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The effect of consuming a fish protein powder supplement during recovery from a strength training session on markers of muscle-building in young men

Submission date
04/11/2021

Recruitment status
No longer recruiting

Registration date
11/11/2021

Overall study status
Completed

Last Edited
10/01/2025

Condition category
Other

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

Plain English summary of protocol

Background and study aims
Appropriate nutrition intake after resistance (strength) training aids recovery and can positively influence the muscle-building process. The majority of research in this area has focused on the type, timing and amount of protein ingested in the post-exercise period. The industry gold standard protein source, whey protein, stimulates the muscle-building process faster than other sources, such as casein and vegetable protein sources.
The aim of this study is to investigate whether a new fish-derived protein powder supplement can impact the muscle building process after a single session of exercise training in a similar manner to a whey protein supplement. To test this, participants will perform a full-body resistance training session before ingesting a protein supplement and then remain in the laboratory for 6 hours after ingesting the supplement in order to provide breath, blood and urine samples that will allow the researchers to understand the activation of muscle building process during this time.
This fish-derived protein supplement is from blue whiting, is economical and environmentally efficient and aims to improve the sustainability of the sector. It was developed by Bio-Marine Ingredients Ireland, a fish processing company based in County Monaghan, and the research is funded by a government agency known as the Marine Institute under a funding mechanism that seeks to improve the commercial value and sustainability of the marine industry in Ireland.

Who can participate?
Non-smoking men between 18 and 40 years of age who are free from chronic metabolic disease (e.g. diabetes), are not currently using any chronic medications (especially anticoagulatory medications), have never used performance-enhancing drugs (e.g testosterone) even for medical reasons, and have a body mass index of <30 kg/m², and who have been performing two or more resistance exercise sessions per week for more than 2 years.

What does the study involve?
Participants are requested to attend three visits to the Metabolic Research Unit in DCU, with

each visit separated by 1 or 2 weeks. In each of these visits, participants must arrive having fasted from 10 PM the night before and after having not performed any vigorous exercise training for 48 hours. They will be provided with pre-prepared meals for the day before each visit in order to standardise their preparation for each visit. For each visit, participants will also be asked to drink a pint of water 2 hours before they are due to visit the lab. Each visit will last around 7 hours. Participants will provide breath, urine and blood samples at regular intervals throughout the visit after having performed a resistance exercise training session of about 45 minutes in length, and having drank one of the following drinks on each occasion:

1. Blue whiting protein hydrolysate (BWPH)
2. Whey protein isolate (WPI)
3. Non-essential amino acids (NEAA)

The amount of protein powder will be about 20 to 30 g depending on the participant's weight, and this is typical of what people ingest in a standard protein shake. In each drink, the researchers will add a small amount of a labelled amino acid known as [^{13}C]leucine, and when the researchers analyse the breath samples they can detect how much of this amino acid was used by the body or excreted in the breath. These measurements allow the researchers to calculate how “anabolic” (i.e. muscle building) each one of the protein sources is. ^{13}C refers to a stable isotope of carbon, but this is not to be confused with a radiolabelled isotope. Stable isotopes like ^{13}C are naturally present in the environment, including foods, and for this experiment, the researchers simply give participants a little more than would usually be present in food so that they can measure it accurately in the breath samples.

At the end of the data collection each day, participants will be provided with a meal before they leave the lab, but during the visit, they will only be provided water (as much as they like) and the protein powder after the training session.

As part of the data collection process, the researchers will be collecting some personal data, specifically, name; age; informed consent; and body composition (height, weight, muscle, fat). Breath, urine and blood samples will also be collected. Breath will be collected by breathing into a bag from which the researchers can collect a small sample in a tube for later analysis. Urine will be collected in jug-like containers from which the researchers will keep a small sample for later analysis. Blood will be collected from a small plastic needle known as a cannula that will stay in place in the participant's arm for the duration of each visit, so they will only have one needle “prick” each visit.

Breath samples will be used to measure ^{13}C “enrichment” and allow the researchers to assess the anabolic potential of the protein powders. Urine will be used to measure the breakdown of protein. Blood will be used to analyse the digestion of the protein powders into amino acids.

What are the possible benefits and risks of participating?

There are no direct benefits to participants, but they will receive information on their present level of body fat and muscle mass, which many people find interesting to know about themselves, and three days worth of meals, plus three individual meals, are provided during the study, which again some people may view as a benefit.

There are no major risks associated with this study. There is a minor risk that participants may receive minor bruising from the needle used to draw their blood. There is also a very low risk of developing a mild skin infection if the area of your arm from where the blood is drawn is not treated with appropriate aseptic care. To ensure these risks are kept to a minimum, a person trained specifically for this purpose will be employed to undertake this procedure. The procedures employed have been used extensively by the researchers conducting this study and are generally well-tolerated by participants. The researchers will take all possible precautions to avoid infection during these procedures. These samples will be taken with sterile disposable needles, drapes and gauze; in fact, sterile (aseptic) techniques are used during all sampling procedures. All of the procedures described are standard procedures for the evaluation of the response to food intake. These procedures are currently the best methods for the questions

being addressed. Participants will be asked to perform a resistance exercise training session that is similar to what they would usually perform as part of their training so this also carries a negligible risk of injury other than what participants usually expose themselves to as part of their training.

When is the study starting and how long is it expected to run for?
June 2021 to December 2021

Who is funding the study?
Marine Institute (Ireland)

Who is the main contact?
1. Dr Mark Evans, Mark.Evans@dcu.ie
2. Dr Brendan Egan, Brendan.Egan@dcu.ie

Contact information

Type(s)
Scientific

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Dr Brendan Egan

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
BII01

Study information

Scientific Title
The effect of acute ingestion of a blue whiting-derived soluble protein hydrolysate powder on the anabolic response to a single session of resistance exercise in trained young men

Study objectives
The aim of the research is to investigate the effect of acute ingestion of a blue whiting-derived soluble protein hydrolysate (BWPH) on the anabolic response to a single session of resistance exercise in trained young men, and compare this response to ingestion of isonitrogenous quantities of non-essential amino acids or whey protein concentrate (WPC).

Stated as a null hypothesis, there will be no difference in the anabolic response to acute ingestion of BWPH and WPC.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 15/06/2021, Dublin City University Research Ethics Committee (Research and Innovation Support, Dublin City University, Glasnevin, Dublin 9; +353 (0)17008000; rec@dcu.ie), ref: DCUREC/2021/152

Study design
Double-blind randomized cross over trial with a within-subjects repeated measures design

Primary study design
Interventional

Secondary study design
Randomised cross over trial

Study setting(s)
Other

Study type(s)
Other

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
Anabolic response to acute resistance exercise and protein ingestion in young men

Interventions
This study will employ a within-subjects repeated measures design, comprising of ten resistance-trained male participants. After consenting to participate, participants will be asked to attend the laboratory at the School of Health and Human Performance for three identical visits separated by 1 to 2 weeks each. For each visit, participants will be asked to have not exercised

vigorously for the previous 48 hours and be overnight fasted from 10 PM the previous evening. Food will be provided to participants for the 24 h prior to each experimental visit (Gourmet Fuel, Dublin) standardised based on body mass and providing 60%, 20%, 20% carbohydrate, protein and fat respectively.

Each visit will be identical except for the drink consumed, and will involve the ingestion of one of the three conditions below ("Test drinks"). Participants will arrive at the lab fasted, will have their height, weight and body composition (SOZO device; bioelectrical spectroscopy) assessed and provide baseline breath, blood and urine samples. Participants will then complete a 35 min whole-body resistance exercise training session using machine weights and consisting of 3 x 10-12 repetitions of six different exercises. After voiding the bladder, returning to the lab and providing a post-exercise breath sample, participants will ingest one of the three experimental drinks in a randomised order. The trial order will be allocated using an online random number generator. This trial is double-blinded i.e. the investigator preparing trial drinks will not be involved in data collection. Following this the participants will remain in the Performance Lab for 6 hours providing breath and blood samples at regular intervals (every 20 or 30 min), and during when a pooled urine sample will be collected

The order of the drink condition will occur in a double-blind randomised crossover design. The three conditions will be as follows:
1. 0.33 g/kg body mass blue whiting protein hydrolysate (BWPH)
2. 0.33 g/kg body mass whey protein isolate (WPI)
3. 0.33 g/kg body mass non-essential amino acids (NEAA)

Intervention Type
Supplement

Primary outcome measure
Dietary net leucine balance (the difference between leucine intake and total exogenous leucine oxidation), measured by $^{13}CO_2$ enrichment of breath samples by isotope-ratio mass spectrometry over the 6-hour recovery period

Secondary outcome measures
Between-condition comparison of:
1. Total amino acid concentrations in plasma measured by high-performance liquid chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. Area under the curve (AUC), peak concentration (Cmax), and time to peak concentration (Tmax) will be calculated from these data points
2. Essential amino acid concentrations in plasma measured by high-performance liquid chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. AUC, Cmax, and Tmax will be calculated from these data points
3. Branched-chain amino acid concentrations in plasma measured by high-performance liquid chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. AUC, Cmax, and Tmax will be calculated from these data points
4. Non-essential amino acid concentrations in plasma measured by high-performance liquid chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. AUC, Cmax, and Tmax will be calculated from these data points
5. Individual amino acid concentrations in plasma measured by high-performance liquid

chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. AUC, Cmax, and Tmax will be calculated from these data points
6. Alpha-ketoisocaproate (KIC) concentrations in plasma measured by high-performance liquid chromatography at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks. AUC, Cmax, and Tmax will be calculated from these data points
7. [^{13}C]leucine in urine measured by liquid chromatography tandem mass spectrometry (LC/MS /MS) before exercise, and in pooled samples collected over 6 hours after ingestion of the drinks
8. Breath enrichment of $^{13}CO_2$ measured by isotope ratio mass spectrometry at 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 210, 240, 270, 300, 330, and 360 minutes after ingestion of the drinks

Overall study start date
01/06/2021

Completion date
31/12/2021

Eligibility

Key inclusion criteria
1. Healthy males aged between 18 and 40 years of age
2. Non-smokers
3. Free from chronic metabolic disease and coagulation disorders
4. Not have any chronic medication use for >6 months
5. Body mass index of <30 kg/m^2
6. Self-declared as never having taken performance-enhancing drugs (e.g exogenous testosterone), even for medical reasons
7. Self-report a resistance (strength) training history of >2 years or two or more resistance exercise training sessions per week

Participant type(s)
Healthy volunteer

Age group
Adult

Lower age limit
18 Years

Upper age limit
40 Years

Sex
Male

Target number of participants
10

Total final enrolment

10

Key exclusion criteria
1. <18 or >40 years of age
2. Smokers
3. Suffering or previously suffering from a chronic metabolic disease and/or coagulation disorder
4. Chronic medication use >6 months
5. Body mass index >30 kg/m²
6. Currently of previously used performance enhancing drugs
7. Resistance training history <2 years

Date of first enrolment
01/09/2021

Date of final enrolment
30/11/2021

Locations

Countries of recruitment
Ireland

Study participating centre
Dublin City University
Metabolic Research Unit
School of Health and Human Performance
Lonsdale Building
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Sponsor information

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Sponsor type
University/education

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ROR
https://ror.org/04a1a1e81

Funder(s)

Funder type
Government

Funder Name
Marine Institute

Alternative Name(s)
Foras Na Mara

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Ireland

Results and Publications

Publication and dissemination plan
Planned publication in a Q1 sport science/nutrition/physiology peer-reviewed journal and dissemination of this work at annual scientific congresses. Additional documents are not available.

Intention to publish date
30/06/2024

Individual participant data (IPD) sharing plan
Anonymised raw participant data generated during and/or analysed during the current study will be available from the Principal Investigator Brendan Egan (brendan.egan@dcu.ie) on reasonable request upon completion of the study. Data for all primary and secondary outcome measures will be available in the form of fully-anonymised data points at the individual participant level.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		01/01/2025	10/01/2025	Yes	No