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Effect of encapsulated nutrients on gut peptide secretion

Submission date
17/10/2012

Recruitment status
No longer recruiting

Registration date
18/10/2012

Overall study status
Completed

Last Edited
11/08/2017

Condition category
Nutritional, Metabolic, Endocrine

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

Plain English summary of protocol

Background and study aims
Within the last 20 years, population levels of obesity have greatly increased in many countries throughout the world. This trend has prompted great interest in the regulation of feeding and hunger in humans. There is some evidence that patients with obesity and type 2 diabetes mellitus (T2DM) may have abnormalities affecting the regulation of appetite. A particularly promising area in this field involves the study of gut hormones, particularly GLP-1, which promotes insulin secretion and satiety (fullness) following a meal. There is evidence to suggest that certain specialised cells in the gut wall can identify basic carbohydrate, protein and fat in the gut, which can trigger GLP-1 secretion. The aim of this study is to investigate if GLP-1 secretion is stimulated in human volunteers by ingesting capsules of nutrients, such as basic protein and fat. We will do this by giving capsules containing nutrients and naturally-occurring substances to volunteers, with subsequent blood testing to identify any changes in blood gut hormone levels. It is hoped that this study, if successful, will permit future development of novel treatment strategies for obesity and T2DM.

Who can participate?
People aged 18-65 years old including 90 healthy volunteers and 90 patients with T2DM

What does the study involve?
Participants are asked to fast overnight and attend the Clinical Research Facility in the morning. There are several different types of study visit – not all participants do all visits. On most visits, the participant has a cannula (tube) inserted into a vein and blood samples are taken. They are then asked to take either capsules containing the active ingredient or placebo (dummy) capsules. Participants are asked to fill in a questionnaire about hunger levels and have blood removed from the cannula at intervals over the next 4-6 hours. Some participants have a DXA scan to assess body composition. This requires a very low dose of radiation. Other types of study visit involve participants having to drink a sugary liquid as part of an oral glucose tolerance test or to have a meal to assess effects on hunger.

What are the possible benefits and risks of participating?
The main risk is this study is that the capsules may provoke unwanted effects. The active capsules contain basic protein, fat or components of bile – all substances which occur normally in

the human gut. These substances have all be given before to humans and have been well tolerated. Insertion of a cannula and blood testing can cause minor bruising. There is also a small risk that blood testing will demonstrate conditions which were previously undiagnosed. Potential participants have the opportunity to discuss these risks fully with investigators.

Where is the study run from?
The study is run by medical doctors and researchers based at the Cambridge Institute for Medical Research (CIMR) and Addenbrooke's Hospital in Cambridge.

When is the study starting and how long is it expected to run for?
November 2012 to July 2015

Who is funding the study?
The study is part of a large research collaboration called Full4Health funded by a grant from the European Commission under framework programme 7.

Who is the main contact?
Dr Claire Meek
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Contact information

Type(s)
Scientific

Contact name
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Additional identifiers

Protocol serial number
12443

Study information

Scientific Title
To establish the effect of encapsulated nutrients on gut peptide secretion, glucose tolerance and appetite

Study objectives

Gut hormones are released in response to ingested nutrients and are important in the regulation of appetite and control of insulin secretion. These hormones are released by specialised cells known as L cells, which are located in the lower part of the small intestine. Under normal conditions, ingested nutrients are subject to absorption and enzymatic degradation in more proximal parts of the intestine and therefore negligible quantities reach the L cells. By encapsulating nutrients in an acid, enzyme-resistant capsule, it may be possible to deliver nutrients to target parts of the intestine where they will come into direct contact with L cells.

This study will involve a series of randomised controlled trials which will examine the effect of giving encapsulated nutrients to healthy volunteers on gut hormone secretion and the consequent impact on insulin secretion and appetite.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Norfolk & Norwich, 25/09/2012 ref: 12/EE/0389

Study design
Randomised interventional trial

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Metabolic and endocrine diseases

Interventions
Each participant will receive both placebo and active treatments at different visits. Each participant will receive one capsule type at one dose per visit with an interval period of at least 24 hours between visits. Each participant will have 3-6 visits. All capsules will be taken orally.

For example:
Visit 1- Active dose at level 1
Visit 2- Placebo
Visit 3- Active dose at level 2

The active capsules contain one of the following ingredients which will be tested individually against placebo:
Glutamine - a naturally-occurring protein. Approximate doses 0.6-6g
Mono-oleoyl glycerol - found naturally in olive oil. Approximate doses 0.3-6g
Sodium taurocholate - a normal component of bile. Approximate doses 0.5-7g
The placebo capsule contains microcrystalline cellulose.

Intervention Type
Supplement

Primary outcome(s)

Concentrations of gut hormones (such as GLP-1, GIP or PYY) will be measured in plasma at timepoints 0, 1, 2, 2.5, 3, 3.5, 4, 4.5, 5 and 6 hours after capsule ingestion. The outcome will be assessed by peak hormone concentrations and area under the curve calculations.

Key secondary outcome(s))
1. Glucose and insulin levels will be measured at timepoints 0, 1, 2, 2.5, 3, 3.5 and 4 hours following a 75g oral glucose tolerance test. The outcome will be assessed by peak concentrations of glucose and insulin, concentrations at 2, 3 and 4 hours post-ingestion and area under the curve calculations.
2. Hunger and satiety will be measured using a visual analogue scale. The outcome will be measured by peak values of hunger and satiety and area under the curve calculations.
3. Food quantity ingested and speed of intake will be assessed using an ad libitum meal and universal eating monitor. The outcome will be measured by total caloric content ingested, calories ingested at timepoints 5, 10, 20 and 30 minutes after the start of the meal, and area under the curve for caloric intake.
4. Safety and tolerability will be assessed using a symptom diary with a severity scale. Peak severity score and area under the curve measurements will be assessed for adverse effects in comparison to placebo.

Completion date
01/07/2015

Eligibility

Key inclusion criteria
Tasks 1-2
1. Healthy male or female subjects, aged 18 to 65 years.
2. BMI 18 to 45 kg/m2.
3. Willingness to attend the CRF on 4-5 occasions at approximately 12 week intervals for administration of capsules.

Tasks 3-5
1. Male or female subjects, aged 18 to 65 years with T2DM or glucose intolerance as diagnosed by a previous OGTT and /or fasting glucose level and HbA1c level.
2. BMI 18 to 45 kg/m2.
3. Willingness to attend the CRF on 4-5 occasions and take capsules three times daily for a total period of four weeks
4. Male & female participants
5. Aged 18 - 65 years

Participant type(s)
Mixed

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Key exclusion criteria
1. Age <18 or >65 years old at enrolment
2. BMI <18 or >45 kg/m2 at enrolment
3. Pregnancy or breast feeding
4. Any current medical disorder or history of disorder with potential to influence parameters measured in this study
5. Any current medical disorder or history of disorder likely to influence the ability follow the study protocol safely and effectively
6. Any current medication or history of medication likely to influence parameters measured in this study. For example, patients with T2DM should be on oral medication only and not on exogenous insulin or injectable GLP-1 mimetics
7. Current or historical drug or alcohol abuse
8. Current smoking habit
9. Any concern that a potential participant may not understand the nature or requirements of the study sufficiently to consent to participation
10. Any other circumstance or condition not covered above which would make participation unreasonable

Date of first enrolment
01/10/2012

Date of final enrolment
01/07/2015

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Cambridge Institute for Medical Research
Cambridge
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Sponsor information

Organisation
Cambridge Institute for Medical Research (UK)

ROR
https://ror.org/013meh722

Funder(s)

Funder type
Government

Funder Name
Seventh Framework Programme

Alternative Name(s)
EC Seventh Framework Programme, European Commission Seventh Framework Programme, EU Seventh Framework Programme, European Union Seventh Framework Programme, FP7

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not provided at time of registration

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	26/02/2015		Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes