The impact of whey versus collagen protein ingestion on post-exercise myofibrillar and connective tissue protein synthesis rates

Published: 12-02-2020
Last updated: 10-04-2024

To assess the impact of whey and collagen protein on myofibrillar and connective tissue protein synthesis rates in muscle tissue obtained during recovery from exercise in vivo in humans.

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

Summary

ID

NL-OMON50063

Source
ToetsingOnline

Brief title
Whey vs collagen

Condition

- Other condition

Synonym
muscle health, Sarcopenia

Health condition

Spier en bindweefsel 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: Muscle, Protein, Resistance exercise

Outcome measures

Primary outcome

Primary study parameters are myofibrillar and connective tissue protein

synthesis rates.

Secondary outcome

Secondary study parameters are plasma amino acid concentrations, upper thigh

muscle thickness and body composition.

Study description

Background summary

Protein ingestion stimulates muscle protein synthesis and augments the muscle protein synthetic response to a single exercise session. In support, protein supplementation has been shown to augment the gains in muscle mass and strength following resistance exercise training. The force generated by contracting muscle is transferred through a network of collagenous connective tissue proteins to articulate the bone. Therefore, the remodelling of skeletal muscle connective tissue represents an essential component of muscle adaptation to exercise. A single exercise session increases muscle connective tissue protein synthesis rates. However, the impact of protein ingestion to augment post-exercise connective tissue protein synthesis rate remains to be established. Whey protein is considered the preferred protein source to maximize myofibrillar protein synthesis rates. However, whey protein contains insufficient glycine and proline to support the post-exercise increase in connective tissue protein synthesis rates. In contrast, dietary collagen protein is rich in glycine and proline and has, therefore, been proposed as a

preferred protein source to support connective tissue remodelling. We hypothesize that whey protein ingestion will stimulate greater myofibrillar protein synthesis rates and collagen protein ingestion will stimulate greater collagen protein synthesis rates in skeletal muscle tissue during post-exercise recovery in young men and women.

Study objective

To assess the impact of whey and collagen protein on myofibrillar and connective tissue protein synthesis rates in muscle tissue obtained during recovery from exercise in vivo in humans.

Study design

double-blind, placebo-controlled intervention study.

Intervention

All subjects will perform an exercise bout consisting of 6 sets of barbell squats at a workload of 60% 1RM with 15, 12, 10, 10, 8, 8 repetitions per set, respectively. Immediately following exercise, subjects will be randomly assigned to ingest a beverage (500 mL) containing either 30 g whey protein, 30 g collagen protein or non-caloric flavoured water (n=15 per group). Muscle biopsies will be collected to assess myofibrillar and connective tissue protein synthesis rates. Blood samples will be collected to assess post-prandial plasma amino acid availability.

Study burden and risks

The burden and risks associated with participation are low. Participants will come to the university twice: 1 screening (3 hours) and 1 experimental trial (9 hours). During the screening visit, we will perform a BIA and determine 1RM for the squat exercise. For 3 days prior to the experimental trial, 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 trial. 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 the experimental trial, participants will complete an exercise session, additionally one group will consume a milk-based protein beverage and one group will consume a collagen protein beverage (both commercially available food products) while the researchers involved will collect muscle and blood samples. For blood collection, insertion of the catheters is comparable to a blood draw and could result in a small hematoma. We will take 11 blood samples (10 mL) during the experimental trial. The total amount of blood drawn (110 mL)

is less than a third the amount of a blood donation (500 mL) and will be completely restored in approximately 1 month. We will collect 2 muscle biopsies from the vastus lateralis during the experimental trial. 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 improve health and functional capacity in older and more clinically compromised populations, which will be obtained from this study and used in the future.

Contacts

Public
Universiteit Maastricht

Universiteitssingel 60
Maastricht 6229 ER
NL
Scientific
Universiteit Maastricht

Universiteitssingel 60
Maastricht 6229 ER
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

Age between 18 and 35 y
BMI between 18.5 and 30 kg/m2
Prior experience with weight lifting exercise (at least half a year of weightlifting, 3 times per week and training with free weights)

Exclusion criteria

Celiac disease
Lactose intolerance
Smoking
Diabetes
Cancer
Cardiovascular Disease
Donated blood within the last 3 months
Pregnant
Hormone replacement therapy
Third generation oral contraceptives
Diagnosed GI tract diseases
Arthritic conditions
A history of neuromuscular problems
Any medications known to affect protein metabolism (i.e. corticosteroids, non-steroidal anti-inflammatories, or prescription strength acne medications).
Hypertension, high blood pressure that is above 140/90 mmHg.

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):	27-02-2020
Enrollment:	57
Type:	Actual

Ethics review

Approved WMO

Date:	12-02-2020
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

No registrations found.

In other registers

Register	ID
CCMO	NL72262.068.19