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Effects of single-dose dietary nitrate on oxygen consumption during and after maximal exercise in healthy humans

Effects of Single-Dose Dietary Nitrate on Oxygen Consumption During and After Maximal Exercise in Healthy Humans

Integrative Human Physiology Laboratory

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INTRODUCTION

- Oxygen is the substrate for aerobic metabolism; with exercise, oxygen consumption (VO_2) will increase to provide the substrate for energy production. As VO_2 increases, energy expenditure (Kcal) also increases.
- As exercise begins, the amount of O_2 needed increases faster than the body can increase its uptake. At cessation of exercise, the body continues to maintain an elevated VO_2 rate to make up for the deficit. This continued elevated intake is referred to as excess post- exercise oxygen consumption (EPOC).
- Dietary nitrate supplementation has been shown to decrease VO_2 at a given workload[1], increase performance in time trial time[2], and decrease diastolic blood pressure[3]. However, there is a lack of published data regarding the effect of nitrate supplementation on EPOC.
- **Therefore, we tested the hypothesis that acute nitrate supplementation in the form of beetroot juice will significantly decrease VO_2max and excess post-exercise oxygen consumption (EPOC).**

METHODS

Subjects, Instrumentation and Measurements

- A total of 8 healthy young individuals aged 19-31
  - maximal, n=4; submaximal, n=6
- Parvo Medics TrueOne 2400 Metabolic Cart
- Heart rate (HR) determined by Polar H7 Smart Chest Transmitter
- Blood pressure (BP) measured with automatic sphygmomanometer
- RPE measured on a 6-20 Borg Scale

Control Condition

- 70 ml antibacterial mouthwash rinse
  - prevent conversion from NO_3^- to NO
- 70 ml Beet It Sport Shot (BR)

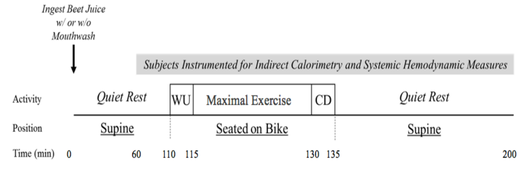
Nitrate Supplementation

- 70 ml water rinse
- 70 ml Beet It Sport Shot (BR)
- administered orally

Cycle Ergometry

- 5 experimental visits
- **Maximal Exercise (Control)**
- **Maximal Exercise (BR)**
- Prolonged (45 min) Submaximal (% of Ctrl Max) (Control)
- Prolonged (45 min) Submaximal (% of Ctrl Max) (BR)
- Prolonged (45 min) Submaximal (% of BR Max) (BR)

Experimental Protocol

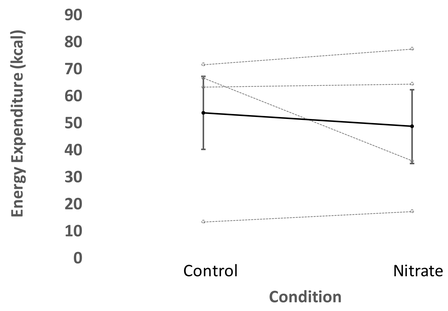


RESULTS

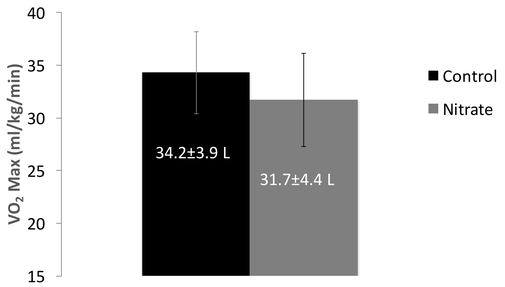
1 Subject Characteristics

Variable	Mean ± SEM
Age (year)	24.88 ± 1.41
Height (cm)	181.29 ± 2.88
Weight (kg)	78.15 ± 3.17
Body Fat (%)	15.81 ± 1.50
BMI (kg/m²)	23.71 ± 0.40

2 Pre-Exercise Energy Expenditure

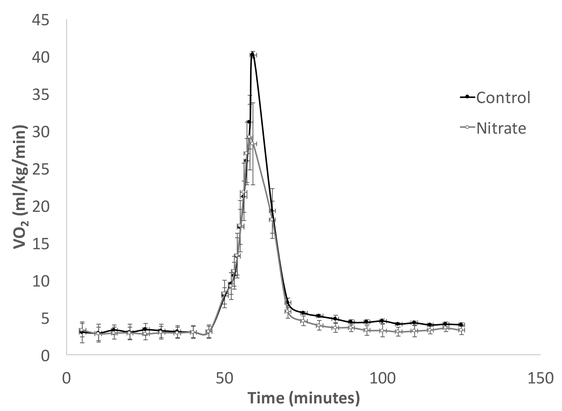


3 VO_2 Max

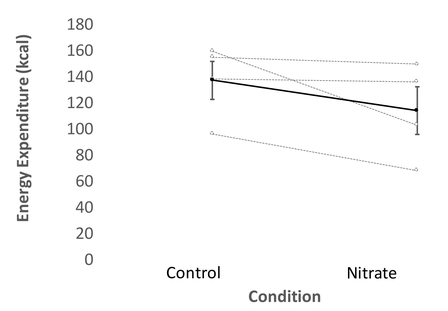


Values represented as mean ± SEM.

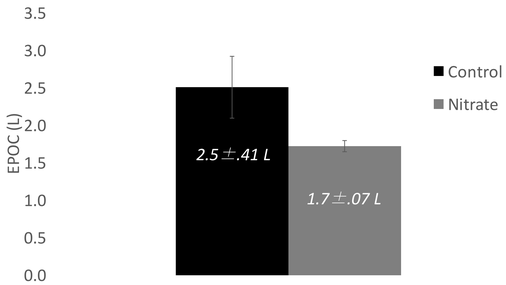
4 Dynamic Oxygen Consumption



5 Post-Exercise Energy Expenditure



6 60 Minute EPOC



Values represented as mean ± SEM.

CONCLUSIONS

- Contrary to our hypothesis, in young, healthy, untrained males, VO_2 max is not attenuated with nitrate supplementation.
- Accordingly, contrary to our hypothesis, EPOC is not lower in this condition.
- These findings are relevant given the increase in supplementation use, particularly for both health and performance goals.
- Some experimental considerations include:
  - Subject population and number
  - Electronically-braked ergometer not used
  - No familiarization visits
  - Lack of plasma NO_3^- measures

PERSPECTIVES

The collective data derived from the present investigation fails to provide evidence to support our hypothesis that nitrate supplementation will significantly decrease maximal oxygen consumption and EPOC. Follow-up investigations should test highly-trained males in order to observe the effects of NO_3^- supplementation on VO_2max in this population. If no significant effects are seen in the elite population, this could impact the growing use of the supplement as an ergogenic aid in sport performance.

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