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Effects of dietary protein distribution and resistance exercise training on muscle health in older adults

Submission date
05/09/2017

Recruitment status
No longer recruiting

Registration date
27/09/2017

Overall study status
Completed

Last Edited
05/07/2019

Condition category
Musculoskeletal Diseases

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and aims
A great deal of evidence indicates that muscle mass and function decline with increasing age, and the design of studies to preserve skeletal muscle has been a major research goal for the last 30 years. Resistance (strengthening) exercise training has been shown to be the most effective way of maintaining muscle function in older age, but given that dietary protein also affects muscle function, it is thought that this too could be an important factor in such interventions. Specifically, there is some evidence to suggest that the distribution of protein may be important – i.e., the amounts of protein consumed at different times of day. The aim of this study is to investigate the effects of two different protein distribution diets in combination with resistance exercise training on muscle-related outcomes.

Who can participate?
Women aged 65 years or older who are able to walk (with or without walking aids).

What does the study involve?
Participants are randomly allocated to either Spread or Pulse protein distribution groups. All participants receive a set of meal plans to follow for the two-week study duration; these either divide daily protein equally across breakfast, lunch and dinner (Spread group), or into a 10:80: 10% distribution across the meals (Pulse group). Participants also complete three exercise sessions per week, consisting of 6 sets of 8 repetitions of a leg strengthening exercise at a moderate intensity. They only exercise one leg, and comparisons are made between exercised and non-exercised legs as well as between the protein distribution groups. Small samples from participants' thigh muscles at the start and end of the study, as well as saliva samples are taken from participants. Participants drink a small amount of water containing a tracer molecule at the start and after one week. Blood samples are taken to measure markers of inflammation, and participants also complete a test of leg strength, at the start and end of the study. Participants are asked to record how well they follow the meal plan, so we can analyse compliance to the intervention.

What are the possible benefits and risks of participating?
Resistance exercise training has consistently been shown to have beneficial effects in older adults, such as increases in muscle size and strength. Participants may find the exercises or the tests of muscle function a little uncomfortable, especially if they are not accustomed to this type of activity. Some people find both the administration of the local anaesthetic and the biopsy procedure uncomfortable, and risks can include bruising, infection or insensitivity of the skin although these risks are very small. The blood sampling may also cause slight discomfort but the procedure is quick and the sampling will be done by a trained member of the study team. The tracer water has been known to cause feelings of dizziness and nausea, although this is unusual.

Where is the study run from?
The study is run by the University of Birmingham (UK), and takes place in the Heritage Building of the Queen Elizabeth Hospital (UK).

When is study starting and how long is it expected to run for?
April 2016 to December 2017

Who is funding the study
MRC-Arthritis Research UK Centre for Musculoskeletal Ageing Research (UK)

Who is the main contact?
1. Danielle Thomas
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Contact information

Type(s)
Scientific

Contact name
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Type(s)
Public

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Additional identifiers

EudraCT/CTIS number

IRAS number

ClinicalTrials.gov number

Secondary identifying numbers
RG_15-238

Study information

Scientific Title
Influence of Pulse vs Spread protein distribution in combination with resistance exercise training on muscle protein synthesis, muscle strength and markers of inflammation in older women

Acronym
PRODREX

Study objectives
There will be a significant difference in muscle health with different protein distributions. Based on previous studies, we hypothesise that improvements will be seen in both groups, however there will be greater improvement in the Pulse group.

Ethics approval required
Old ethics approval format

Ethics approval(s)
West Midlands - Black Country Research Ethics Committee, 18/03/2016, ref 16/WM/0005

Study design
Single-centre randomised parallel group trial

Primary study design
Interventional

Secondary study design
Randomised parallel trial

Study setting(s)
Hospital

Study type(s)
Quality of life

Participant information sheet

Not available in web format, please use contact details to request a participant information sheet

Health condition(s) or problem(s) studied
Sarcopenia

Interventions
Participants are randomly allocated to one of two groups, and receive a set of meal plans to follow for two weeks. Participants are randomised in advance by a UHB statistician using a computer generated programme and concealed in sequentially numbered opaque envelopes. Neither the investigators nor the participants are blinded following allocation for practical reasons. These plans will provide 1.2 g/kg/d of protein, divided across the day into one of two protein distributions:

Spread: 33:33:33% across breakfast, lunch and dinner
Pulse: 10:80:10% across breakfast, lunch and dinner

All participants will also complete three sessions per week of unilateral resistance exercise training , each session consisting of 6 x 8 reps at 75% 1-RM leg extension.

The main outcome measured is the rate at which muscles make new protein; we will take small samples from participants' thigh muscles at the start and end of the study, as well as saliva samples, and participants will drink a small amount of water containing a tracer molecule at the start and after one week. We will also take blood samples to measure markers of inflammation, and participants will also complete a test of leg strength, at the start and end of the study. Participants are asked to record how well they follow the meal plan, so we can analyse compliance to the intervention.

Intervention Type
Supplement

Primary outcome measure
Muscle protein synthesis is measured using D2O tracer, muscle biopsies and saliva samples at baseline and day 14

Secondary outcome measures
1. Leg extension strength is measured using 1-RM tests at baseline and day 14
2. Serum inflammatory markers IL-1, IL-6, IL-8, TNF-alpha, and the anti-inflammatory cytokine IL-10, are measured using blood samples taken at baseline and day 14
3. Compliance to diet intervention is measured using self-reported records of daily compliance to meal plans, and 3-day food diary between days 7 and 14

Overall study start date
04/08/2015

Completion date
30/06/2018

Eligibility

Key inclusion criteria

1. Aged 65 years or over
2. Female
3. Ambulatory (with or without walking aids)

Participant type(s)
Healthy volunteer

Age group
Senior

Sex
Female

Target number of participants
16

Total final enrolment
12

Key exclusion criteria
1. Already engaging in regular exercise (at least twice a week)
2. History of myocardial infarction within previous 2 years
3. Cardiac illness: moderate/ severe aortic stenosis, acute pericarditis, acute myocarditis, aneurysm, severe angina,
4. Clinically significant valvular disease, uncontrolled dysrhythmia, claudication within the previous 10 years
5. Thrombophlebitis or pulmonary embolus within the previous 2 years
6. History of cerebrovascular disease (CVA or TIA) within the previous 2 years
7. Treatment with anticoagulants (Warfarin, rivaroxaban, apixaban, dabigatran) and antiplatelets (dipyridamole, clopidogrel, prasugrel, ticagrelor, glycoprotein IIb/IIIa antagonists). Nb. those regularly taking aspirin will be asked to stop for 3 days prior to biopsies and restart the day after
8. Acute febrile illness within the previous 3 months
9. Severe airflow obstruction
10. Uncontrolled metabolic disease (e.g., thyroid disease or cancer)
11. Significant emotional distress, psychotic illness or depression within the previous 2 years
12. Lower limb fracture sustained within the previous 2 years; upper limb fracture within the previous 6 months; non arthroscopic lower limb joint surgery within the previous 2 years
13. Any reason for loss of mobility for greater than 1 week in the previous 2 months or greater than 2 weeks in the previous 6 months
14. Resting systolic pressure >200 mmHg or resting diastolic pressure >100mmHg
15. Poorly controlled atrial fibrillation
16. Poor (chronic) pain control
17. Moderate/ severe cognitive impairment (MMSE <23)
18. Renal impairment (Stage 4 or 5)

Date of first enrolment
18/04/2016

Date of final enrolment
31/03/2018

Locations

Countries of recruitment
England

United Kingdom

Study participating centre
University of Birmingham
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Study participating centre
Queen Elizabeth Hospital Birmingham
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Sponsor information

Organisation
University of Birmingham

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Sponsor type
University/education

ROR
https://ror.org/03angcq70

Funder(s)

Funder type
Charity

Funder Name
MRC-Arthritis Research UK Centre for Musculoskeletal Ageing Research

Results and Publications

Publication and dissemination plan
Results of this trial will be submitted for publication in peer reviewed journals. The manuscript will be prepared by the study team led by Dr Carolyn Greig and authorship will be determined by mutual agreement.

Intention to publish date
31/03/2019

Individual participant data (IPD) sharing plan
The datasets generated and/or analysed during the current study during this study will be included in the subsequent results publication.

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Basic results	version V6	05/07/2019	05/07/2019	No	No
Protocol file		10/04/2017	05/07/2019	No	No
HRA research summary			28/06/2023	No	No