ISRCTN10030424 https://doi.org/10.1186/ISRCTN10030424

Digestibility of broad bean (faba bean) protein compared to whey protein

Submission date 06/06/2025	**Recruitment status** No longer recruiting	[_] Prospectively registered [X] Protocol
Registration date 11/06/2025	**Overall study status** Completed	[_] Statistical analysis plan [_] Results
Last Edited 06/06/2025	**Condition category** Other	[_] Individual participant data [X] Record updated in last year

Plain English summary of protocol

Background and study aims
Plant-rich diets are recommended for health and environmental sustainability. Recently, there has been great interest in how we can maximise land use efficiency in the United Kingdom and Ireland by growing a wider range of plant crops. One promising plant source of protein is faba beans, commonly known as broad beans. However, it is unknown if its protein is readily digested in comparison to high-quality animal proteins, such as whey protein (coming from cow's milk). It is also unknown how the digestion of faba bean protein influences things like the secretion of gut hormones that influence appetite, and the levels of glucose in the blood. This study aims to examine how well faba bean protein is digested and how this affects metabolism compared with whey protein, when they are consumed as a drink alone or in combination with glucose.

Who can participate?
Healthy volunteers aged 18 to 40 years

What does the study involve?
Eligible individuals who signed the consent form will be invited to attend four visits (in a fasted state) that took place in the Northern Ireland Clinical Research Facility, Belfast, at least one week apart.

At each visit, participants consumed one of the following drinks:
• Whey protein OR
• Faba bean protein OR
• Whey protein in combination with glucose (50g) OR
• Faba bean protein in combination with glucose (50g)

The drinks will be given in a random order, which is computer-generated. The protein content of the drinks is based on participants' body weight, with 0.4g of protein per Kg of body weight in every drink. All drinks will be prepared using 450ml of bottled water together with the protein powder and flavoured with a sugar-free fruit cordial for flavour.

At the first visit, participants completed a short lifestyle questionnaire with questions about gender, age, usual food and drink consumption, alcohol intake, usual level of physical activity and smoking status. Their height, weight and waist circumference will also be measured.

At each visit, a trained research nurse collects participants' blood samples (60ml in total) on five occasions: shortly before being given the drink and again after 30 minutes, 60 minutes, 90 minutes, and 120 minutes. These samples will be used to measure nutritional and metabolic markers, including gut hormones, insulin, glucose and levels of amino acids (the building blocks of proteins). Participants will also be asked to rate their hunger (each time a blood sample was collected) and to indicate what they thought of the taste and texture of the drink they had (after the last blood draw).

What are the possible benefits and risks of participating?
Benefits of participating
Participants had the opportunity to help us understand how faba bean protein is digested and how it affects metabolism compared to whey protein. This will help a range of stakeholders, including farmers, food producers and nutrition and health experts, understand more about how faba beans can support human health. They also received a token of appreciation for the time it took to participate in this research: a £100 voucher after the first two visits and a further £100 voucher after the last two visits.

Side effects
The content of both drinks (faba bean and whey protein) is available to purchase, widely consumed and well tolerated, so the risk of any adverse effects was very low. Potential hazards associated with taking blood samples include minor discomfort, fainting and bruising due to the insertion of the cannula and providing blood. However, few cases of the above are expected, thanks to the fully trained member of staff who will ensure the safe collection of the blood samples. Additionally, following completion of all measurements, all participants will be given time to relax and a snack and drink to take away with them.

Where is the study run from?
This research study is managed and run by the Centre for Public Health, Queen's University Belfast. The study visits will take place in the Northern Ireland Clinical Research Facility, U Floor, Belfast City Hospital.

When is the study starting and how long is it expected to run for?
October 2023 to July 2024

Who is funding the study?
1. The Department of Agriculture, Environment and Rural Affairs (DAERA)
2. The Department of Agriculture, Food and the Marine (DAFM)

Who is the main contact?
1. Dr Eleni Spyreli, Research Fellow, Eleni.spyreli@qub.ac.uk
2. Professor Michelle McKinley, Professor, M.mckinley@qub.ac.uk

Contact information

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil Known

Secondary identifying numbers
DAFM 2019 Competitive Research Fund: CRF 19/R/702

Study information

Scientific Title
Effect of faba bean protein versus whey protein on human metabolic responses: a single-blind, randomised, acute crossover study

Acronym
U-Protein

Study objectives

Hypothesis 1 – A beverage containing faba bean protein will have a similar stimulatory effect on glucagon-like peptide-1 (GLP-1) and satiety hormone secretion but will have lower amino acid availability compared to whey protein.

Hypothesis 2 – A beverage containing faba bean and glucose will attenuate the postprandial glycaemic response to a greater extent than a beverage containing the same dose of whey protein and glucose.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 16/02/2024, Faculty of Medicine, Health and Life Sciences Research Ethics Committee, Queen's University Belfast (90 Lisburn road, Belfast, BT9 6AF, United Kingdom; +44 (0)28 9097 2529; facultyrecmhls@qub.ac.uk), ref: MHLS 24_11

Study design
Single-blind randomized acute crossover intervention trial

Primary study design
Interventional

Secondary study design
Randomised cross over trial

Study setting(s)
University/medical school/dental school

Study type(s)
Other

Participant information sheet
See study outputs table

Health condition(s) or problem(s) studied
This is an acute feeding study in healthy adults

Interventions
Participants will complete four acute interventions (two tests, as shown below) in a random order (randomisation was carried out using a computer programme) with at least a one-week washout between studies. At each visit, participants will consume one of the four test beverages detailed below.
Test 1
- Intervention 1: Whey protein (WP), 0.4g/kg body weight
- Intervention 2: Faba bean protein (FP), 0.4g/kg body weight
Test 2
- Intervention 3: Whey protein (WP) and glucose load, 0.4g/kg body weight WP + 50g glucose
- Intervention 4: Faba bean protein (FP) and glucose load, 0.4g/kg body weight FP + 50g glucose
Test beverages will be prepared fresh for each participant just before consumption and will be served in opaque containers. For interventions 1 and 2 (WP vs FP), beverages will be prepared using bottled water (450ml) together with protein powder equating to 0.4g/kg/d for the

participant and flavoured with a sugar-free flavouring (e.g. commercially available cordial). The test beverages for interventions 3 and 4 (WPG vs FPG) will be prepared in the same way, but with the addition of 50g glucose. Participants will be asked to consume beverages within 15 minutes of serving.

Intervention Type
Supplement

Primary outcome measure
Circulating concentrations of GLP-1 measured using a Mesoscale Discovery (MSD) analyser in plasma blood samples at T0 (before the drink is consumed), T30, T60, T90 and T120 (minutes)

Secondary outcome measures
Circulating concentrations of the following molecules in plasma blood samples at T0 (before the drink is consumed), T30, T60, T90 and T120 (minutes):
1. Other satiety hormones (C-Peptide, GIP, glucagon, insulin, leptin and PYY) measured using a Mesoscale Discovery (MSD) analyser
2. Glucose measured using a glucose oxidase analyser
3. Amino acids measured using a triple-quadrupole mass spectrometer
4. Targeted metabolites measured using a commercially available metabolomics profiling kit

Overall study start date
01/10/2023

Completion date
09/07/2024

Eligibility

Key inclusion criteria
1. 18-40 years old
2. Body mass index (BMI) ≥ 18.5 kg/m2 and/or weight ≥50kg
3. Be willing to consume a drink with whey protein and fava bean protein
4. Be available to meet the requirements of the study (i.e. attend study visit, give blood samples)

Participant type(s)
Healthy volunteer

Age group
Adult

Lower age limit
18 Years

Upper age limit
40 Years

Sex
Both

Target number of participants
16

Total final enrolment
20

Key exclusion criteria
1. Pregnancy or lactating
2. Any known food allergy or intolerance, including lactose intolerance or milk allergy
3. Known history of diabetes mellitus or the use of antihyperglycemic drugs or insulin to treat diabetes and related conditions
4. Medical condition or medication known to affect glucose regulation or appetite and/or digestion and absorption of nutrients
5. Major medical or surgical event requiring hospitalisation in the three months preceding the first visit
6. Use of steroids, protease inhibitors or antipsychotics
7. Donated blood to the NI Blood Transfusion Service in the last 12 weeks for men or 16 weeks for women

Date of first enrolment
05/03/2024

Date of final enrolment
10/06/2024

Locations

Countries of recruitment
Northern Ireland

United Kingdom

Study participating centre
Centre for Public Health, Queen's University Belfast
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Funder(s)

Funder type
Government

Funder Name
Department of Agriculture, Environment and Rural Affairs, UK Government

Alternative Name(s)
DAERA

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Funder Name
Department of Agriculture, Food and the Marine, Ireland

Alternative Name(s)
An Roinn Talmhaíochta, Bia agus Mara, An Roinn Talmhaiochta Bia agus Mara, Department of Agriculture, Food and the Marine, agriculture_ie, Department of Agriculture, Food and the Marine (Ireland), DAFM

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Ireland

Results and Publications

Publication and dissemination plan
Planned publication in a high-impact peer-reviewed journal with open access. Target journal is the British Journal of Nutrition.

Intention to publish date
31/12/2025

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study will be available upon request from Dr Eleni Spyreli, eleni.spyreli@qub.ac.uk.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	version 4.0	18/04/2024	06/06/2025	No	Yes
Protocol file	version 4.0	18/04/2024	06/06/2025	No	No