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The effect of two different fats (medium chain triglycerides and long chain triglycerides) combined with exercise on energy balance

Submission date
22/03/2017

Recruitment status
No longer recruiting

Registration date
19/04/2017

Overall study status
Completed

Last Edited
03/06/2020

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
Different fats have different effects on appetite, hunger and fullness, and, as a result, energy balance – the relationship between energy in (i.e. food and drink eaten) versus energy out (i.e. energy expended for body functions and movement). As energy balance, not energy expenditure alone, is important for weight management strategies, it is important to examine the responses in appetite and food intake around exercise. Fats called medium-chain triglycerides (MCT) lead to reduced feelings of hunger and reduced food intake compared to long-chain triglycerides (LCT). Further, exercise can burn energy without increasing food intake at a later date, which creates an energy deficit and ultimately could lead to weight loss. This is in spite of the fact that these energy deficits also increase the overall desire to eat. It is not known, however, if the combination of a meal containing MCT with an acute bout of exercise leads to greater reductions in energy balance. The aim of this study is to find out whether a combination of MCT and exercise suppresses hunger and appetite more than MCT alone.

Who can participate?
Generally fit and healthy males, aged 18-65

What does the study involve?
This study involves four trials in a random order, with a break of 48 hours to 10 days between trials. In the 24 hours before each trial, participants abstain from alcohol and strenuous physical activity and record all the food and drink they consume, and then fast overnight. Participants then come to the laboratory and are randomly allocated to eat a high-fat breakfast meal containing either MCT or LCT before either a bout of cycling or a period of rest. Participants' metabolic rate, appetite and energy intake at a self-served lunch are measured in order to examine the effect of the two different meals on energy balance. The rate of food leaving the stomach (gastric emptying) is also measured in order to provide insight into the potential differences between the two test fats. After lunch, participants leave the laboratory and record all food and drink consumed in the evening to examine their 24 hour energy intake.

What are the possible benefits and risks of participating?
There are no direct benefits to participants. Participants may experience strong feelings of hunger. Consuming MCTs has previously been linked with digestive distress, but in higher doses that are provided in the current study. There is a risk of weakness and nausea associated with the exercise test, as well as the cycling tests as part of the trials.

Where is the study run from?
Oxford Brookes University (UK)

When is the study starting and how long is it expected to run for?
May 2016 to June 2017

Who is funding the study?
Oxford Brookes University (UK)

Who is the main contact?
Dr Miriam Clegg

Contact information

Type(s)
Scientific

Contact name
Dr Miriam Clegg

ORCID ID
https://orcid.org/0000-0002-8871-0116

Contact details
Department of Sport and Health Sciences
Faculty of Health and Life Sciences
Oxford Brookes University
Gipsy Lane
Oxford
United Kingdom
OX3 0BP

Additional identifiers

Protocol serial number
161020

Study information

Scientific Title
The effect of triglyceride chain length combined with exercise on appetite, satiety and energy balance

Study objectives

The aim of this study is to elucidate whether a combination of medium-chain triglycerides (MCT) and exercise would suppress hunger and appetite more than MCT alone compared to a control.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Oxford Brookes University Research Ethics committee, 06/07/2016, ref: UREC 161020

Study design
Randomised cross-over design

Primary study design
Interventional

Study type(s)
Other

Health condition(s) or problem(s) studied
Energy balance

Interventions
Following provision of informed consent and study screening, which includes a VO2max test, eligible participants are given weighing scales and a standardisation booklet in order to fulfil standardisation requirements. This requires abstaining from alcohol and strenuous physical activity, and to record all food and drink consumed throughout the 24 hours preceding each trial. This was to be repeated in the same period before the remaining trials.

Participants completed four trials in a random order, with a minimum of 48 hours and a maximum of 10 days between trials:
1. 18.4g control oil (vegetable oil) at rest
2. 18.4g control oil (vegetable oil) with exercise
3. 20g MCT oil at rest
4. 20g MCT oil with exercise

Upon arriving at the laboratory, participants are to rest for 10 minutes before a 30 minute baseline resting metabolic rate sample is taken, followed by baseline visual analogue scale and gastric emptying breath test. After this, the porridge breakfast containing the lipid is served. After this, participants either rest for 4 hours (rest trials); or rest for two hours, cycle for an hour at 65% VO2max and then rest for the remaining hour (exercise trials) until an ad libitum lunch is served. Gastric emptying breath tests are taken every 15 minutes, visual analogue scales every 30 minutes, and gaseous exchange data collected every 15 minutes for a 15 minute sample, other than during hours 2-3, where a continuous sample is taken (during exercise or the hour of rest).

After the ad libitum lunch finishes, participants are free to leave the laboratory, with another diet diary, which is to be filled for the remainder of the day. They are also provided with a gastrointestinal symptoms questionnaire to fill the following morning.

Intervention Type
Other

Primary outcome(s)
1. Energy intake, assessed by the ad libitum buffet lunch that participants consume at the end of trials in the lab at 255–285 mins
2. Subjective sensations of appetite (hunger, fullness, desire to eat, prospective food consumption and nausea), measured using Visual Analogue Scales at 0 mins, 10 mins, 30 mins, 60 mins, 90 mins, 120 mins, 180 mins, 210 mins, 240 mins and 285 mins
3. Energy balance, measured using the CPX Ultima and combined with energy intake data, at -30 mins – 0 mins, 30 mins – 45 mins, 60 mins – 75 mins, 90 mins – 105 mins, 120 mins – 180 mins, 210 mins – 225 mins, 240 mins – 255 mins

Key secondary outcome(s))
1. 24 hour energy intake, measured using recorded diet diaries completed after the morning in the lab
2. Gastrointestinal distress (to identify any adverse effects associated with the lipids), measured using a GI Distress questionnaire on the morning following the lab visit
3. Gastric emptying, measured through the 13C octanoic acid breath test at 0 min, 15 min, 30 min, 45 min, 60 min, 75 min, 90 min, 105 min, 120 min, 135 min, 150 min, 165 min, 180 min, 195 min, 210 min, 225 min, 240 min, 285 min
4. Hedonic properties of the lipid (to outline palatability issues with the breakfasts which may confound the results), assessed by Quantitative Descriptive Analysis at 10 min

Completion date
01/06/2017

Eligibility

Key inclusion criteria
1. Aged 18-65
2. Male
3. BMI of 18.5-29.9 kg/m2

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Upper age limit
65 years

Sex
Male

Total final enrolment

Key exclusion criteria
1. Allergic/intolerant to any of the foods provided in the study
2. Taking medication which could affect appetite
3. Smokers
4. A ‘restrained eater’, as defined by the TFEQ and DEBQ
5. Not weight stable (losing/gaining 3kg in the last 3 months)
6. Currently dieting to lose weight

Date of first enrolment
01/09/2016

Date of final enrolment
01/05/2017

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Oxford Brookes University
Gipsy Lane
Headington
Oxford
United Kingdom
OX3 0BP

Sponsor information

Organisation
Oxford Brookes University

ROR
https://ror.org/04v2twj65

Funder(s)

Funder type
University/education

Funder Name
Oxford Brookes University

Alternative Name(s)

Funding Body Type
Private sector organisation

Funding Body Subtype
Universities (academic only)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are/will be available upon request from Dr Miriam Clegg

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	14/12/2019	03/06/2020	Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes