Functional magnetic resonance imaging of human hypothalamic responses to oral glucose ingestion in obese and lean subjects

Published: 28-01-2015
Last updated: 21-04-2024

The objective of the study is to determine hypothalamic function in response to oral glucose ingestion in obese subjects.

Ethical review	Approved WMO
Status	Suspended
Health condition type	Appetite and general nutritional disorders
Study type	Observational invasive

Summary

ID

NL-OMON41891

Source
ToetsingOnline

Brief title
HYROB (HYpothalamic Response to oral glucose ingestion in OBesity)

Condition

- Appetite and general nutritional disorders

Synonym
corpulence, Obesity

Research involving
Human

Sponsors and support

Primary sponsor: Leids Universitair Medisch Centrum
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: FMRI, Hypothalamus, Obesity, OGTT

Outcome measures

Primary outcome

BOLD signal intensity changes of the hypothalamus after ingestion of 2

different stimuli (300 ml each): water at room temperature and glucose solution

at room temperature. The last stimulus will contain 75g of glucose.

Secondary outcome

BOLD responses in amygdala and nucleus accumbens

Z-scores of functional connectivity (rs-fMRI)

Psychophysical ratings of hunger and pleasantness of taste scored by VAS

Study description

Background summary

Recently, a simple and robust method has been developed to determine differences in homeostatic response, during food-intake by measuring the state of activation of the hypothalamus using functional magnetic resonance imaging (fMRI) .

Functional magnetic resonance imaging (fMRI) is a non-invasive method, which detects transient haemodynamic changes in the brain, based on blood oxygen level dependent (BOLD) signal differences in response to external or internal stimuli. BOLD signal differences (contrasts) measured with T2* weighted fMRI imaging sequences are dependent on local and global oxygen content, blood volume, perfusion and tissue metabolism. These factors potentially influence the oxy-to-deoxyhemoglobin ratio, and hence result in variation in the fMRI signal. Measuring hypothalamic activity to oral glucose load using fMRI, has been shown to be feasible in several studies. A well-defined and validated protocol for the scan itself and for the data processing is therefore available.

In recent studies we have demonstrated attenuated hypothalamic response to

glucose ingestion in diabetic subjects and reversal of this phenomenon when diabetic subjects are subjected to a short-term stringent diet. We hypothesize that insulin resistance is the key factor driving this principle. To further elucidate this principle we want to compare non-diabetic obese subjects to lean subjects. Non-diabetic obese subjects in general have insulin resistance, but do not have high glucose levels, making them a good subjects to further elucidate this matter.

Further understanding of the mechanisms driving altered hypothalamic signaling in diabetic and obese people could help develop new treatment strategies for obese pre-diabetic subjects to prevent progression to diabetes.

We hypothesize that non-diabetic obese subjects will demonstrate an attenuated hypothalamic response to glucose ingestion, comparable to the diabetic subjects we described earlier.

Therefore we will perform a case-control study in non-diabetic obese and lean subjects, investigating their hypothalamic response to glucose ingestion.

Study objective

The objective of the study is to determine hypothalamic function in response to oral glucose ingestion in obese subjects.

Study design

The study will be a randomized cross-over observational study, consisting of two study occasions. The occasions consist of ingestion of either glucose or water.

Study burden and risks

There is a minimal burden/risk for the subjects. They have to attent sober on scandays, but will be scanned early in the morning. They will receive a intravenous catheter twice for a short period of time. The intake of glucosewater can cause mild nausea. The accumalative time spend in the hospital is two hours.

Contacts

Public
Leids Universitair Medisch Centrum

Albinusdreef 2

Leiden 2333 ZA
NL
Scientific
Leids Universitair Medisch Centrum

Albinusdreef 2
Leiden 2333 ZA
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

BMI >30 for obese subjects and BMI 19-25 for lean subjects
Age 21-30 years
Male

Exclusion criteria

History of diabetes or medication influencing glucose metabolism
Relevant genetic or psychiatric disease
Chronic disease
Renal or hepatic disease
Recent weight loss > 5 kg within the last 3 months
Smoking
Alcohol consumption > 21 units per week
Use of recreational drugs during the last year
Recent blood donation (< 2 months)
Recent participation in other biomedical research projects (within the last 3 months), participation in 2 or more biomedical research projects in on year

MRI contra-indications (i.e. claustrophobia, ferromagnetic implants)

Study design

Design

Study type:	Observational invasive
Intervention model:	Other
Allocation:	Non-randomized controlled trial
Masking:	Open (masking not used)
Control:	Active
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Suspended
Start date (anticipated):	01-12-2014
Enrollment:	28
Type:	Anticipated

Ethics review

Approved WMO

Date:	28-01-2015
Application type:	First submission
Review commission:	METC Leiden-Den Haag-Delft (Leiden) metc-ldd@lumc.nl

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL51519.058.14