ISRCTN10600261 https://doi.org/10.1186/ISRCTN10600261

A high-calorie challenge in healthy subjects

Submission date	Recruitment status	[_] Prospectively registered
09/05/2017	No longer recruiting	[_] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
12/05/2017	Completed	[X] Results
Last Edited	**Condition category**	[_] Individual participant data
11/07/2018	Nutritional, Metabolic, Endocrine	

Plain English summary of protocol

Background and study aims
Regulations for health claims on foods demand a lot of evidence. In the EU, many health claim dossiers from the food industry have been rejected by agencies. This is mainly due to shortcomings in consistent evidence, and partly due to the difficulty in demonstrating specific health benefits of food or food ingredients. In healthy people it can be very difficult to assess changes in health status. The aim of this study is to look into the bodily processes which are most relevant to a healthy metabolism. The aim of this study is to develop a generally accepted standardised test which will be able to demonstrate cause-effect relationships in dietary programs.

Who can participate?
Healthy men and women aged 20-70 years

What does the study involve?
The night before the study day, participants are asked not to eat or drink anything for 10 hours except water. When they attend the study day, a sample of blood is taken before they are asked to drink a high calorie drink. The drink has to be consumed within 5 minutes and was stored in a refrigerator until use. Further blood samples are then taken half and hour, one, two, four, six and eight hours after they have consumed the drink. On the same time points, hunger and fullness levels are measured using a rating scale. In certain patients, blood samples collected before consuming the drink and one, two and four hours afterwards are further analysed.

What are the possible benefits and risks of participating?
There are no direct benefits involved with participating. There is a small risk of pain or bruising from the blood sampling.

Where is the study run from?
Centre for Human Drug Research (Netherlands)

When is the study starting and how long is it expected to run for?
February 2013 to June 2013

Who is funding the study?
1. Ministry for Ecomonic Affairs (Netherlands)

2. Abbott Nutrition (Netherlands)
3. Friesland Campina (Netherlands)
4. Danisco-DuPont (Netherlands)
5. DSM (Netherlands)
6. Nestlé (Netherlands)

Who is the main contact?
Dr Suzan Wopereis

Contact information

Type(s)
Scientific

Contact name
Dr Suzan Wopereis

ORCID ID
https://orcid.org/0000-0001-9612-657X

Contact details
TNO
Utrechtseweg 48
Zeist
Netherlands
3704 HE

Additional identifiers

Protocol serial number
NL43765.056.13

Study information

Scientific Title
A high-calorie challenge within the healthy range of the population

Study objectives
The aim of this study is to investigate whether the high calorie challenge test and the predetermined biomarkers could define the healthy ranges of phenotypic flexibility (focusing on the five defined processes) and could indicate the movement towards a less healthy situation in an apparently healthy population. This study also aims to explore how spectra, measured by Raman spectroscopy, correlate with blood glucose levels that are measured at the same time.

Ethics approval required
Old ethics approval format

Ethics approval(s)

Independent Ethics Committee (IEC) Assen Foundation Beoordeling Ethiek Biomedisch Onderzoek (Review Ethics Biomedical Research), 22/03/2013, ref: NL43765.056.13

Primary study design
Interventional

Study design
Single center explorative open-label study non randomised study

Study type(s)
Quality of life

Health condition(s) or problem(s) studied
Healthy living

Interventions
Participants are allocated to one of 10 groups according to gender, age and body fat %. All participants undergo a high-calorie challenge test during which a challenge drink is administered. The high-calorie challenge is a 500 mL mixture containing 75g glucose, 20g Protifar (Nutricia), 60 mL palm oil and 320 mL water.

Prior to the challenge (t=0) and after the challenge several blood samples are drawn (up to 8 hours post dose). The challenge drink is consumed after a fasting period of at least 10 hours.

During a sub investigation, 19 subjects also undergo Raman spectroscopy measurements at four different timepoints during the challenge day. Afterwards the spectra measured by Raman spectroscopy were compared with blood glucose levels so that a (possible) correlation could be demonstrated.

Intervention Type
Other

Primary outcome(s)
Markers of glucose metabolism (including, but not restricted to glucose, glucagon, GLP-1, insulin), markers of lipid metabolism (including, but not limited to triglycerides and cholesterol), hormones and markers for oxidative stress (including, but not limited to adiponectin, gastric inhibitory polypeptide, C-peptide, glutathione ratio), immunology related parameters (including, but not restricted to, C reactive protein, serum amyloid A, soluble intercellular adhesion molecule, soluble vascular cell adhesion molecule), markers of clinical chemistry (including, but not limited to gamma-GT, ALAT, ASAT, ALP, albumin, creatinin), metabolites measured by metabolomics technology in plasma (including, but not restricted to, endogenous metabolites involved in energy metabolism, urea cycle, glucose metabolism, ketone bodies, lipid metabolism and amino acids) are measured using blood samples collected at baseline (overnight fasting), 0.5, 1, 2, 4, 6 and 8 hours after challenge test. Furthermore, the amount of hunger and satiety measured by the ''VASfood'' questionnaire at baseline (overnight fasting), 0.5, 1, 2, 4, 6 and 8 hours after challenge test.

Key secondary outcome(s)
Glucose is measured using Raman spectroscopy at baseline, 1, 2 and 4 hours after challenge test.

Completion date
26/06/2013

Eligibility

Key inclusion criteria
1. Healthy male / female subjects (ratio: 50-50), 20 to 70 years of age, inclusive. Healthy status is defined by absence of evidence of any active or chronic disease following a detailed medical and surgical history, a complete physical examination including vital signs, hematology and blood chemistry and the health and lifestyle questionnaire.
2. Body fat percentage within limits of predefined recruitment categories
3. Able to participate and willing to give written informed consent and to comply with the study restrictions

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Sex
Male

Key exclusion criteria
1. Participation in an investigational drug or device study within 3 months prior to screening and / or participation of more than 4 times in the previous
year
2. Loss of blood outside the limits of Sanquin (500 mL) within 3 months prior to screening or not willing to refrain from blood- or plasma donation during the study
3. Average alcohol consumption > 21 units/week for women and > 28 units/week for men
4. Change of smoking habits within two months prior to screening
5. Not having a general practitioner or health insurance
6. Unacceptable concomitant medication use at baseline, e.g., drugs known or likely to interact with the challenge drink or study assessments
7. Use of dietary supplements less than one month prior to Day 1
8. Reported slimming or being on a medically prescribed diet
9. Reported unexplained weight loss or gain of > 2 kg in the last month before screening
10. Reported food allergy or sensitivity for one of the used ingredients
11. Females who are pregnant, planning to be pregnant during the study period, or lactating
12. Not willing to accept information transfer which concerns participation in the study or information regarding health (e.g. laboratory results, findings at
health and lifestyle questionnaire, physical examination or eventual adverse events) to and from their general practitioner
13. Having hypertension defined as a systolic blood pressure (SBP) greater than 140 mmHg or diastolic blood pressure (DBP) greater than 90 mmHg
(assessed three times at five minutes interval). In the case of isolated systolic hypertension in middle aged volunteers (phenotypic group 5 and 10), the

principal investigator will judge whether this condition will cause a clinically significant interference with the study outcome
14. Clinically significant abnormalities, as judged by the Investigator, in laboratory test results. In the case of uncertain or questionable results, tests
performed during screening may be repeated once before determination of eligibility
15. Inappropriate veins for cannula insertion
16. Having a chronic disease related to inflammation (such as arthritis)
17. Having a history or symptoms of any significant disease including (but not limited to), neurological, psychiatric, endocrine, cardiovascular, respiratory,
gastrointestinal, hepatic, or renal disorder
18. Any known factor, condition, or disease that might interfere with treatment compliance, study conduct or interpretation of the results such as drug or
alcohol dependence or psychiatric disease
19. Unwillingness or inability to comply with the study protocol for any other reason

For the sub investigation (Raman spectroscopy):
20. Dark skin color according to the Fitzpatrick skin type scale (type 5 or 6)
21. Abnormalities of the skin at the desired measurement location (upper side of forearm)

Date of first enrolment
23/03/2013

Date of final enrolment
16/05/2013

Locations

Countries of recruitment
Netherlands

Study participating centre
Centre for Human Drug Research
Zernikedreef 8
Leiden
Netherlands
2333 CL

Sponsor information

Organisation
TNO

ROR
https://ror.org/01bnjb948

Funder(s)

Funder type
Government

Funder Name
Ministry for Ecomonic Affairs (Ministerie van Economische Zaken)

Alternative Name(s)
Ministry of Economic Affairs, Netherlands Ministry of Economic Affairs, EZ

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Netherlands

Funder Name
Abbott Nutrition

Funder Name
Friesland Campina

Funder Name
Danisco-DuPont

Funder Name
DSM

Funder Name
Nestlé

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study will be stored in a non-publically available repository (Phenotype database; https://dashin.eu/interventionstudies/) and can be made available upon request from suzan.wopereis@tno.nl

IPD sharing plan summary

Stored in repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	06/12/2017		Yes	No