Protein ingestion prior to sleep as a dietary strategy to improve postexercise, overnight recovery

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

Summary

ID

NL-OMON33483

Source ToetsingOnline

Brief title muscle protein synthesis during sleep

Condition

• Other condition

Synonym muscle anabolism, muscle growth

Health condition

inspanningsfysiologie / spiergroei

Research involving

Human

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Sponsors and support

Primary sponsor: Universiteit Maastricht **Source(s) of monetary or material Support:** bedrijf,GlaxoSmithKline

Intervention

Keyword: exercise, muscle protein synthesis, overnight, protein

Outcome measures

Primary outcome

Muscle fractional synthetic rate

Secondary outcome

plasma glucose

plasma insulin

plasma amino acids

plasma tyrosine and phenylalanine enrichment

muscle free amino acid concentrations

muscle protein phenylalanine enrichment

Study description

Background summary

Resistance type exercise training stimulates both muscle protein synthesis and breakdown rates. A single bout of resistance type exercise has been shown to stimulate muscle protein synthesis for up to 48 hours. However, in the absence of food intake muscle protein breakdown exceeds protein synthesis rates. Protein ingestion during immediate post-exercise recovery stimulates muscle protein synthesis, inhibits protein breakdown, leading to net muscle protein accretion.

So far, only few studies have focused on muscle protein synthesis during overnight recovery. Previous work by Tipton et al suggests that 24h net protein

balance reflects the acute anabolic response to a single bout of exercise. However, recent work from our laboratory showed that post-exercise muscle protein synthesis rates during overnight sleep are close to basal fasting levels. Therefore, we hypothesise that muscle protein synthesis rates during overnight recovery can be stimulated by providing sufficient amino acids during the night.

We suggest that ingestion of a single bolus of intact casein represents an effective dietary strategy to augment plasma amino acid availability during sleep.

Allowing post-exercise muscle protein synthesis rates to be elevated during overnight recovery might be of considerable relevance to both enhance the benefits of exercise training in both athlete and clinical populations. For example, stimulating muscle protein synthesis during the sleeping recovery might augment muscle hypertrophy, increase mitochondrial mass, and/or improve muscle tissue repair.

Study objective

The present proposal is designed to assess the effects of protein ingestion prior to sleep on muscle protein synthesis overnight in a practical setting. After a full day on a standardized diet, subjects will perform an exercise-bout in the evening. Casein or a flavoured placebo will be ingested 30 min prior to sleep. We hypothesize that feeding casein prior to sleep will enhance muscle protein synthesis rates during overnight recovery.

Study design

Subjects report to the lab and receive a standardized meal. A primed, continuous infusion of isotopically labelled phenylalanine and tyrosine will be inserted. A second Teflon catheter will be inserted in the contralateral hand vein for arterialised blood sampling. The exercise protocol consists of a lower limb resistance type exercise workout with 8 sets of 10 repetitions on the horizontal leg press machine (Technogym BV, Rotterdam, The Netherlands) and 8 sets of 10 repetitions on the leg extension machine (Technogym BV, Rotterdam, The Netherlands). The entire protocol will require \sim 45 min to complete. One post-exercise drink (60 g carbohydrate and 20 g whey protein) will be provided after cessation of exercise. At the end of the exercise protocol (t=0), subjects will rest supine and a blood sample from the arterialised hand vein and a muscle biopsy from the vastus lateralis muscle will be obtained. At 23.30 h subjects will receive the test drink and the second muscle biopsy will be taken. Subsequently, subjects will rest supine until 24.00 h. This will be followed by a sleeping period of 7 h. The third muscle biopsy will be obtained at 7.00 h. Blood samples (8ml) will subsequently be taken from the arterialised hand vein at t=-120, -60, 0, 30, 60, 90, 120, 150, 165, 180, 210 min and t= 4, 5, 6, 7, 8, 9, 10 hours. Muscle biopsies will be taken at t=0 h, 2,5 h and 10 h

post-exercise.

Intervention

Subjects will ingest 500 ml water with or without 40 g intrinsically labelled casein 30 min prior to sleep. L-[1-13C]phenylalanine was used to produce intrinsically labeled milk proteins. Labeled proteins were obtained by infusing a cow with L-[1-13C]phenylalanine, collecting milk and purifying the casein fraction.

Study burden and risks

The risks involved in participating in this study are minimal. Insertion of the catheters in a vein is comparable to a normal blood draw and the only risk is a small local heamatoma. This is the same for the muscle biopsy. The incision made for obtaining the muscle biopsy (performed by an experienced physician) will heal completely. The labeled amino acids in both the infusion and in the casein are stable (not radio-active) and therefore completely safe. The rest of the food and drinks provided are normal foods or food ingredients and do not impose health risks.

Contacts

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Trial sites

Listed location countries

Netherlands

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Eligibility criteria

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

Inclusion criteria

healthy male between 20-30 years old recreationally active

Exclusion criteria

use of medication BMI > 25 inactivity

Study design

Design

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

Recruitment

NL	
Recruitment status:	Recruitment stopped
Start date (anticipated):	11-05-2010
Enrollment:	24
Туре:	Actual

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Ethics review

Approved WMO	
Date:	22-03-2010
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

No registrations found.

In other registers

Register CCMO ID NL29077.068.09