s, and the mean decay time constant was 144s. The rapidity of this action was remarkable, given that the infusion was delivered intravenously at the hand, and had to diffuse from the periglandular capillary and through the interstitial fluid before it could block receptors on the sweat gland. This was facilitated by an almost immediate cardiac acceleration (40±4 beats.min⁻¹) and presumably by the rapid reduction in peripheral vasoconstrictor tone to support pressure regulation. It took longer for the full suppression to become established at the forehead ($p < 0.05$), and this delay may be explained by its higher initial sweat rate. Indeed, a larger atropine dose is required to produce inhibition when sweating is more profuse (Cummings & Craig, 1967). Furthermore, it was only the total suppression time that was delayed, while neither the phase delays nor the time constants differed significantly among sites ($p > 0.05$).

Skin site	Phase delay (min)	Time constant (min)	Full suppression (min)
Forehead (N=6)	0.8 ±0.4	2.6 ±1.3	7.8 ±2.4 [†]
Dorsal forearm (N=6)	0.9 ±0.4	2.1 ±0.7	3.9 ±0.2
Dorsal hand	1.2 ±0.5	2.7 ±0.5	4.4 ±0.6
Palm	0.9 ±0.4	2.1 ±0.4	3.7 ±0.7
Upper calf	1.0 ±0.2	2.4 ±0.4	5.1 ±1.6
All sites (mean)	1.0 ±0.3	2.4 ±0.3	4.9 ±0.5

[†]significantly different from all other sites.

Cummings, E.G. & Craig, F.N. (1967). Influence of the rate of sweating on the inhibitory dose of atropine. *Journal of Applied Physiology*. **22**: 648-654.