The effects of single leg immobilization on muscle protein synthesis, protein breakdown, and glucose uptake in healthy young men

No registrations found.

Ethical review	Positive opinion
Status	Pending
Health condition type	-
Study type	Observational non invasive

Summary

ID

NL-OMON26917

Source NTR

Brief title Muscle protein turnover after immobilization

Health condition

Immobilization, muscle wasting

Sponsors and support

Primary sponsor: McMaster University Source(s) of monetary or material Support: Canadian Institutes of Health Research

Intervention

Outcome measures

Primary outcome

1) The effect of single leg immobilization on basal and postprandial skeletal muscle protein

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synthesis

2) The effect of single leg immobilization on basal and postprandial skeletal muscle protein breakdown

3) The effect of single leg immobilization on rates of skeletal muscle glucose uptake

Secondary outcome

1) The effect of single leg immobilization on muscle mass, muscle strength, and body composition

2) The effect of single leg immobilization on integrated (chronic) rates of muscle protein synthesis

Study description

Background summary

Periods of muscle disuse are commonly experienced in young and elderly individuals as a result of short-term hospitalization or leg casting after injury. Periods of immobilization result in a profound loss of muscle mass and strength. Aside from skeletal muscle's central role in movement, the muscle also plays a large role in general health. For example, skeletal muscle is the largest 'sink' into which blood sugar (glucose) is taken up following a meal. Leg immobilization results in an impairment in the body's ability to take up glucose into skeletal muscle tissue, which can eventually result in insulin resistance. In our study, we are interested in looking at the regulation of muscle growth and breakdown as well as the rate of glucose uptake by the muscle. Understanding the underlying mechanisms causing muscle loss after immobilization will help us to create interventions to prevent the loss of muscle mass and function during periods of disuse.

Study objective

Single leg immobilization affects muscle protein synthesis, breakdown, and glucose uptake

Study design

After 3 d immobilization

Pre and Post 3 d immobilization

Intervention

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Day 0

Upon arrival to the laboratory in the fasted state, a saliva and blood sample will be taken. Participants will then ingest heavy water that allows for measuring integrated muscle protein synthesis rates. Two hours after ingestion of the heavy water another sample of saliva and blood will be taken. Participants will then undergo a DXA scan to assess body composition and an ultrasound scan on the mid-thigh region of both legs for the assessment of muscle thickness. Maximal leg strength will be determined using Biodex. After the baseline measurements, a knee brace will be placed on one of the legs to start the immobilization period.

Day 1 - 3

During the immobilization period, participants will collect daily saliva samples upon waking.

Day 4

Participants will visit the lab in the fasted state. The knee brace will be removed and subjects will lie on the laboratory bed for the infusion trial. A catheter will be placed in both arms. Before beginning the infusion, a baseline blood sample will be obtained. Following the collection of the baseline blood sample, the first infusion (tracers and 2DG) will be initiated via one of the catheters and continued for the entire duration of the trial. Blood samples will be collected from the other catheter at multiple time points. After 1.5 hours, muscle biopsies are collected under local anesthesia from both legs. Another muscle biopsy will be taken from the immobilized and control leg 2 hours later, signifying the end of the fasted state measurements. Next, to simulate conditions after a meal, the second infusion containing a mixture of amino acids and dextrose will be started. Additional muscle biopsies will be collected from both legs at 90 and 180 minutes of the amino acid/dextrose infusion. The last muscle biopsy marks the end of the infusion trial. After ending the infusion trial, body composition, muscle thickness, muscle cross sectional area, and muscular strength will be measured.

Contacts

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Eligibility criteria

Inclusion criteria

- 1) Healthy males, between the ages of 18 and 30 y
- 2) BMI between 18.5 and 30.0 kg/m2
- 3) Able and willing to provide informed consent

Exclusion criteria

1) The use of anti-inflammatory and/or analgesic medication, whether it is prescription or not

2) A history of neuromuscular disorders or muscle/bone wasting diseases

3) Any acute or chronic illness, cardiac, pulmonary, liver, or kidney abnormalities, uncontrolled hypertension, insulin-dependent or insulin-independent diabetes, or the presence of any other metabolic disease – all of which will be determined via a medical history screening questionnaire

4) The use of any medications known to affect protein metabolism (glucocorticoids, nonsteroidal anti-inflammatory medication, or prescription strength acne medication, etc.)

- 5) A (family) history of thrombosis
- 6) The use of anticoagulant medications
- 7) Consumption of tobacco-containing products
- 8) Excessive alcohol consumption (>21 units/wk)

9) History of bleeding diathesis, platelet or coagulation disorders, or antiplatelet/anticoagulation therapy

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Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	Non controlled trial
Masking:	Open (masking not used)
Control:	N/A , unknown

Recruitment

NL	
Recruitment status:	Pending
Start date (anticipated):	01-11-2016
Enrollment:	8
Туре:	Anticipated

Ethics review

Positive opinion	
Date:	30-09-2016
Application type:	First submission

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.

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In other registers

Register	ID
NTR-new	NL59
NTR-old	NTR
Other	N/A :

NL5919 NTR6099 N/A : 2016-2192-GRA

Study results