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How sugars impact on lean and overweight /obese humans

Submission date	Recruitment status	[X] Prospectively registered
12/02/2016	No longer recruiting	[_] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
13/07/2016	Completed	[X] Results
Last Edited	**Condition category**	[_] Individual participant data
07/11/2017	Nutritional, Metabolic, Endocrine	

Plain English summary of protocol

Background and study aims
It has been suggested that drinking a lot of sugary drinks can be at least partly to blame for people becoming obese (that is, very overweight). Being obese puts someone at risk of cardiovascular disease (for example, heart attack)). Gaining weight also slowly increases body fat content which, in turn, can affect glucose metabolism (that is, how sugar is used in the body). One of the most important immediate consequence of a disturbed glucose metabolism is an increase in the amount of insulin in the blood. In a healthy person, insulin affects the resistance to blood flow of the blood vessels (the tone of resistance vessels) and works on the heart. A rise in insulin levels, e.g. due to drinking a surgery drink, leads to peripheral vasodilation (expanding of peripheral blood vessels) which in turn increases cardiac (heart) function by increasing stroke volume (blood volume ejected by the heart) and heart rate. However, to date, it is not known if an impaired glucose metabolism, with increased fasting glucose and insulin levels, affect the cardiovascular system, i.e. blood pressure, resistance, and cardiac output (heart rate x stroke volume), differently compared to an unchanged glucose metabolism. This study is looking at the impact of an oral glucose tolerance test (OGTT) on two groups of participants , i.e. one group with normal weight (BMI 18-24.9 kg/m2) and one group of overweight/obese persons (BMI 25-39.9 kg/m2) who are likely to be glucose intolerant. It is thought that in people with an impaired OGTT, blood pressure will increase due to higher levels of insulin.

Who can participate?
Healthy men aged 20-45 with a BMI between 18 – 39.9 kg/m2.

What does the study involve?
Participants undergo a OGTT test. This involves drinking 75 g of glucose dissolved in 300 mL of tap water within five minutes. They are then assessed to see whether they have an impaired-OGTT, that is, whether they have a glucose level of between 140-199 mg/dL two hours after taking the test. This is done though taking blood samples before the OGTT test and then every 30 minutes for the next 120 minutes and analysing them.

What are the possible benefits and risks of participating?
There is no benefit in participating in this study with the exception of a comprehensive cardiovascular investigation, which could reveal certain pathologies (health problems), i.e. impaired glucose metabolism or type 2 diabetes.

Where is the study run from?
Department of Medicine/Physiology, University of Fribourg (Switzerland)

When is the study starting and how long is it expected to run for?
July 2015 to November 2016

Who is funding the study?
University of Fribourg (Switzerland)

Who is the main contact?
Dr Erik Konrad Grasser

Contact information

Type(s)
Scientific

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Study information

Scientific Title
Impact of glucose intolerance on glucose-induced blood pressure regulation in young overweight /obese humans

Study objectives
The central working hypothesis is that in overweight/obese subjects, particularly in those with impaired oral glucose tolerance test, the blunting effect of glucose on the blood pressure would be attenuated or abolished because of their states of peripheral vascular insulin resistance and hyperinsulinemia-induced sympathetic overactivity - both of which will increase total peripheral resistance, leading to increased blood pressure.

Ethics approval required

Old ethics approval format

Ethics approval(s)
Cantonal commission on ethics of research on humans (Commission Cantonale e'Éthique de la recherche sur l'être humain), 12/08/2015, ref: 239/15

Primary study design
Observational

Study design
The study will be conducted on two groups of subjects, namely: a group of normal weight subjects (BMI within 19-24 kg/m2) with normal oral glucose tolerance test (OGTT), and a group of overweight/ obese subjects (BMI within 27-37 kg/m2) with impaired OGTT. Moreover, each of the two groups will be sub-classified with respect to ethnicity.

Study type(s)
Other

Health condition(s) or problem(s) studied
Impaired glucose tolerance

Interventions
An impaired-OGTT is defined according to the guidelines provided by the American Diabetes Association, namely the following changes in blood glucose levels in response to ingestion of 75g glucose dissolved in 300 mL water and ingested within five minutes: a 2-h glucose value between 140 and 199 mg/dL (7.8–11.1 mmol/L).

After reaching cardiovascular and metabolic stability (approximately 20-30 minutes), a baseline recording will then be made for 30 minutes. Then, the subject will ingest the test drink over five minutes and post-drink cardiovascular recordings will be done for another 120 min.

Blood samples will be drawn immediately after the end of baseline hemodynamic measurements and every 30 minutes after the sugar drink over the next 120 minutes. Pulse waveform analysis will take place immediately after collecting the respective blood sample. Additionally, metabolic measurements will be conducted.

Intervention Type
Other

Primary outcome(s)
1. Haemodynamics: Measurements will be performed continuously starting with a 30 min baseline and continued after the OGTT for another 120 min using a Task Force Monitor (CNSystems). Haemodynamic parameters are: Blood pressure (systolic and diastolic), heart rate, stroke volume
2. Blood parameters: Measurements will be performed at the end of the baseline (30 min) and after the OGTT consecutively every 30 min until the end of the OGTT, i.e. 120 min post-drink. Blood parameters are: Plasma glucose (glucose oxidase method) and plasma insulin (Elisa Kit)

Key secondary outcome(s)
1. Haemodynamic parameters: Cardiac output, total peripheral resistance, index of contractility, heather index, thoracic fluid content, thoracic impedance, spectral analysis parameters,

Baroreflex sensitivity; all parameters will be measured continuously starting with a 30 min baseline and continued after the OGTT for another 120 min using a Task Force Monitor (CNSystems)
2. Radial waveform parameters will be measured by applanation tonometry (AtCor) immediately after each blood sample, i.e. end of baseline, 30-, 60-, 90-, and 120 min post-drink
3. Indirect calorimety: Resting energy expenditure and respiratory quotient will be measured continuously starting 30 min before OGTT testing and 180 min thereafter by assessment of ventilation parameters using a ventilated hood system (COSMED)
4. Anthropometric parameters will assessed with a calibrated scale (Seca), and a statiometer (Seca) before the OGTT
5, Body composition parameters will be derived by either body impedance measurements (InBody 720) or deuterium oxide measurements (collection of saliva samples) before the OGTT
6. Questionnaire-derived data collected before the OGTT

Completion date
30/11/2016

Eligibility

Key inclusion criteria
1. Healthy
2. Non-smokers
3. BMI between 18 and 39.9 kg/m2
4. 20-45 years old

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Sex
Male

Key exclusion criteria
1. Participants diagnosed as diabetics based on the following criteria: fasting glucose levels equal to or exceeds 126 mg/dL (7.0 mmol/L), and b) 2-h glucose equal to or exceeds 200 mg/dL (11.1 mmol/L)
2. Any medical condition which could interfere with the measured variables, e.g. cardiovascular-, gastrointestinal-, neurological-, and overt metabolic disorders
3. Subjects under current medication (either for acute or chronic illnesses)
4. Competition athletes, smokers, or overtly sedentary, or have eating disorders
5. Subjects who fear or have adverse reactions to cannulation

Date of first enrolment
18/07/2016

Date of final enrolment
18/09/2016

Locations

Countries of recruitment
Switzerland

Study participating centre
Department of Medicine/Physiology, University of Fribourg
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Sponsor information

Organisation
University of Fribourg - Faculty of Science

ROR
https://ror.org/022fs9h90

Funder(s)

Funder type
University/education

Funder Name
Université de Fribourg

Alternative Name(s)
University of Fribourg, Universität Freiburg

Funding Body Type
Private sector organisation

Funding Body Subtype
Universities (academic only)

Location
Switzerland

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. Study related original data are stored on hard-drives in a coded form to which only the PI (Erik Konrad Grasser) has access. The same follows for processed data derived from the original data files.

IPD sharing plan summary
Stored in repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	18/07/2017		Yes	No