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

No registrations found.

Ethical review	Positive opinion
Status	Pending
Health condition type	-
Study type	Interventional

Summary

ID

NL-OMON24647

Source
Nationaal Trial Register

Health condition

Young males, Muscle protein synthesis

Sponsors and support

Primary sponsor: NUTRIM School for Nutrition, Toxicology, and Metabolism Maastricht University
Source(s) of monetary or material Support: TIFN

Intervention

Outcome measures

Primary outcome

Muscle protein synthesis rate (myofibrillar and mitochondrial)

Secondary outcome

• The fractional synthetic rate (FSR) of muscle protein synthesis (myofibrillar, and mitochondrial proteins) from 0-3 and 3-6 hours in the post-prandial period.

• Plasma free L-[ring-2H5]-phenylalanine enrichment (expressed as MPE)

• Plasma free L-[ring-2H4]-tyrosine enrichment (expressed as MPE)

• Plasma free L-[3,5-2H2]-tyrosine enrichment (expressed as MPE)

• Plasma free L-[ring-2H5]-phenylalanine enrichment

• Plasma free L-[1-13C]-leucine enrichment

• Plasma free L-[1-13C]-KIC enrichment

• Plasma total phenylalanine (expressed as ìmol/L)

• Plasma total tyrosine (expressed as ìmol/L)

• Total plasma amino acids (AAmax [ìmol/L])

• Plasma glucose (glucosemax [mmol/L])

• Plasma insulin (insulinmax [mU/L])

Study description

Background summary

Rationale: 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 stimulate myofibrillar muscle protein synthesis, but not mitochondrial muscle protein synthesis, after endurance exercise [4]. It is reasonable to suggest that mitochondrial muscle protein synthesis may be particularly 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.

Objective: To define the dose-response relationship after intrinsically labeled milk protein ingestion on whole-body, myofibrillar, and mitochondrial muscle protein synthesis after a single bout of endurance exercise in young men.
Study design: Parallel design, randomized, placebo controlled, double blind.

Study population: 48 young (20-30 y inclusive) healthy males.

Intervention (if applicable): 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.

Main study parameters/endpoints: Primary: myofibrillar, and mitochondrial protein bound [13C6] phenylalanine and [13C6] leucine enrichments. Secondary: plasma glucose, insulin, leucine, phenylalanine, tyrosine, plasma [13C6]phenylalanine, plasma [13C6] leucine, plasma D5-phenylalanine and plasma (3,5-D2)-tyrosine enrichments.

Study objective

30 grams of dietary protein ingestion is necessary to maximize whole-body, myofibrillar, and mitochondrial muscle protein synthetic response after a single bout of endurance exercise in healthy young males. Lower doses of protein (ie. 0 and 15 g) will be suboptimal while higher doses (ie. 45 g) will not induce a greater protein synthetic response.

Study design

t=0 drink; t=0 h, t=3 h, t=6 h skeletal muscle biopsies; 14 blood draws

Intervention

exercise bout and protein drink with different doses

Contacts

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Eligibility criteria

Inclusion criteria

- Males

- Aged between 18-35 years

- Bodyweight between 65-95 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 4 days per week

- VO2max < 35 ml/kg/min or > 70 ml/kg/min

- Phenylketonuria

- lactose intolerance

- blood donation within two months of study initiation

Study design

Design

Study type:	Interventional
Intervention model:	Parallel
Allocation:	Non controlled trial
Masking:	Double blinded (masking used)
Control:	Placebo

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-04-2015
Enrollment:	64
Type:	Anticipated

IPD sharing statement

Plan to share IPD: Yes

Plan description
Data (in de-identified form), code book, and analytic code will be made available upon request pending application and approval from the corresponding author.

Ethics review

Positive opinion

Date:	23-03-2015
Application type:	First submission

Study registrations

Followed up by the following (possibly more current) registration

ID: 42627
Bron: ToetsingOnline
Titel:

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

No registrations found.

In other registers

Register	ID
NTR-new	NL4973
NTR-old	NTR5111
CCMO	NL52519.068.15
OMON	NL-OMON42627

Study results