Influence of increasing dietary protein on hepatic fat accumulation and postprandial metabolism.

Published: 13-09-2011
Last updated: 29-04-2024

To investigate the potential beneficial effect of increasing protein in the diet in order to decrease hepatic lipid accumulation on a high-fat diet.

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Glucose metabolism disorders (incl diabetes mellitus)
Study type	Interventional

Summary

ID

NL-OMON35839

Source
ToetsingOnline

Brief title
Dietary protein and hepatic fat (LiF-Pro)

Condition

- Glucose metabolism disorders (incl diabetes mellitus)
- Hepatic and hepatobiliary disorders

Synonym
Fatty liver, liver fat accumulation

Research involving
Human

Sponsors and support

Primary sponsor: Wageningen Universiteit
Source(s) of monetary or material Support: Nederlandse Zuivel Organisatie

Intervention

Keyword: (Hepatic) lipid metabolism, Hepaic fat accumulation, Liver, Protein

Outcome measures

Primary outcome

Hepatic fat accumulation measured with 1H- magnetic resonance spectroscopy

(1H-MRS).

Secondary outcome

Secondary parameters are postprandial lipid and glucose metabolism (meal

challenge), adipose tissue gene expression and changes in gut microbiota.

Study description

Background summary

Fat can accumulate, not only in the adipose tissue, but also in non-adipose tissue like skeletal muscle and other organs like the liver. When lipid accumulation exceeds the innate storage capacity of these tissues, so-called lipotoxicity can develop and this can drive the inflammatory state associated with obesity, and induce insulin resistance. Increased intra-hepatic lipid (IHL) is correlated with hypertriglyceridemia as well as a reduced suppressive effect of insulin on hepatic glucose production, which contributes to hyperglycemia. Dietary manipulation can rapidly change lipid storage in tissues. A recent human study showed that protein intake significantly blunted the effect of a high-fat diet on IHL in healthy volunteers.

Study objective

To investigate the potential beneficial effect of increasing protein in the diet in order to decrease hepatic lipid accumulation on a high-fat diet.

Study design

A strictly-controlled dietary intervention study using a cross-over design with two intervention periods will be performed in healthy volunteers (n=20). Parallel to the groups in the cross-over design a control group will be

included in the study (n=10).

Intervention

After a two-week run-in period on a low-protein, low-fat diet (according to the healthy eating guidelines), subjects will be assigned to either one of the two groups (high-fat group or the control group). The high-fat group consists of two intervention periods of two weeks per diet, either high or low protein. Half of the subjects assigned to the high-fat group will start on the low-protein diet, the other half on the high-protein diet. After 2 weeks subjects will cross to the other condition. The control group will continue on the low-protein, low-fat diet for 4 weeks, and serve as a control. Tests will be performed after 2, 4 and 6 weeks.

Study burden and risks

This study will require an effort of the subjects, since they have no freedom to eat what they want for 6 weeks. This means that they will not be able to eat out and that they cannot eat snacks during parties for instance. Besides, they have to eat at the university during week days. Furthermore, in the 6 weeks of the study they have to come to the hospital in Ede three times, of which two times a whole day.
Risks for the subjects during this study are considered moderate.
The high-protein diets do not exceed safe levels of protein intake of 2.5 g/kg/d, since they will receive approximately 2.2 g/kg/d in the high protein diet. Besides, subjects with known kidney problems or other medical issues will not be included in the study. The subjects who will receive the high-fat diet are likely to gain weight and to have increased hepatic fat after the intervention. The hepatic fat accumulation is reversible and is not expected to cause any health related problems. Hepatic fat content is very low in young, lean, healthy subjects. Although the high-fat diet will increase liver fat, absolute levels of liver fat will remain far below what is considered hepatic steatosis (5% wet-weight).
Subjects will be checked 4 weeks after the intervention to see if they have lost the gained weight. If they did not lose weight, counselling will be offered.
The meal challenge with added stable isotopes tracers (13C-palmitate) is frequently used in research of the postprandial fat handling. Stable isotopes are naturally occurring isotopes and are not harmful for subjects, as there is no decay.
Proton Spectroscopy (1H-MRS) is not considered to bare any additional risk for the subject, as long as contra-indications are taken into account.
Adipose tissue biopsies will be taken, under local anaesthesia, by an experienced physician, and proper precautions will be taken to minimize the risk of complications. Taking an adipose tissue biopsy can generate mild discomfort and result in local bruising.

Furthermore, placing a venous catheter and blood sampling can occasionally cause a local haematoma or bruise and some participants may report pain or discomfort.
The radiation of the DXA scanning is approximately 0.2 µSv, which is within normal limits.

Subjects will get a financial compensation of ¤300,- when they complete the study.

Contacts

Public
Wageningen Universiteit

Bomenweg 2
6703 HD Wageningen
NL
Scientific
Wageningen Universiteit

Bomenweg 2
6703 HD Wageningen
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

healthy male subjects, 18 to 40 years old, body mass index (BMI) 18-25 kg/ m2, stable dietary habits and physical activity levels.

Exclusion criteria

Unable or unwilling to comply with study procedures;
Not Caucasian
Unstable body weight (weight gain or loss > 3 kg in the past three months);
Moderate intense physical activity (exercise) for more than 4 hours/week
(Chronic) disease which might influence the study outcomes e.g. diabetes mellitus or any other endocrine disorder, active cardiovascular disease, hepatic disease, renal disease, cancer;
Family history of diabetes mellitus;
Use of medication, except incidental use of paracetamol;
Abuse of drugs;
Alcohol consumption of more than 14 glasses per week;
Participation in another biomedical study within 1 months prior to the first screening visit;
A contraindication to MRI scanning.

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Single blinded (masking used)
Control:	Active
Primary purpose:	Prevention

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	05-10-2011
Enrollment:	30
Type:	Actual

Ethics review

Approved WMO

Date:	13-09-2011
Application type:	First submission
Review commission:	METC Wageningen Universiteit (Wageningen)

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
ClinicalTrials.gov	NCT01354626
CCMO	NL36668.081.11