Ethnic differences in body composition and substrate utilization: the effect of physical activity and diet.

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON34820

Source
ToetsingOnline

Brief title
Body composition and substrate utilization.

Condition

- Other condition

Synonym
oxidation of fat, protein and carbohydrate, substrate metabolism

Health condition

substraatmetabolisme en insulineresistentie

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: body composition, Ethnicity, fat oxidation, metabolic profile

Outcome measures

Primary outcome

The main study parameters for the cross-sectional part are the differences in body composition, fat distribution, energy expenditure and substrate utilisation (including dietary fat oxidation). The main study parameters of the overfeeding-high fat diet intervention are the differences in abdominal fat content, liver fat and intramyocellular lipid content (IMCL) and glucose tolerance. The main study parameters for the sedentary life-style intervention are the differences and changes in gene expression related to in adipogenesis, lipogenesis and lipolysis as well as glucose tolerance.

Secondary outcome

• Differences in physical activity between Asians and Caucasians

• Differences in physical fitness between Asians and Caucasians

• Differences in adipocyte size between Asians and Caucasians

• Differences in blood lipid profiles at baseline and after overfeeding a high fat diet or a sedentary life-style between Asians and Caucasians

Study description

Background summary

For the same BMI, age and gender Asians tends to have a higher percentage of body fat and a lower absolute fat-free mass compared to Caucasians. Lower fat-free mass was associated with lower energy expenditure at rest. Therefore the difference in body composition may affect substrate utilisation for energy metabolism and may result in a chronic imbalance between energy storage and oxidation, primarily as fat. With increasing body fat percentage, Asians were also reported to accumulate more fat in the abdominal region and to develop a higher ectopic fat depot in the liver or intramyocellular compared to Caucasians. The unfavourable body composition and fat distribution in Asians may predispose to the development of insulin resistance in a lesser degree of obesity. The interaction between this genetic predisposition and environment (dietary pattern and sedentary life style) may increase the risk of developing the metabolic syndrome.

Study objective

The aims of this study are:
1. To investigate the difference in body composition, fat distribution, energy expenditure, substrate and dietary fat oxidation in Asians and Caucasians.
2. To investigate the effect of overfeeding a high fat diet on liver fat and intramyocelullar lipid content as well as glucose tolerance in Asians and Caucasians
3. To investigate the effect of a sedentary life-style on the expression of genes involved in adipogenesis, lipogenesis and lipolysis as well as glucose tolerance in Asians and Caucasians.

Study design

The study will be a comparative study between Asians and Caucasians with a cross-sectional part and an intervention part (see below).

cross-sectional
Subjects will stay in the respiration chamber for two nights, one day (35 hrs) to assess energy expenditure and substrate utilization. Before staying in the respiration chamber, daily physical activity will be measured for 7 days, followed by 3 days of an energy balance diet. Dietary fat oxidation will be measured using labelled palmitic acids. Subjects will undergo complete anthropometric measurement including waist and hip circumference and skinfold thickness. Body composition will be measured, using underwater weighing to determine body density and the deuterium dilution technique to measure total body water.

Intervention

The results from the cross-sectional part will be used for the intervention.
For each intervention, ten Asian and 10 Caucasian subjects, matched for body

fat percentage will be selected. Hence, there will be 10 Asian and 10 Caucasian subjects in each intervention.
Intervention 1 tests the effect of 3 day overfeeding a high fat-diet containing 60% energy from fat (25% from carbohydrate and 15% protein) on ectopic fat stores (liver and intramyocellular) and glucose tolerance. Intervention 2 tests the effect of decreased physical activity, due to staying in a respiration chamber for 3 days, while receiving a normal energy intake based on energy needs in daily life, on fat cell gene expression and glucose tolerance.

Study burden and risks

The risks are minimal, and the (time) burden is reasonable. This research is not harmful for general health. The fitness test may cause fatigue in the legs and requires maximal exertion. Taking blood and the fat biopsy may cause a small bruise at the location where the blood/biopsy is taken. The burden is proportional to the benefits of the research. The subject receives accurate information about the personal physical activity level, physical fitness, energy metabolism, body composition, fat distribution and blood lipid profile.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

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

Inclusion criteria

The study includes healthy subjects with a BMI 20-27 kg/m2, aged 20-40 years, stable body weight in the last three months, not following a diet, not using medications except oral contraceptive and no family history of diabetes.

Exclusion criteria

Subjects with chronic diseases known to affect energy metabolism (energy intake and/or expenditure) and athletes will be excluded.
Subjects that meet any of the exclusion criteria for MRI (electronic implants, pacemakers, metal fragments in the eyes, skin or body) will be excluded.

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	29-05-2010
Enrollment:	80
Type:	Actual

Ethics review

Approved WMO Date:	28-05-2010
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

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
Other	7891
CCMO	NL31217.068.10