

Carbohydrate-rich meals with sucrose for complete muscle and liver glycogen recovery within 12 hours after intense exercise

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The goal of this study is to assess the recovery of muscle and liver glycogen stores (by ingesting carbohydrates) within 12 hours after exhaustive exercise.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON49691

Source

ToetsingOnline

Brief title

Liver and muscle glycogen recovery

Condition

- Other condition

Synonym

not applicable

Health condition

Lever en spier onderzoek (geen aandoeningen)

Research involving

Human

Sponsors and support

Primary sponsor: Universiteit Maastricht

Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Carbohydrates, Glycogen, Recovery, Sucrose

Outcome measures

Primary outcome

To assess whether post-exercise liver and muscle glycogen stores can be fully replenished within 12 h after eating large amounts of carbohydrates (in 10 g/kg/12 h) that primarily contain sucrose.

Secondary outcome

To assess whether muscle glycogen concentrations as assessed with MRI are similar compared to muscle glycogen concentrations as assessed with skeletal muscle biopsies.

Study description

Background summary

Glycogen is another word for sugar storage within the human body. Hence, sugars are stored within the muscles and liver in the form of glycogen. During exhaustive exercise, the body will use these stored sugars to deliver energy to enable exercise performance. As a result, these sugar stores will be empty after prolonged moderate- to high-intensity exercise. By ingesting sufficient carbohydrates after exercise, these stores can be replenished again in both the muscle as well as the liver.

We have recently demonstrated that with sucrose (table sugar) ingestion, the recovery of these sugar stores in the liver can be doubled compared with glucose ingestion.

Given that (elite) athletes often need to recover fast after exercise because they need to optimally perform several days in a row (think about the Tour de

France, for example), it is important to accelerate the recovery of these sugar stores (glycogen) within the body. Therefore, we want to investigate whether the ingestion of large amounts of carbohydrates (mainly in the form of sucrose) can fully replenish liver and muscle glycogen stores within 12 hours.

Study objective

The goal of this study is to assess the recovery of muscle and liver glycogen stores (by ingesting carbohydrates) within 12 hours after exhaustive exercise.

Study design

Randomized cross-over design.

Intervention

The group of males will receive either nothing (only water/tea) or 10g/kg body mass of carbohydrates during 12 hours of recovery of exhaustive endurance exercise. The carbohydrate-rich meals will contain primarily sucrose. During 1 test day the participants will receive a carbohydrate-rich breakfast to determine (maximal) liver and muscle glycogen levels in rest. This is necessary to assess whether full recovery of liver and muscle glycogen can occur within 12 hours.

Study burden and risks

The burden and risks associated with participation are low. Participants will come to the university four times: 1 screening (2 hours), 2 experimental trials (each 17 hours) and 1 experimental trial (6 hours). During the screening visit, we will perform a DEXA and determine their VO₂max with a cycling test. For 2 days prior to the experimental trials, participants will be asked to keep their diets as consistent as possible and to refrain from consuming alcohol or performing any type of intense physical exercise. We will ask the participants to fill out a medical questionnaire and record their food intake and physical activity for the last 2 days prior to the experimental trials. For the experimental trial, participants will be fasted and will need to refrain from eating or drinking (except for water) from 22h00 the evening before. During 2 experimental trials, participants will complete an exercise session, additionally participants will receive either nothing (only water/tea) or large amounts of a carbohydrate-rich diet (primarily containing sucrose). During 1 experimental trial a carbohydrate-rich breakfast will be provided. The researchers involved will collect muscle and blood samples and perform MRI procedures (10x in total). For blood collection, insertion of the catheters is comparable to a blood draw and could result in a small hematoma. We will take 52 blood samples (8 mL) during the experimental trial. The total amount of blood drawn (416 mL) is less than the amount of a blood donation (500 mL) and

will be completely restored in approximately 1 month. We will collect in total 8 muscle biopsies from the vastus lateralis during two experimental trials. Muscle biopsies will be taken under local anaesthesia by an experienced physician, but may cause some minor discomfort up to 24 h after completion. The discomfort is comparable to muscle soreness or the pain one has after bumping into a table. There is no direct benefit for the participants except for their contribution to the scientific knowledge and this will provide the basis for novel nutritional interventions to accelerate post-exercise recovery for elite and recreational athletes, which will be obtained from this study and used in the future.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age

Adults (18-64 years)

Elderly (65 years and older)

Inclusion criteria

Males, aged between 18 and 40 y
BMI between 18.5 and 25 kg/m²
Well-trained endurance athletes (cyclists, runners, triathletes), with a VO₂max > 50 ml/kg/min.

Exclusion criteria

Female
VO₂max < 50 ml/kg/min
Celiac disease
Smoking
Diabetes
Cancer
Cardiovascular Disease
Donated blood within the last 2 months
Diagnosed GI tract diseases
Arthritic conditions
A history of neuromuscular problems
Vegetarian/vegan

Study design

Design

Study type:	Interventional
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Other

Recruitment

NL	
Recruitment status:	Recruitment stopped
Start date (anticipated):	22-09-2021

Enrollment: 15
Type: Actual

Ethics review

Approved WMO
Date: 28-10-2020
Application type: First submission
Review commission: METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

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: 24661
Source: NTR
Title:

In other registers

Register	ID
CCMO	NL74550.068.20
Other	Trialregister.nl
OMON	NL-OMON24661