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

EFFECTS OF SINGLE-DOSE DIETARY NITRATE ON OXYGEN CONSUMPTION DURING AND AFTER PROLONGED SUBMAXIMAL EXERCISE IN HEALTHY HUMANS

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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 excess post-exercise oxygen consumption (EPOC).**

METHODS

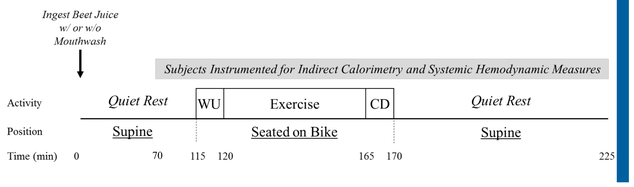
Subjects, Instrumentation and Measurements
- A total of 7 healthy, untrained, young males aged 21-31
- Parvo Medics TrueOne 2400 Metabolic Cart
- Heart rate (HR) determined by ECG
- Blood pressure (BP) measured with automatic sphygmomanometer
- RPE measured on 6-20 Borg Scale

Control Condition
- 70 ml mouthwash
- prevent conversion from NO_3 to NO

Nitrate Supplementation
- 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

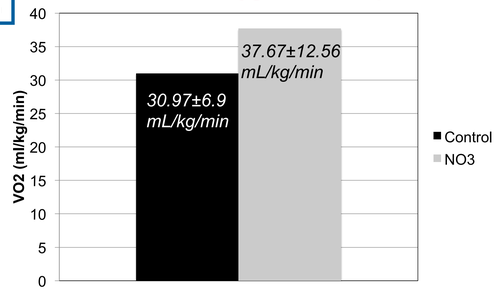


RESULTS

1 Subject Characteristics

Variable	Mean ± SEM
Age (years)	25.5 ± 8.2
Height (m)	1.82 ± .392
Weight (kg)	77.9 ± 4.32
Body Fat (%)	15.8 ± 1.81
BMI (kg/m^2)	23.5 ± .521

2 Maximal Oxygen Consumption

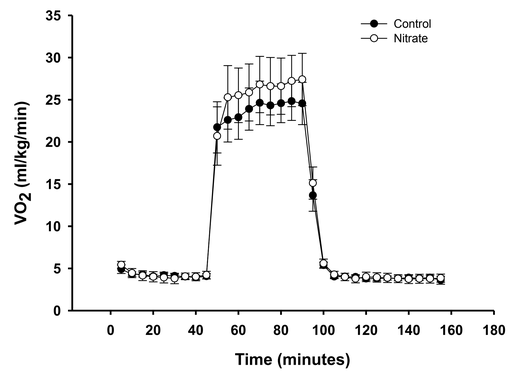


Data presented as mean ± SE.

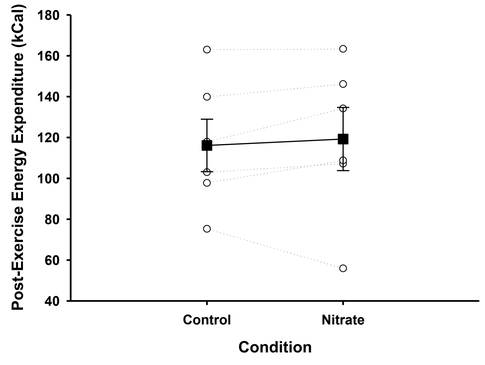
3 Supplementation Efficacy at Rest

	Control	NO_3	Δ
HR (bpm)	58.0	61.5	+3.5
MAP (mm Hg)	83.8	82.9	-0.9

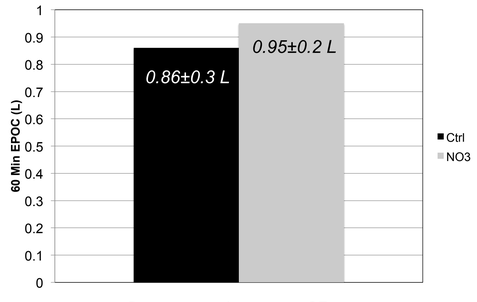
4 Dynamic Submaximal Oxygen Consumption



5 Energy Expenditure



6 60 Min EPOC



Data presented as mean ± SE.

CONCLUSIONS

- Preliminary data suggests that in our population, at a given workload, oxygen consumption 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 to support supplementation efficacy

PERSPECTIVES

The collective data derived from the present investigation fails to provide evidence to support our hypothesis that nitrate supplementation will significantly decrease EPOC. While further tests must be conducted to reaffirm the results, preliminary data suggest that at a given submaximal workload, VO_2 and EPOC are not lowered. If the results are confirmed, this could impact the growing use of the supplement as an ergogenic aid in sport performance.

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