
This item was submitted to [Loughborough's Research Repository](#) by the author.
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

Individual and combined impact of hypoxia and acute inorganic nitrate ingestion on autonomic thermoregulatory responses to the cold [Abstract]

PLEASE CITE THE PUBLISHED VERSION

https://www.icee2019.com/pdf/BoA_ICEE2019.pdf

PUBLISHER

International Society for Environmental Ergonomics

VERSION

AO (Author's Original)

PUBLISHER STATEMENT

No part of this publication may be reproduced by any means without the prior permission of the copyright holder, and proper reference.

LICENCE

CC BY-NC-ND 4.0

REPOSITORY RECORD

Arnold, Josh, Simon Hodder, Stephen Bailey, and Alexander Lloyd. 2019. "Individual and Combined Impact of Hypoxia and Acute Inorganic Nitrate Ingestion on Autonomic Thermoregulatory Responses to the Cold [abstract]". figshare. <https://hdl.handle.net/2134/9544646.v1>.

Individual and combined impact of hypoxia and acute inorganic nitrate ingestion on autonomic thermoregulatory responses to the cold

Josh T. Arnold; Simon G. Hodder; Stephen J. Bailey; Alex B. Lloyd

Loughborough University, Loughborough, UK.

Introduction: This study assessed the impact of normobaric hypoxia and dietary nitrate (NO_3^-) ingestion on shivering thermogenesis and vascular control in response to acute whole-body cooling.

Method: Ten male volunteers underwent supine passive cooling at 10°C air temperature across four conditions; NORM_PLAC: 20.9% fraction of inspired oxygen (FiO_2) with ~ 0.003 mmol NO_3^- ingestion, NORM_NTR: 20.9% FiO_2 with ~ 13 mmol NO_3^- ingestion, HYP_PLAC: 12.6% FiO_2 with ~ 0.003 mmol NO_3^- ingestion, HYP_NTR: 12.6% FiO_2 with ~ 13 mmol NO_3^- ingestion. Shivering thermogenesis via mechanomyography (MMG) and pulmonary oxygen uptake ($\dot{V}\text{O}_2$) were continuously assessed to determine shivering onset. Vascular activity, via laser doppler flowmetry (LDF) at the forearm and mean arterial pressure (MAP), in addition to rectal and skin temperature (T_{re} and T_{sk}), were continuously assessed and analysed across a 30 min time window during passive cooling. Preliminary data from 7 participants is presented.

Results: Hypoxia significantly reduced (earlier) shivering onset time assessed via MMG and $\dot{V}\text{O}_2$ (mean of NORM condition minus HYP conditions; MMG, 500 ± 140 s, $P=0.02$; $\dot{V}\text{O}_2$, 337 ± 158 s, $P=0.04$) and increased microvascular perfusion (NORM minus HYP; LDF, -18 ± 7 PU, $P=0.03$). Hypoxia reduced MAP, reduced T_{re} and increased T_{sk} (NORM minus HYP; MAP, 3 ± 2 mmHg, $P=0.2$; T_{re} , 0.06 ± 0.06 $^\circ\text{C}$, $P=0.3$; T_{sk} , -0.24 ± 0.19 $^\circ\text{C}$, $P=0.3$), though these differences were not significant. No significant main effects were found for nitrate ingestion (mean of PLAC conditions minus NTR conditions; MMG, -430 ± 220 s, $\dot{V}\text{O}_2$, -532 ± 326 s; LDF, 21 ± 16 PU; MAP, 4 ± 2 mmHg; T_{re} , -0.06 ± 0.07 $^\circ\text{C}$; T_{sk} , -0.21 ± 0.29 $^\circ\text{C}$).

Conclusions: Initial findings suggest increased heat loss with hypoxic exposure, leading to earlier onset of shivering thermogenesis. No differences were seen with nitrate ingestion. Interactions between hypoxia and nitrate ingestion requires further investigation.