The effects of protein dose response on myofibrillar and mitochondrial protein synthesis after endurance exercise in young men.

Published: 17-06-2015
Last updated: 15-05-2024

To define a dose-response relationship after intrinsically labeled milk protein ingestion on myofibrillar and mitochondrial muscle protein synthesis after a single bout of endurance exercise.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Protein and amino acid metabolism disorders NEC
Study type	Interventional

Summary

ID

NL-OMON42627

Source
ToetsingOnline

Brief title
Protein dose response on post-exercise protein synthesis

Condition

- Protein and amino acid metabolism disorders NEC
- Muscle disorders

Synonym
Muscle anabolism; muscle protein deposition

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: endurance exercise, exercise recovery, muscle protein synthesis, protein dose

Outcome measures

Primary outcome

Myofibrillar, and mitochondrial protein bound [13C6] phenylalanine and [13C6]

leucine enrichments.

Secondary outcome

Plasma glucose, insulin, leucine, phenylalanine, tyrosine, plasma

[13C6]phenylalanine, plasma [13C6] leucine, plasma D5-phenylalanine and plasma

(3,5-D2)-tyrosine enrichments.

Study description

Background summary

Dietary protein intake after exercise is necessary to maximally stimulate muscle protein synthesis rates [1]. Previous studies have shown that the ingestion of 20 grams of both egg and whey protein is sufficient to maximize both mixed and myofibrillar muscle protein synthesis after resistance type exercise [2, 3]. In addition, it has been observed that 20 grams of protein intake is sufficient to maximize myofibrillar muscle protein synthesis, but not mitochondrial muscle protein synthesis, after endurance exercise [4]. It is reasonable to suggest that mitochondrial muscle protein synthesis is most important for endurance athletes, as it will improve the oxidative capacity of the skeletal muscle in this athletic population. It remains to be elucidated whether higher doses (>20 grams) of protein ingestion are necessary to enhance mitochondrial muscle protein synthesis rates after endurance exercise. In addition, the effects of different doses of milk protein, as source of dietary protein, have never been tested on myofibrillar and mitochondrial muscle protein synthesis after endurance exercise. We aim to fill these gaps in our

understanding.

Study objective

To define a dose-response relationship after intrinsically labeled milk protein ingestion on myofibrillar and mitochondrial muscle protein synthesis after a single bout of endurance exercise.

Study design

Parallel design, randomized, placebo controlled, double blind.

Intervention

Subjects will perform endurance exercise and consume a combination of carbohydrate (45 gr) and different doses of intrinsically labeled milk protein (0, 15, 30, 45 gr). In addition, continuous intravenous tracer infusions will be applied, with plasma and muscle samples collected.

Study burden and risks

The risks involved in participating in this experiment are minimal. Insertion of the catheters in a vein is comparable to a normal blood draw and the only risk is a small local hematoma. This is also true for muscle biopsies. Muscle biopsies will be taken through a small (5 mm) incision, following local anaesthetic of the skin and muscle fascia, and will heal completely. Muscle biopsies will only be obtained by an experienced physician. The labeled, non-radioactive amino acids tracers that will be infused intravenously are produced according to GMP standards and are safe for human use. There is no risk associated with the DEXA scan. The radiation dose emitted during a DEXA scan is 0.001 mSv. This is a very low exposure compared to the total background radiation in the Netherlands, which is ~2.5 mSv/year. For comparison, the radiation dose during a flight higher than 10 km is 0.005 mSV*h-1.

Contacts

Public
Universiteit Maastricht

Universiteitssingel 50 G2.224
Maastricht 6200 MD
NL
Scientific
Universiteit Maastricht

Universiteitssingel 50 G2.224
Maastricht 6200 MD
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

- Males
- Aged between 18-35 years inclusive
- Bodyweight between 60-95 kg inclusive
- Healthy, moderately trained
- BMI < 30 kg/m2
- Having given informed consent

Exclusion criteria

- Having any identified metabolic or intestinal disorders
- Use of tobacco products
- Non-steroidal anti-inflammatory drugs (NSAID) in the 4 days prior to the experimental trial
- Allergies to milk proteins (whey or casein)
- Arthritic conditions
- A history of neuromuscular problems
- Previous participation in amino acid tracer studies
- Individuals on any medications known to affect protein metabolism (i.e. corticosteroids, non-steroidal anti-inflammatories, or prescription strength acne medications).
- Diabetes
- Training more than 6 days per week
- VO2max < 35 ml/kg/min or > 70 ml/kg/min
- Lactose Intolerance
- Phenylketonuria

- Blood donation within 2 months of study initiation

Study design

Design

Study type:	Interventional
Intervention model:	Parallel
Allocation:	Randomized controlled trial
Masking:	Double blinded (masking used)
Control:	Placebo
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	03-02-2016
Enrollment:	64
Type:	Actual

Ethics review

Approved WMO

Date:	17-06-2015
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: 24647
Source: Nationaal Trial Register
Title:

In other registers

Register	ID
CCMO	NL52519.068.15
OMON	NL-OMON24647