Mitochondrial Capacity in Untrained and Endurance-trained Young Males

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Ethical review	Approved WMO
Status	Completed
Health condition type	Other condition
Study type	Observational invasive

Summary

ID

NL-OMON45254

Source
ToetsingOnline

Brief title
MCAP

Condition

- Other condition
- Muscle disorders

Synonym
Ageing, Sarcopenia

Health condition

Veroudering

Research involving
Human

Sponsors and support

Primary sponsor: Wageningen Universiteit
Source(s) of monetary or material Support: NWO

Intervention

Keyword: Metabolism, Mitochondrial capacity, Near-infrared spectroscopy, Oxygen consumption

Outcome measures

Primary outcome

The main study parameter is the rate of recovery of muscle oxygen consumption measured using NIRS combined with transient arterial occlusions. The rate of recovery is expressed as a time constant. Subjects will be screened for VO2max, measured using an incremental exercise protocol on a bicycle ergometer. Eight endurance-trained and eight untrained subjects will be included based on their VO2max. These subjects are invited to a study test day, in which they are asked to arrive in a fasted state for a blood sample . Afterwards mitochondrial capacity will be measured in the gastrocnemius and wrist flexor muscles using transient arterial occlusions and NIRS measurements.

Secondary outcome

EPOC will be measured following a short sub-maximal exercise bout on a bicycle ergometer by indirect calorimetry. Mitochondrial function will be measured in PBMC*s extracted from blood using the Seahorse XFe analyzer.

Study description

Background summary

Analysing mitochondrial muscle health is challenging and current methods rely on invasive methods, such as taking biopsies. Near-infrared spectroscopy (NIRS) is a novel technique that allows us to measure changes in oxygenation states in the muscle in vivo and non-invasively. Combining transient arterial occlusions, by applying external pressure using a blood pressure cuff, with NIRS measurements allows us to measure oxygen consumption in the muscle. This technique will be used in future studies to measure changes in mitochondrial function in response to dietary and exercise interventions in subjects in which biopsies are often not preferred, such as in elderly subjects. Investigating less invasive techniques will facilitate research in the future and could reduce discomfort of the research for participants.

Study objective

The primary objective of this study is to measure mitochondrial capacity and maximal oxygen consumption (VO2max) in endurance-trained and untrained young males in order to verify if NIRS can be used to analyse differences in mitochondrial function in a normal population. Mitochondrial capacity will be measured in the gastrocnemius and wrist flexor muscles to compare which site correlates best to measurements of whole body oxygen consumption. Furthermore, the current protocol is designed to measure mitochondrial function in peripheral blood mononuclear cells (PBMCs) and excess post exercise oxygen consumption (EPOC) in order to verify if these techniques can be used in future studies to assess mitochondrial capacity.

Study design

Cross sectional study

Study burden and risks

No direct health benefit for the subjects is expected. The experimental procedures are safe, but can be painful or cause discomfort to a certain degree. Blood sampling can cause local hematoma or bruising. The maximal exercise test can cause muscle soreness. The mitochondrial capacity test makes use of arterial occlusions by external pressure, which can be painful or uncomfortable and possibly could bruise the site of the occlusion. The subject is asked to fast overnight for the second day and remain fasted throughout the test session. The benefits of participation are a relevant contribution to scientific research and a financial compensation of ¤20 when completing the screening test day and an additional ¤40 euros when completing the study test day as well.

Contacts

Public
Wageningen Universiteit

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

18-28 year old male
BMI 18,5-25 kg/m2
VO2max * 47 mL/kg/min or VO2max * 57 mL/kg/min

Exclusion criteria

- Health concerns regarding respiratory and pulmonary diseases, such as COPD, (exercise induced) asthma and cardiovascular disease.
- (known symptoms of) Metabolic diseases, such as type I or II diabetes,
- Regular smoker (defined as smoking >5 cigarettes per week)
- Haemoglobin concentrations below 8.0 mmol/L

- Recent usage (within four months) of supplements with suggestive training effects, such as creatine phosphate, EPO or anabolic steroids.
- Usage of recreational drugs, such as marihuana, amphetamines and cocaine during the study (starting after screening day)
- Suffers from (sport) injury that hampers maximal exercise performance
- Blood donation during the course of study
- Current participation in other clinical trials
- Employed or undertaking a thesis or internship at the department of Human and Animal Physiology

Study design

Design

Study type: Observational invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Diagnostic

Recruitment

NL

Recruitment status:	Completed
Start date (anticipated):	17-09-2017
Enrollment:	16
Type:	Actual

Ethics review

Approved WMO

Date:	13-05-2017
Application type:	First submission
Review commission:	METC Wageningen Universiteit (Wageningen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

ID: 22088
Source: Nationaal Trial Register
Title:

In other registers

Register	ID
CCMO	NL60823.081.17
OMON	NL-OMON22088