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Acute ingestion of beetroot juice does not improve repeated sprint performance in male team sport athletes

C.M.E. Reynolds, C. Halpenny, C. Hughes, S. Jordan, A. Quinn and B. Egan
UCD Institute for Sport and Health, School of Public Health, Physiotherapy and Sports Science, University College Dublin, Republic of Ireland

Nitric oxide (NO) is a key signalling molecule that plays a role in numerous physiological functions including the regulation of blood flow, neurotransmission, mitochondrial respiration, muscle contractility, myocyte differentiation, and glucose and calcium homeostasis[1]. Dietary nitrate supplementation in the form of beetroot juice (BR), as a precursor to NO, has acquired much attention for its proposed ergogenic properties and improves performance in sports such as rowing[2] and swimming[3]. Considering that most studies of BR ingestion to date have used endurance-related exercise models, there is a clear gap in literature regarding the effects of acute ingestion of BR on repeated sprint performance (RSP) as representative of team sport performance.

After obtaining ethical approval from the local research ethics committee (permit: LS-12-181-Reynolds-Egan) for procedures in accordance with the Declaration of Helsinki, sixteen male team sport athletes (age, 20·9 ± 1·8 y; height, 180·1 ± 5·3 cm; body mass, 80·8 ± 7·9 kg; body fat, 14·6 ± 4·2 %) provided written informed consent and were recruited to complete four trials utilising the 40 m multiple shuttle test (MST)[4] as a measure of RSP. The MST comprises of a 40 m all-out sprint that encompasses two 180° changes of direction. The 40 m sprint is repeated 10 times on a 30 second cycle. Sprint times (sec) were recorded using photoelectric timing gates (Fusion). Heart rate was monitored continuously using telemetry (Polar). Blood lactate was measured at rest and five minutes after the 10th sprint from a fingerprick sample (LactatePro). Trials one and two were familiarisation sessions. For trials three and four, in a double-blind, randomized crossover design, participants ingested, three hours before the commencement of the MST, either a 7 cl 'shot' of BR providing ~6 mmol of nitrate, or 7cl 'shot' of nitrate-depleted BR (placebo, PL; providing ~0·0034 mmol of nitrate). All trials took place at the same time of the day ± 1 h, and each participant had a minimum of seven days between trials. Changes in plasma nitrate were assessed (Nitrate/Nitrite Colorimetric Assay Kit, Cayman Chemical) on venous samples collected prior to commencing the 40 m MST for trials three and four.

There was no difference observed between PL and BR for fastest sprint time (PL, 8·27 ± 0·26 vs. BR, 8·31 ± 0·27 sec; $P = 0·341$) or total sprint time (PL, 87·4 ± 2·9 vs. BR, 87·5 ± 2·3 sec; $P = 0·804$). Based on the performance decrement calculation of RSP[4], there was no difference between trials (PL, 5·71 ± 2·61 % vs. BR, 5·31 ± 2·49 %; $P = 0·334$). Heart rate did not differ between trials, but blood lactate tended ($P = 0·109$) to be lower in BR (PL, 12·3 ± 2·3 vs. BR, 11·8 ± 2·5 mM).

The present study suggests that despite the well-established ergogenic effects of acute ingestion of BR in endurance-type exercise challenges, BR does not improve performance in short-duration high intensity performance such as the 40 m MST. Given previous work suggesting a benefit in short-duration running[1] and rowing[2] performance, and dose-response effects of BR[1,2], further work is needed to explore the efficacy, or lack thereof, for team sport performance.

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