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Does beetroot juice improve walking in people with lung disease and low oxygen levels?

Submission date
03/07/2015

Recruitment status
No longer recruiting

Registration date
14/07/2015

Overall study status
Completed

Last Edited
18/07/2023

Condition category
Respiratory

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
Despite optimum medical treatment, many patients with lung disease remain significantly disabled. There is evidence that dietary nitrate supplementation can reduce the oxygen needed during exercise but it is not clear if this improves the amount of exercise that a person can do. The purpose of this project is to investigate whether dietary nitrate supplementation in the form of a single dose of beetroot juice can improve the distance that people with lung disease who are dependent on oxygen can walk.

Who can participate?
Adults with lung disease who need to use oxygen when they walk.

What does the study involve?
Participants are randomly allocated into one of two groups. Those in group 1 are given 140 ml of nitrate-rich beetroot juice (0.8 g nitrate) to drink. Those in group 2 are given 140 ml of placebo (nitrate-depleted beetroot juice). All participants are then asked to do a walking test (called an “endurance shuttle walk”). How long each participant can walk for and the effects of the nitrate-rich beetroot juice on heart rate and amount of oxygen in the blood is recorded.

What are the possible benefits and risks of participating?
The tests used are all part of routine clinical practice and no significant risks are anticipated. As this is a test of a single dose only, no direct benefit to trial participants is expected but they will be helping to advance understanding of exercise limitation and this could eventually lead to a novel therapy becoming available for them and others with their condition.

Where is the study run from?
Royal Brompton and Harefield NHS Foundation Trust (UK)

When is the study starting and how long is it expected to run for?
October 2015 to July 2024

Who is funding the study?
Moulton Medical Foundation (Guernsey)

Who is the main contact?
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Contact information

Type(s)
Public

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Type(s)
Scientific

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Additional identifiers

Protocol serial number
N/A

Study information

Scientific Title
The effect of dietary nitrate on exercise in hypoxia

Acronym
EDEN-OX

Study objectives
Current hypothesis as of 11/01/2023:
The purpose of this study is to investigate the effects of an acute administration of beetroot (BR) juice versus placebo beverage ingestion on plasma NO2 levels, blood pressure, exercise tolerance and fractional oxygen extraction in 4 groups of patients
1. COPD patients who are using ambulatory oxygen
2. Interstitial pulmonary Fibrosis (IPF) patients who are using ambulatory oxygen
3. Pulmonary hypertension (PHT) patients who are using ambulatory oxygen
4. Adults with a history of COVID-19 and persisting breathlessness at least 3 months following the acute illness and evidence of pulmonary vascular abnormalities

The following hypotheses will be tested:
1. BR would increase plasma NO2- levels (a biomarker of NO production and availability)
2. BR will increase endurance shuttle walk time
3. BR will reduce oxygen desaturation during ESWT (area under SaO2 curve to isotime)
4. BR will reduce heart rate during equivalent exercise (area under HR curve to isotime)

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Previous hypothesis:
The purpose of this study is to investigate the effects of an acute administration of beetroot (BR) juice versus placebo beverage ingestion on plasma NO2- levels, blood pressure, exercise tolerance and fractional oxygen extraction in 3 groups of patients
1. COPD patients who are using ambulatory oxygen
2. Interstitial pulmonary Fibrosis (IPF) patients who are using ambulatory oxygen
3. Pulmonary hypertension (PHT) patients who are using ambulatory oxygen

The following hypotheses will be tested:
1. BR would increase plasma NO2- levels (a biomarker of NO production and availability)
2. BR will increase endurance shuttle walk time
3. BR will reduce oxygen desaturation during ESWT (area under SaO2 curve to isotime)
4. BR will reduce heart rate during equivalent exercise (area under HR curve to isotime)

Ethics approval required
Old ethics approval format

Ethics approval(s)
London-Chelsea Research Ethics Committee, ref: 15/LO/0975

Study design
Series of parallel randomised, double-blind, cross-over, placebo-controlled trial

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied

Patients with lung disease (COPD, interstitial pulmonary fibrosis, pulmonary hypertension) who require ambulatory oxygen because of exertional desaturation and adults with a history of COVID-19 and persisting breathlessness at least 3 months following the acute illness and evidence of pulmonary vascular abnormalities

Interventions
140 ml of nitrate-rich beetroot juice (containing 12.9 mmol nitrate) or nitrate-depleted placebo.

Intervention Type
Supplement

Primary outcome(s)
An increase in endurance shuttle walk (ESWT) time breathing oxygen at the patient's customary flow rate.

Key secondary outcome(s))
1. Area under oxygen saturation curve to isotime during ESWT
2. Area under heart rate curve to isotime during ESWT
3. Resting blood pressure
4. Blood nitrate levels

Completion date
01/07/2024

Eligibility

Key inclusion criteria
Current inclusion criteria as of 18/07/2023:
1. Adult patients with GOLD I-IV COPD who require ambulatory oxygen because of exertional desaturation
2. Adult patients with IPF who require ambulatory oxygen because of exertional desaturation
3. Adult patients with pulmonary hypertension who require ambulatory oxygen because of exertional desaturation
4. Adults with a history of COVID-19 and persisting breathlessness at least 3 months following the acute illness and evidence of pulmonary vascular abnormalities (abnormal gas transfer defined as a TLco <lower limit of normal)

Previous inclusion criteria as of 11/01/2023:
1. Adult patients with GOLD I-IV COPD who require ambulatory oxygen because of exertional desaturation
2. Adult patients with IPF who require ambulatory oxygen because of exertional desaturation
3. Adult patients with pulmonary hypertension who require ambulatory oxygen because of exertional desaturation
4. Adults with a history of COVID-19 and persisting breathlessness at least 3 months following the acute illness and evidence of pulmonary vascular abnormalities

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Previous inclusion criteria:
1. Adult patients with GOLD I-IV COPD who require ambulatory oxygen because of exertional desaturation

2. Adult patients with IPF who require ambulatory oxygen because of exertional desaturation
3. Adult patients with pulmonary hypertension who require ambulatory oxygen because of exertional desaturation

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Key exclusion criteria
1. Clinically unstable patients (within one month of exacerbation)
2. Significant comorbidity limiting exercise tolerance
3. Significant renal impairment (estimated glomerular filtration rate (eGFR) <50 ml.min-1)
4. Hypotension (systolic blood pressure <100 mmHg)
5. Pregnancy
6. Use of nitrate based medication or PDE5 inhibitors such as sildenafil

Date of first enrolment
01/10/2015

Date of final enrolment
01/06/2024

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Royal Brompton and Harefield NHS Foundation Trust
Fulham Rd
London
United Kingdom
SW3 6NP

Sponsor information

Organisation
Imperial College

ROR
https://ror.org/041kmwe10

Funder(s)

Funder type
Charity

Funder Name
Moulton Medical Foundation

Results and Publications

Individual participant data (IPD) sharing plan
The deidentified datasets generated during the current study will be available indefinitely to researchers upon request to Professor Nicholas Hopkinson (n.hopkinson@ic.ac.uk) once the results have been published in a scientific journal.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	Results for COPD group	01/12/2021	03/12/2021	Yes	No
HRA research summary			28/06/2023	No	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes