

# **The effectiveness of orally applied L-menthol on exercise performance in the heat.**

Owen Jeffries<sup>5</sup>, Martin Barwood<sup>1</sup>, Jason Gillis<sup>2</sup>, Russ Best<sup>3,4</sup>.

1. Department for Sport, Health and Nutrition, Leeds Trinity University, Horsforth, United Kingdom
2. Human Performance Laboratory, Department of Sport & Movement Science, Salem State University, Salem, MA, USA.
3. School of Health & Social Care, Teesside University, Middlesbrough, United Kingdom
4. Centre for Sport Science & Human Performance, WINTEC, Hamilton, New Zealand
5. School of Biomedical Sciences, Faculty of Medical Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom.

During exercise in the heat, increasing thermal load leads to thermo-behavioral adjustments in exercise performance, due to greater perceptual and physiological strain. Behavioral reductions in exercise intensity in the heat are initially mediated via rises in skin temperature, which alter thermal perception (comfort and sensation) and later by rises in core temperature, which increase cardiovascular strain and perceived exertion. Therefore, thermoregulation may be ordered and dependant on the magnitude, timing and/or prioritisation of afferent signals.

Non-thermal cooling via L-menthol has been shown to enhance exercise performance in the early and latter stages when delivered orally at a concentration of 0.01%. Indeed, during periods of progressive thermal stress, imposed by the combination of maximal exercise and environmental heat and humidity, L-menthol has been shown to offer an immediate cooling stimulus thus extending exercise capacity. However, repeated administration of L-menthol during exercise in the heat, as thermal load increases, is unable to recover a decline in work rate. Therefore, it is unclear whether the potency of L-menthol is sustained upon frequent application and what strategies are needed in both sporting and occupational settings to optimise its effectiveness.

In this part of the symposium we will consider oral delivery of L-menthol and its potential for reducing an individual's perception of heat stress with associated effects on exercise tolerance in the heat. We will also examine the frequency of use, optimal concentration, timing and novelty of L-menthol in a sporting and occupational context.