The effect of ingesting a whey and collagen protein blend on myofibrillar and connective tissue protein synthesis rates at rest and during recovery from exercise

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To assess the impact of the combined ingestion of whey and collagen protein on myofibrillar and connective tissue protein synthesis rates in muscle tissue obtained at rest and 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-OMON51634

Source
ToetsingOnline

Brief title
Blend Study

Condition

- Other condition

Synonym
Connective tissue, Muscle health

Health condition

Muscle and connective tissue research (no disorders)

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W,Gelita AG,Gelita AG;TKI Health-Holland,TKI Health-Holland

Intervention

Keyword: Collagen, connective tissue, Myofibrillar, Whey

Outcome measures

Primary outcome

- Myofibrillar protein-bound L-[ring-13C6] phenylalanine enrichment (expressed

as MPE)

- Muscle connective tissue protein-bound L-[ring-13C6] phenylalanine enrichment

(expressed as MPE)

- Average plasma L-[ring-13C6] phenylalanine enrichment over the 3.5 h period

before the study beverage and 5 h postprandial period.

Secondary outcome

* Plasma amino acid concentrations (expressed as *mol/L)

* Total plasma amino acids (AAmax [*mol/L])

* Plasma glucose (glucosemax [mmol/L])

* Plasma insulin (insulinmax [mU/L])

Study description

Background summary

The preservation of skeletal muscle mass is of great importance for maintaining

metabolic health and functional capacity. Skeletal muscle mass maintenance is regulated via changes in both muscle protein synthesis and muscle protein breakdown. Of the two, the stimulation of muscle protein synthesis is assumed to be the primary variable responsible for regulating the maintenance or gain in skeletal muscle mass. The two main anabolic stimuli that augment muscle protein synthesis are food intake, in particular dietary protein ingestion, and physical activity. Protein ingestion stimulates muscle protein synthesis and augments the muscle protein synthetic response to a single exercise session. In support, protein supplementation during recovery from exercise has been shown to augment the gains in muscle mass and strength following more prolonged, resistance-type exercise training. The force generated by contracting muscle is transferred through a network of connective tissue proteins towards the bone . Consequently, remodeling of skeletal muscle connective tissue represents an essential component of skeletal muscle adaptation to exercise. A single bout of exercise has been shown to stimulate muscle connective tissue protein synthesis rates. However, the impact of protein ingestion to further augment connective tissue (i.e. collagen) protein synthesis rates remains to be established .
Whey protein is considered the preferred protein source to maximize myofibrillar (i.e. myofiber contractile components) protein synthesis rates. However, whey protein contains relatively little glycine and proline and may, therefore, be ineffective to support the post-exercise increase in collagen protein synthesis rates. Recently, we demonstrated that milk protein ingestion actually lowers plasma glycine availability below baseline concentrations, implying that collagen tissue remodeling during recovery from exercise may be compromised by low plasma glycine availability. In contrast to whey protein, collagen protein is rich in glycine and proline and has, therefore, been proposed as a preferred protein source to support collagen tissue remodeling. While the impact of collagen protein ingestion on collagen tissue protein synthesis rates in skeletal muscle tissue remains to be established, recent studies have shown that collagen protein supplementation can strongly increase both skeletal muscle mass as well as strength gains following more prolonged resistance-type exercise training. Consequently, we hypothesize that the combined ingestion of whey plus collagen protein increases both myofibrillar and connective tissue protein synthesis rates in skeletal muscle tissue. The most ideal protein supplement for stimulating both myofibrillar and collagen protein synthesis is one that gives a rapid initial rise in plasma amino acid concentrations including proline and glycine concentrations. Data from a previous study conducted in this lab (not published yet; METC20-044) showed that a combination of whey and collagen protein with 25 g of whey protein and 5 g of collagen protein ingested during recovery from exercise resulted in the greatest increase in plasma essential amino acids without compromising post-prandial plasma glycine and proline availability. Therefore, the present study will assess the impact of the combined ingestion of 25 g whey and 5 g collagen protein on myofibrillar and connective tissue protein synthesis rates in muscle tissue obtained at rest and during recovery from exercise in vivo in humans.

Study objective

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

Study design

This study utilizes a double-blind, parallel-group, placebo-controlled intervention with two groups. In total, 28 healthy recreationally active male subjects (age: 18-35 y) will be included in the study. Subjects will perform a single unilateral resistance exercise session (leg press and leg extension) and will be randomly assigned to consume a beverage containing either a blend of 25 g whey and 5 g collagen protein or a placebo with non nitrogenous, non-caloric flavored water. Blood and muscle biopsies will be collected while a primed continuous infusion of L-[ring-13C6] phenylalanine infusion will be administered. The duration of the entire study will be approximately 24 months. This period includes screening, testing and data analysis of all 28 subjects.

Intervention

Participants will perform unilateral resistance exercise followed by the ingestion of either 30 g of a protein blend or a non-caloric placebo (flavored water). Continuous intravenous tracer infusion will be applied, and plasma and muscle samples will be collected in order to assess the muscle protein synthetic response.

Study burden and risks

The burden and risks involved in participating in this experiment are small. Insertion of the catheters in a vein is comparable to a normal blood draw and the only risk is a small local hematoma. Muscle biopsies will be obtained under local anesthesia by an experienced physician. The muscle biopsy may cause some minor discomfort, which is comparable to muscle soreness or the pain one has after bumping into the corner of a table. During the experimental trial 12 blood samples (~120 mL in total) will be obtained. The total amount of blood collected is less than half the amount of a blood donation and will be completely restored in approximately 1 month. The stable isotope amino acid tracers that will be infused intravenously during the experimental trial are produced according to GMP standards and are safe for human use. Participants will be instructed on proper utilization of the exercise equipment by the researcher to prevent injury. Participants will visit the University two times. The first visit will involve a screening visit (~3 h), during which the eligibility of the participant will be assessed and a bioelectrical impedance analysis (BIA) will be performed. Additionally, participants will be familiarized with single leg exercise on the leg press and leg extension

machine. The single leg one repetition maximum will be determined on the same machines. For the second visit (experimental trial) participants are required to come to the University in a fasted state, not having consumed any food or beverages (except for water) as from 22:00 the evening before. Also, 2 days prior to the experimental trial participants need to record their food intake and activities performed. During these 2 days* participants are not allowed to perform heavy physical exercise or drink alcohol. Filling out the food and activity log properly will take the participant 30-45 min each day. There is no direct benefit for the participants, except from their contribution to scientific knowledge.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)

Inclusion criteria

- Males

- Aged between 18-35 years
- Healthy, recreationally active (performing exercise between 1 and 4 times per week in the past 6 months)
- BMI 18.5 - 30 kg/m2
- No physical limitations (i.e. able to perform all activities associated with daily living in an independent manner).

Exclusion criteria

- Females
- Musculoskeletal disorders
- Use of any medications known to affect protein metabolism (i.e. corticosteroids, non-steroidal anti-inflammatories, or prescribed acne medications).
- Participation in any structured regular exercise program
- Chronic use of gastric acid suppressing medication or anti-coagulants
- Pathologies of the gastrointestinal tract
- Blood donation in the past 2 months

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):	13-09-2022
Enrollment:	38
Type:	Actual

Ethics review

Approved WMO Date:	04-07-2022
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
ClinicalTrials.gov	NCT05386771
CCMO	NL81201.068.22