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Milk intervention to improve muscle function and exercise in older adults

Submission date
29/10/2018

Recruitment status
No longer recruiting

Registration date
01/11/2018

Overall study status
Completed

Last Edited
30/11/2022

Condition category
Musculoskeletal Diseases

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

Plain English summary of protocol

Background and study aims
Older adults experience a steady decline in skeletal muscle mass and function with ageing (a condition termed sarcopenia), which puts them at increased risk of falls, frailty, disability, and death. Sarcopenia also creates a large personal burden to older adults and their families through the increased risk of loss of independence and poor quality of life. NHS costs related to sarcopenia, for example from increased disability and falls, are estimated to be more than £2.3 billion a year based on the latest National Institute for Health and Care Excellence. Sarcopenia can be made worse by chronic diseases, physical inactivity, and a poor diet. Eating the right amount of protein, in combination with resistance exercise (RE), has been shown to slow down muscle ageing and physical decline in studies using protein supplements. However, current research lacks in understanding the role of whole food sources of dietary protein such as dairy, fish, and meats in the prevention of sarcopenia in older adults, although the importance of a 'whole diet approach' for health is well recognised. Whole milk contains high quality proteins, minerals, vitamins, and biologically active fats. Milk in combination with exercise may provide a platform for developing a preventive strategy to maintain healthy muscles in older adults that does not involve drugs or medical products. This study has two aims. The first aim is to examine the use of milk (whole and skimmed) in combination with RE as an intervention to increase muscle function, strength, and mass in older adults aged 65 and over at risk of sarcopenia. The secondary aim of the study is to explore the impact of milk (whole and skimmed) in combination with RE on muscle function, strength, mass, and self-reported quality of life in older adults.

Who can participate?
Older adults aged 65 and over who live in the community and are at risk of sarcopenia based on weak grip strength or slow walking speed.

What does the study involve?
Thirty older adults who are suitable for the study will be divided randomly into three groups:
1. Whole milk + RE
2. Skimmed milk + RE
3. A control drink (cranberry juice) + RE
Their health and functioning will be measured at baseline at their own homes. This will be followed by a 6-week intervention at a local gym. Older adults will exercise at the gym in small

groups of 2-3 participants under the supervision of a sports medicine researcher twice a week over 6 weeks. The RE programme will include upper and lower body exercises using RE machines such as seated chest press and seated row, and it will be adjusted to their individual levels of fitness. Each exercise session (about 1 hour with warm-up and rests) will be followed by 500ml milk or control drink intake (2 glasses) in a recovery room over 45-50 minutes. Each participant will get another 500ml of milk or control drink to consume at home with their regular diet. After 6 weeks of intervention, the research team will measure participants' health (e.g. quality of life questionnaire, body composition) and functioning (e.g. grip strength, walking speed, balance) at their homes, and ask them about their experiences and opinion about the study.

What are the possible benefits and risks of participating?
There will be no immediate direct benefits to participants taking part. However, the results and participants' experiences in the study will aid our research team in developing a large intervention study using a 'whole food approach' for the maintenance of muscle health in older adults.
There is a small risk of muscle soreness and discomfort after each exercise session. Therefore, the participants will be monitored regularly for muscle soreness. It is expected that participants will experience change in blood pressure because of exercise. Blood pressure and heart rate will be measured before and after each exercise session. There is a small risk of upset stomach and stomach discomfort. Those with noticeable difficulties because of milk intake will be advised to opt out the study. There is also a small risk of appetite change during the intervention. Appetite and diet will be measured at baseline and after 6 weeks of intervention. There is a small risk of changes in blood sugar and weight gain because of juice and milk intake. Extra calories (energy) will be offset by exercise.

Where is the study run from?
The MIlkMAN study is being run by the Newcastle University researchers and takes place in the community (participants' homes and local gym)

When is the study starting and how long is it expected to run?
May 2018 to July 2019

Who is funding the study?
NIHR Newcastle Biomedical Research Centre (UK)

Who is the main contact?
Dr Antoneta Granic
antoneta.granic@newcastle.ac.uk

Contact information

Type(s)
Scientific

Contact name
Dr Antoneta Granic

ORCID ID
https://orcid.org/0000-0001-9247-899X

Contact details

Campus for Ageing and Vitality
Newcastle University
First Floor Biomedical Research Building
Room 1.43
Newcastle
United Kingdom
NE4 6BE
+44 (0)191 208 1112
antoneta.granic@newcastle.ac.uk

Additional identifiers

Protocol serial number
39660

Study information

Scientific Title
MIlk Intervention Muscle AgeiNg (MIlkMAN): pilot study

Acronym
MIlkMAN

Study objectives
Intake of 2 x 500 ml of whole milk in combination with resistance exercise twice a week for 6 weeks is a feasible and acceptable intervention to increase physical performance, muscle strength and mass in older adults aged 65 and over who are at risk of sarcopenia.

Ethics approval required
Old ethics approval format

Ethics approval(s)
North East – Newcastle and North Tyneside 1, 09/10/2018, ref: 18/NE/0265

Study design
Interventional randomised controlled trial

Primary study design
Interventional

Study type(s)
Treatment

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

Interventions
Current interventions as of 11/02/2019:
Thirty eligible participants (15 men and 15 women) will be stratified by gender (male, female) and age (aged 65-74 and 75+) and randomised into three arms using a randomisation procedure

to minimisation based on gender and muscle strength (hand grip strength), which will be conducted by an independent researcher using a free open-source (i.e. minimisation algorithm visible) minimisation software (e.g. MiniPy 0.3, http://minimpy.sourceforge.net or OxMaR, www.ccmp.ox.ac.uk/oxmar). The intervention groups are 'whole milk + resistance exercise' and 'skimmed milk + resistance exercise'. The control group is 'control drink + resistance exercise'. There will be 10 participants in each group, ideally matched for gender, grip strength, and sarcopenia risk.
Milk (whole or skimmed) or the control drink will be consumed as a bolus intake of 500 ml under the supervision of a researcher immediately after exercise over 40-50 minutes during the recovery period (or longer if needed). Another 500 ml will be consumed at participants' home over the next 4-5 hours, and it can be consumed with other foods as a part of participants' usual diet. 500 ml milk (cow) contains on average approximately 20 g of protein. Whole (cow) milk provides 66 kcal/100 ml of energy. Fresh milk will be provided by Arla (Arla Cravendale). Arla Cravendale whole milk contains 3.6 g fat, 3.4 g protein, and 4.7 g carbohydrates per 100 g of milk. Arla Cravendale skimmed milk contains 0.3 g fat, 3.6 g protein, and 4.9 g of carbohydrates per 100 g of milk. The energy of control drink (cranberry juice; Ocean Spray Classic) will be balanced to match the energy content of whole milk, and will be supplemented with maltodextrin (6.05 g of maltodextrin (3.8 kcal/g) per 100 g of juice).
Resistance exercise (RE) will be conducted over 6 weeks (twice a week over two non-consecutive days) in a small group of 2-3 participants, and will be supervised by a trained exercise physiologist. Four sets of 8-12 repetitions for upper and lower body exercise (seated leg press, seated leg curls, seated chest press and seated row) at the sub-optimal level of effort (70-79% repetition maximum) will be performed after a short worm-up exercise (e.g. 5 minutes of walking). Each set of RE will be followed by 1-2 minutes of resting period, and a rest of 4 seconds per repetitions. All RE sessions will be conducted in the community at a sports/recreation centre (The Parks, Contours gym & fitness suite, North Shields, North Tyneside Council). Each participant will get a free gym membership for the duration of the intervention. The first RE session will take about 1 hour and 30-40 minutes and will include a short induction programme at the gym conducted by a gym instructor. All subsequent RE sessions will take 1 hour.
The overall intervention duration is 6 weeks, with a total of 12 visits to The Parks gym. Each visit will include resistance exercise session (about 1 hour) and milk/control drink intake (45-50 minutes). Each participant will get another 500 ml of milk / control drink to consume at home. All 30 participants will be followed up at their own home one or two weeks after completing the intervention. A home-based post-intervention assessment will assess physical performance, muscle strength, muscle mass, self-reported quality of life, activities of daily living (disability), and participants' feedback (e.g. attitudes and barriers to milk/control drink consumption, appetite changes, their opinion about the study).

Previous interventions:
Thirty eligible participants (15 men and 15 women) will be stratified by gender (male, female) and age (aged 65-74 and 75+) and randomised into three arms using a computer-generated random number sequence (1:1 ratio permuted block sequence). The intervention groups are 'whole milk + resistance exercise' and 'skimmed milk + resistance exercise'. The control group is 'control drink + resistance exercise'. There will be 10 participants in each group, ideally 5 men and 5 women.
Milk (whole or skimmed) or the control drink will be consumed as a bolus intake of 500 ml under the supervision of a researcher immediately after exercise over 40-50 minutes during the recovery period (or longer if needed). Another 500 ml will be consumed at participants' home over the next 4-5 hours, and it can be consumed with other foods as a part of participants' usual diet. 500 ml milk (cow) contains on average approximately 20 g of protein. Whole (cow) milk provides 66 kcal/100 ml of energy. Fresh milk will be provided by Arla (Arla Cravendale). Arla Cravendale whole milk contains 3.6 g fat, 3.4 g protein, and 4.7 g carbohydrates per 100 g of

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Intervention Type
Mixed

Primary outcome(s)
Levels of feasibility and acceptability of the study including:
1. Feasibility of identification and recruitment of community-based participants, assessed using a statistical calculation of the percentage of patients screened through general practices data base that meet exclusion and inclusion criteria. This calculation is completed before participant randomisation into control and intervention groups
2. The willingness of community-based participants to participate, assessed using a statistical calculation of the number and percentage of participants who returned reply slips with 'yes' answer expressing their interest in the study out of 200 participants' packs sent. This calculation is completed before screening home-based interview
3. The practicality of delivering assessments/intervention in the proposed setting (participants home and community gym), assessed through feedback from participants and research assistants experiences during an interview using structured and open-ended questions at the post-intervention home visit (after 6 weeks of intervention)
4. Acceptability of the assessment and intervention (whole milk and resistance exercise) to participants, assessed using a post-intervention interview using structured multiple-response questions and standardised open-ended questions
5. Response rates (percentage) to questionnaires, assessments and intervention at home-based screen interview, baseline and post-intervention interview
6. Attrition rate between baseline and 12 consecutive intervention visits to a local gym (The Parks), assessed using a statistical calculation of the percentage of participants dropping out from baseline to intervention visit 6, and from baseline to intervention visit 12
7. Time needed to collect and analyse data (total time in days and months), assessed using a statistical calculation of the total time in days from the first contact with participants over the

phone (pre-screen) until last post-intervention visitm and the total time in days from data entry, cleaning, analysis and report writing

Key secondary outcome(s))

Current secondary outcome measures as of 11/02/2019:
1. Usefulness of the SARC-F measured at pre-screening by comparison to measures of grip strength and walking speed measured at screening.
Exploratory analysis of within and between-group differences in:
2. Physical functioning, measured using the Short Physical Performance Battery (SPPB) comprising of balance test, 4m-gait speed, and 5-chair stands at the baseline and after 6 weeks of intervention (post-intervention home-based interview)
3. Muscle strength (maximum strength test), measured as grip strength using a hand-held dynamometer at the baseline and after 6 weeks of intervention (post-intervention home-based interview)
4. Body composition, measured using bioelectrical impedance analysis (BIA) (body weight, BMI, muscle mass, fat mass) at the baseline and after 6 weeks of intervention (post-intervention interview)
5. Self-reported quality of life, assessed using the 12-item Short Form Survey (SF-12) at the baseline and after 6 weeks of intervention (post-intervention interview)
6. Activities of daily living, assessed using the Barthel Index at the baseline and after 6 weeks of intervention (post-intervention interview)

Previous secondary outcome measures:
Exploratory analysis of within and between group differences in:
1. Physical functioning, measured using the Short Physical Performance Battery (SPPB) comprising of balance test, 4m-gait speed, and 5-chair stands at the baseline and after 6 weeks of intervention (post-intervention home-based interview)
2. Muscle strength (maximum strength test), measured as grip strength using a hand-held dynamometer at the baseline and after 6 weeks of intervention (post-intervention home-based interview)
3. Body composition, measured using bioelectrical impedance analysis (BIA) (body weight, BMI, muscle mass, fat mass) at the baseline and after 6 weeks of intervention (post-intervention interview)
4. Self-reported quality of life, assessed using the 12-item Short Form Survey (SF-12) at the baseline and after 6 weeks of intervention (post-intervention interview)
5. Activities of daily living, assessed using the Barthel Index at the baseline and after 6 weeks of intervention (post-intervention interview)

Completion date

19/08/2019

Eligibility

Key inclusion criteria

Current inclusion criteria as of 11/02/2019:
1. Aged ≥65 years
2. Living in the community
3. Registered patient with one of the general practice (GP) surgeries in North East and North Cumbria CRN (lead: Laura Renwick, Research Operation Officer).

Previous inclusion criteria:
1. Aged ≥65 years
2. Living in the community
3. Registered patient with one of the general practice (GP) surgeries in North East and North Cumbria CRN (lead: Laura Renwick, Research Operation Officer).
4. Low grip strength (<20 kg in women, and <30 kg in men) or slow walking speed (<0.8 m/s or ≥5 s over 4 m distance), which are established components of sarcopenia (this will be established at the screening assessment at participants' home)

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Senior

Sex
All

Total final enrolment
30

Key exclusion criteria
1. Living in care homes (residential or nursing)
2. Lacks capacity to consent
3. Self-reported lactose intolerance or milk allergies
4. Dislikes milk
5. Unable to understand instructions for muscle strength and function assessments in English or unwilling to participate in protocol when explained
6. Dislikes gym exercise with equipment
7. Doctor diagnosed diabetes I and II
8. Doctor diagnosed impaired renal function (estimated glomerular filtration rate <30 ml/min/1.73m²)
9. Doctor diagnosed liver function impairment, including viral hepatitis, alcoholic hepatitis, liver cirrhosis, biliary obstruction, non-alcoholic fatty liver disease, ischemic liver injury
10. Significant respiratory disease, including COPD, severe asthma, and bronchitis
11. Doctor diagnosed gastrointestinal tract disease, including gastritis, peptic ulceration, inflammatory bowel disease, gastric carcinoma, pancreas disease
12. History of neuromuscular problems and all other co-morbidities that substantially interact with mobility and muscle metabolism, including severe arthritis, rigidity, paralysis
13. Pacemaker or severe heart failure or any other significant heart disease
14. Uncontrolled hypertension (160/100) and uncontrolled hypotension (<100 systolic)
15. Hip or knee replacement
16. BMI ≥30 kg/m²
17. Unintentional weight loss ≥5 kg for the last 3 months
18. Taking warfarin
19. Structured resistance exercise training and gym-based programme in last month
20. An individual who the General Practitioner feels it is inappropriate for the researchers to

approach — the general practitioner has detailed knowledge of patients and may consider individual unsuitable for approach for reasons such as end stage terminal disease or safety risk such as any physical and medical conditions that preclude safe participation in an exercise programme

Date of first enrolment
19/11/2018

Date of final enrolment
15/04/2019

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
The Parks
Howdon Road
North Shields
United Kingdom
NE29 6TL

Sponsor information

Organisation
Northumbria Healthcare NHS Foundation Trust

ROR
https://ror.org/01gfeyd95

Funder(s)

Funder type
Government

Funder Name
NIHR Newcastle Biomedical Research Centre; Grant Codes: Not Known

Results and Publications

Individual participant data (IPD) sharing plan

The data sharing plans for the current study are unknown and will be made available at a later date.

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	qualitative results	19/05/2020	03/09/2020	Yes	No
Results article	results	10/07/2020	03/09/2020	Yes	No
Protocol article	protocol	08/10/2019	03/09/2020	Yes	No
HRA research summary			28/06/2023	No	No
Other publications	narrative review	20/05/2020	03/09/2020	Yes	No
Protocol (other)	V2	02/01/2019	30/11/2022	No	No