

Abstract book

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P1:

Weight loss maintenance in overweight subjects on ad libitum diets with high or low protein content and glycemic index: the DIOGENES trial 12 months results

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Introduction: A high dietary protein (P) content and low glycemic index (GI) have been suggested to be beneficial for weight management, but long-term studies are scarce. The DIOGENES randomized clinical trial investigated the effect of P and GI on weight loss maintenance in overweight or obese adults in 8 centers across Europe. This study reports the 1-year results in 2 of the centers that extended the intervention to 1 year.

Methods: After an 8-week low calorie diet (LCD), 256 adults (BMI > 27 kg/m²) were randomized to 5 ad libitum diets for 12 months: high P/low GI (HP/LGI), high P/high GI (HP/HGI), low P/low GI (LP/LGI), low P/high GI (LP/HGI) and a control diet. During the first 6 months foods were provided for free through a shop system, during the whole 12-month period subjects received guidance by a dietician. Primary outcome variable was the change in body weight over the 12-month intervention period.

Results: During the LCD period subjects lost 11.2 (10.8, 12.0) kg (mean (95% CI)). Average weight regain over the 12-month intervention period was 3.9 (95% CI 3.0 to 4.8) kg. Subjects on the HP diets regained less weight than subjects on the LP diets. The difference in weight regain after 1 year was 2.0 (0.4, 3.6) kg (P = 0.017) (completers analysis, N=139) or 2.8 (1.4, 4.1) kg (P < 0.001) (intention-to-treat analysis, N = 256). No consistent effect of GI on weight regain was found. There were no clinically relevant differences in changes in cardiometabolic risk factors among diet groups.

Conclusion: A higher protein content of an ad libitum diet improves weight loss maintenance in overweight and obese adults over 12 months.

1. Conflict of interest: Dr Astrup is currently member of advisory boards for the food producing or -marketing concerns McCain Foods, USA, Global Dairy Platform, USA, JennyCraig, USA, and McDonald's, USA and has received funding for other studies from about 100 food companies covering all food groups. Dr Saris is corporate scientist human nutrition for DSM, The Netherlands, and received research grants and food donations from several food companies. Dr Aller, Larsen, Holst, Lindroos, Kafatos, Pfeiffer, Martinez, Handjieva-Darlenska, Kunesova, Stender and van Baak report no conflict of interest.

2. Funding:

The DIOGENES trial was funded by the European Commission, contract no. FP6-2005-513946. The funding source had no role in the study design, data collection, data analysis, data interpretation or writing of the report. The majority of the food items in the shops were provided for free by a large number of different food companies. A complete list can be found on www.diogenes-eu.org. Food items to be offered in the shops were selected by the investigators. Companies were in no way involved in the planning, execution or analysis of the study.

P2:

Fcγ-receptors do not play a role in the development of insulin resistance

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Introduction: It has previously been shown that during the development of obesity, pathogenic IgG antibodies are produced, which contribute to the development of insulin resistance. However, the associated downstream effector pathways of these antibodies are not known. To investigate whether receptors for the Fc part of IgG (FcγR), which mediate immune effector mechanisms, play a role in the development of adipose tissue inflammation and insulin resistance, we studied mice which lack all four FcγRs (FcγR1234^{-/-}).

Methods: FcγR1234^{-/-} and WT mice were fed a high fat lard diet (HFD; 45 energy%) for 11 weeks to induce obesity. Body weight and insulin sensitivity were analyzed and gonadal adipose tissue (gWAT) was characterized for adipocyte functionality and extent and type of inflammation.

Results: After 11 weeks of HFD the FcγR1234^{-/-} mice had body weight and fat mass comparable to WT. The FcγR1234^{-/-} mice showed similar adipose tissue inflammation, as immune cell numbers (T-, B-lymphocytes and macrophages; determined by flow cytometry) and gene expression of pro-inflammatory cytokines in gWAT were comparable to WT mice. FcγR1234^{-/-} mice showed similar whole body glucose tolerance, as well as adipocyte specific insulin responsiveness as WT mice.

Conclusion: We conclude that the FcγRs are not involved in the development of adipose tissue inflammation and insulin resistance. Our data suggest that obesity associated IgG may induce insulin resistance via other pathways than FcγRs.

1. Conflict of interest: -

2. Funding: -

P3:

Process evaluation of a combined lifestyle intervention in Dutch primary care

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Introduction: A qualitative process evaluation has been executed as part of a cluster randomized trial, which investigated the effectiveness and cost-effectiveness of a combined lifestyle intervention for people with overweight (the BeweegKuur-study). The intervention consisted of one year coaching by a lifestyle advisor, physiotherapist and nutritionist. We studied implementation of the intervention in primary care, to gain insight into factors that might influence effectiveness and cost-effectiveness.

Methods: The evaluation was based on frameworks for health promoting interventions. Main topics were content of coaching, interdisciplinary collaboration and performance according to protocol. Interviews were conducted with the professionals (n = 25) of a representative selection of locations that implemented the intervention. In addition, patient information was retrieved by means of written questionnaires.

Results: Professionals adjusted coaching to personal needs and wishes of participants, to increase feasibility and participants' satisfaction. Both the amount of tailoring and the participants' satisfaction with coaching differed between locations. Health issues were common reasons for drop-out. Younger, non-Dutch and unemployed participants were more often lost to follow up. Interdisciplinary collaboration within the intervention was appreciated by most professionals and continued after the study. Financial reimbursement reinforced the continuation of the intervention.

Conclusion: The amount of protocol adherence by professionals varied. Tailoring might decrease risk of participants' drop-out and thereby influence costs and effects. Whether locations continued to offer the intervention seemed to depend on funding and on involvement of professionals in the team. Having good collaboration in multidisciplinary teams occurred to be a success factor and improved chances for continuation of implementation.

1. Conflict of interest: None

2. Funding: The study is funded by ZonMW, The Netherlands Organization for Health Research and Development (project number: 123000002).

P4:

The influence of body mass index of health professionals on the perception of body weight and overweight in children.

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Introduction: Clinical recognition of overweight and obesity is important for prevention and treatment of childhood obesity. The aim of this study is (1) to assess accurateness of obesity diagnosis in children and (2) whether clinical view and perceptions on childhood obesity vary by BMI and profession of child health professionals.

Methods: Health professionals (HP) including paediatricians, GP's, child abuse workers and youth health care workers were asked to rate 7 preschool children (underweight to morbid obese) on a verbal scale (very light to very heavy) and based on sketches (too thin to too thick) to diagnose the child's body shape. In addition, health professionals characteristics and attitudes on childhood obesity were assessed.

Results: 49% (353/706) of questionnaires were returned. In general, weight of children was underestimated. Slightly overweight children were rated as normal by 76% and as 'slightly overweight' by 23% of HP. Obese children were rated as slightly overweight by 38%, obese by 48%, and normal by 14% of HP. Only morbidly obese children were accurately rated (95% correct). Diagnosis did not vary significantly according to HP's BMI, although trends were visible, e.g. obese rated as obese by 52% of low BMI HP and by 44% of high BMI HP, $P=0.19$. In contrast, attitudes on childhood obesity differed by profession and HP BMI. For example, childhood obesity was considered as 'child neglect' in 83% of child abuse workers, 47% in GPs and 29% specialists ($P=0.009$) and in 62% of HP with $BMI < 21.5 \text{ kg/m}^2$ and in 42% of HP with $BMI > 25.0 \text{ kg/m}^2$ ($P=0.041$).

Conclusion: Health professionals are unlikely to correctly diagnose the weight status of overweight and obese children based on clinical view. Furthermore, perceptions of childhood obesity may differ according to health professionals BMI and profession.

1. Conflict of interest: none declared

2. Funding: this study is funded by an unrestricted grant from Hutchison Whampoa Ltd and the University of Groningen.

P5:

Proximal and distal colonic infusions differentially affect fat oxidation and metabolic parameters in overweight males

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Introduction: Short-chain fatty acids (SCFAs), formed by microbial fermentation of dietary fiber, are believed to be involved in the etiology of the metabolic syndrome. The aim of this study was to investigate effects of proximal versus distal colonic infusions with the SCFA sodium acetate on human substrate and energy metabolism.

Methods: In this randomized, double-blind, crossover study, six overweight males underwent two experimental periods, once with distal and once with proximal colonic infusions. A feeding catheter was inserted during endoscopy, staying in place for three consecutive days, enabling instillation of sodium acetate (100mM or 180mM) or placebo. The primary outcome fat oxidation was measured via an open-circuit ventilated hood system. Blood samples were collected during fasted and postprandial conditions, before and 15, 30, 60, 90 and 120 minutes after colonic infusion. Treatment group differences are measured as area under the curve (AUC) or incremental AUC (iAUC) and were analyzed by analysis of variance with post-hoc least significant difference correction.

Results: Distal colonic infusions with 180mM sodium acetate increased fasted fat oxidation by 23% (iAUC2h: 1.78±0.28 vs -0.78±0.88g fat, p<0.05), increased fasted plasma PYY (iAUC2h: 1976±393 vs 0±534ng/L, p<0.05), postprandial acetate (AUC2h: 14.98±4.94 vs 9.83±2.96mM, p<0.001) and postprandial insulin concentrations (iAUC2h: 6.76±1.28 vs 5.58±1.18U/L, p<0.02), and tended to enhance postprandial glucose concentrations (iAUC2h: p<0.1), when compared to placebo. Additionally, distally administered 100mM sodium acetate decreased TNF-α concentrations, when compared to placebo (iAUC2h: -21.68±9.80 vs -2.09±8.80ng/L, p<0.05). In contrast, proximal administration of sodium acetate showed no significant effect on these metabolic parameters. Distal and proximal infusions did not affect energy expenditure or plasma fatty acids, glycerol, GLP-1 and leptin concentrations.

Conclusion: This study showed that distal sodium acetate infusions modulate whole body substrate metabolism, with a pronounced increase in fat oxidation. Modulating colonic acetate may yield new mechanisms for treating or preventing metabolic diseases.

1. Conflict of interest: The authors have declared that no competing interests exist.

2. Funding: The research is funded by TI Food and Nutrition, a public-private partnership on pre-competitive research in food and nutrition. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

P6:

Body Shape Index as a Predictor of Total and Cause-Specific Mortality among the Elderly: The Rotterdam Study

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Background: The association of BMI with mortality among the elderly remains controversial. We aimed to evaluate the performance of a new anthropometric measure, A Body Shape Index (ABSI), in prediction of total and cause-specific mortality; (including cardiovascular disease (CVD) and cancer mortality), in a population ≥ 55 years and to compare it with those of other anthropometric measures; BMI, waist circumference (WC), and waist to hip ratio (WHR).

Methods: The study included 6,366 participants from the prospective population-based Rotterdam Study. We used Cox proportional hazards regression models to estimate the association of ABSI, BMI, WC, and WHR with total and mortality. Predictive performance was compared by calculating the “informativeness”, using the difference in twice the log-likelihood, for a model including age, total and HDL cholesterol, diabetes mellitus, current smoking, systolic blood pressure, treatment for hypertension and models including each additional anthropometric measure.

Results: During follow-up (median: 16 years) there were 3,675 deaths from all-causes, 1195 deaths from CVD, and 939 deaths from cancer. In the multivariate adjusted models, ABSI was associated with total (HR 1.15, 95%CI 1.09-1.21) and CVD mortality (HR 1.18, 95%CI 1.08-1.29) among men and with total (HR 1.09, 95%CI 1.04-1.14) and cancer mortality (HR 1.19, 95%CI 1.09-1.31) among women. ABSI was the most informative measure followed by BMI in prediction of total and CVD mortality and followed by WHR in prediction of cancer mortality.

Conclusion: In our population-based study, ABSI was the most informative measure to predict total and cause-specific mortality. Higher ABSI indicates unhealthy body shapes despite the fact that BMI or WC may be in normal range.

1. Conflict of interest: None

2. Funding: None

P7:

The effects of 4 weeks oral administration of omega-3 fatty acids on hepatic steatosis and insulin sensitivity in morbidly obese patients undergoing gastric bypass surgery

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Introduction: Non-alcoholic fatty liver disease (NAFLD) and steatohepatitis (NASH) are associated with insulin resistance and may progress to cirrhosis. The prevalence of NAFLD rises, and NASH is a leading cause of liver transplantation. Omega-3 (ω -3) fatty acids have demonstrated potential to reduce NAFLD and improve insulin sensitivity in rodents.

Methods: We studied the effect of oral ω -3 fatty acid supplementation (4g EPA and 1.7g DHA/day) on NAFLD and insulin sensitivity in morbidly obese patients, randomized to a eucaloric diet intervention consisting of a 50% ad libitum diet supplemented with liquid meals with or without fish oil (FO) to meet caloric requirements. Participants consumed the diet for 4 weeks prior to gastric bypass surgery. Before and after the dietary intervention hepatic fat content (IHTG) was analyzed using magnetic resonance spectroscopy and a hyperinsulinemic-euglycemic clamp was performed to assess insulin sensitivity. Liver biopsies were taken during surgery.

Results: We included 15 patients (41.9 ± 9.5 yrs; BMI 44.3 ± 5.9 kg/m²; IHTG $18.1 \pm 7.7\%$). BMI did not differ at baseline and did not change during the intervention. EPA and DHA concentrations in erythrocytes increased from $3.7 \pm 1.3\%$ to $18.8 \pm 3.9\%$ ($p < 0.001$) and $20.7 \pm 4.1\%$ to $26.3 \pm 2.5\%$ ($p < 0.001$) resp. in the FO group only. Hepatic fat content was reduced significantly within both treatment arms (FO diet by $3.2 \pm 1.4\%$, $p = 0.002$ and control diet by $4.0 \pm 2.1\%$, $p = 0.013$) but did not differ between groups ($p = 0.49$). There were no significant differences in hepatic or peripheral insulin sensitivity before and after treatment between and within the diet groups.

Conclusion: In morbidly obese patients, supplementation of 50% of caloric needs as a liquid meal reduces hepatic steatosis with no additional effect of dietary fish oil. Insulin sensitivity does not improve upon a 4 weeks high dose fish oil diet.

1. Conflict of interest: none to declare

2. Funding: P.W. Gilijamse is supported by the 2012 EU RESOLVE consortium (grant number FP7-EU 305707).

P8:

Weight related health status of patients treated by dietitians in primary care practice: first results of a cohort study.

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Introduction: Overweight and obesity are common in the Netherlands: in 2006 51% of adult men and 42% of adult women were overweight; 10% of men and 12% of women were obese [1]. Patients with overweight or obesity in the Netherlands are often referred to dietitians in primary care for weight loss treatment. We followed a prospective observational cohort to study the effectiveness of this treatment and present the baseline results in this article.

Methods: We invited dietitians throughout the country, who completed at baseline a questionnaire for each patient including weight, stature, waist circumference, age, gender, morbidities, medication, education level, ethnicity, referral, treatment expectations, history of previous weight loss attempts, and exercise.

Results: At baseline data from 1546 patients were obtained from 158 dietitians working in 26 practices. The majority (73%) of patients were obese (BMI \geq 30 kg/m²); and 10% had a BMI of 40 kg/m² or more. The majority of patients (94%) had a high to extremely high weight related health risk (WRHR): (BMI 25-30 kg/m² with comorbidities, or BMI 30-35 kg/m² without comorbidities, up to BMI \geq 35 with comorbidities and BMI \geq 40 with or without comorbidities). More than half (57%) had comorbidities and a long history of weight loss attempts. An extremely high WRHR was seen in 24.5% of the sample. Patients with very high to extremely high WRHR often had type 2 diabetes mellitus; hypertension; dyslipidaemia; osteo arthritis; and sleep apnoea. A very high or extremely high WRHR in men was associated with hypertension, and in women with all comorbidities.

Conclusion: The study was effective in recruiting dietitians to participate. The sample is representative for dietitians working in primary care. The majority of patients (94%) had a high to extremely high weight related health risk (WRHR).

1. Conflict of interest: The authors declare that they have no competing interests.

2. Funding: The study is conducted by the department of Health Science of VU University, Amsterdam, the Netherlands. Funding was obtained from the department of Health Science of VU University to visit practices; as well as for printing, distributing and collecting questionnaires.

P9:

Exploring the influence of a low glyceemic diet on postprandial hypoglycemia

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Introduction: The number of morbidly obese subjects that have to undergo bariatric surgery is drastically increasing worldwide. Within the Netherlands, the Dutch Obesity Center (NOK) supports patients after a Roux-en-Y gastric bypass (RYGB) operation. Recent research revealed that a fraction of the RYGB patients develop episodes of postprandial hypoglycemia within one to three years after surgery. Current dietetic treatment for postprandial hypoglycemia include a low-carbohydrate diet. In this research we explored if a low glyceemic diet could reduce the symptoms of postprandial hypoglycemia.

Methods: Postprandial hypoglycemia causes symptoms of late dumping. This is the reason why patients were selected by screening for the incidence of dumping syndrome using the Signad score system. After screening 197 patients that had undergone a RYGB in 2012, 67 patients (34%) had a positive score for dumping syndrome. 9 participants with dumping syndrome registered their regular food intake for 5 days. After this week the participants received adjustments in their diet. These adjustments replaced food products with a high glyceemic load for products with a lower glyceemic load.

Results: A significant reduction in the glyceemic load of the diet was observed in the participants. In addition, patients also seemed to experience a decrease in the gravity of the symptoms of postprandial hypoglycemia, although this latter effect was not observed to be significant.

Conclusions: The outcome of this practical research suggests that a low glyceemic diet may be effective in treating post-gastric bypass, postprandial hypoglycemia. In order to further study the effects of a low glyceemic load on postprandial hypoglycemia we suggest to prolong the study for a longer period and make additional studies with more participants.

1. Conflict of interest:

2. Funding:.

P10:**Fasting-induced insulin resistance reduces brown adipose tissue activity**

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Human brown adipose tissue (BAT) activity has been associated with non-shivering thermogenesis (NST) and human BAT has been shown to be a highly insulin sensitive tissue. Retrospective human studies have suggested that type 2 diabetes is associated with reduced BAT activity, measured as BAT glucose uptake. However, it is not known whether BAT glucose uptake is impaired due to insulin resistance, per se. Therefore, in this study, insulin resistance was induced by a 2-day fasting period and its effect on cold-induced BAT glucose uptake and NST was investigated. To this end, 16 healthy subjects (8M, 8F, age 21.9±3.1 years, BMI 21.4±1.6 kg/m²) participated in a randomized crossover study in which BAT activity was measured twice: after a normal-fed period (Control) and after a 54-h fasting period (to induce insulin resistance). Cold-stimulated BAT glucose uptake was measured using dynamic [¹⁸F]FDG-PET/CT scanning at maximal NST (defined as the increase in energy expenditure above basal metabolic rate, at a temperature just above an individual's shivering temperature), as achieved by an individualized cooling protocol. Skin perfusion and skin- and core-temperatures were monitored as well.

In the fasting condition, cold-stimulated BAT glucose uptake rate was significantly decreased compared to the control condition (2.7±1.7 vs. 6.0±3.4 μmol/min/100g, p<0.001). No change in [¹⁸F]FDG uptake was observed in other tissues, such as skeletal muscle, liver and brain. NST was also significantly reduced from 12.7±9.1 to 6.7±5.1% (p<0.01). Interestingly, core temperature showed a significant decrease upon cold exposure only in the fasted condition (-0.26±0.21 °C, p<0.01).

These findings indicate that fasting-induced insulin resistance hampers BAT activity, which is accompanied with a reduced non-shivering thermogenesis and a decreased core temperature during mild cold exposure. If BAT glucose uptake is also reduced in other insulin-resistant conditions, this may be involved in the development of hyperglycemia.

1. Conflict of interest: None

2. Funding: EU FP7 project DIABAT (HEALTH-F2-2011-278373 to W.D. van Marken Lichtenbelt).

P11:

Niacin increases poly unsaturated fatty acid synthesis in adipocytes, increasing docosahexanoic acid secretion

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Introduction: Niacin, an anti-hyperlipidemic and anti-inflammatory drug, has been shown to affect adipocyte function and gene expression. We aimed to obtain more mechanistic insight into the effects of niacin on adipose tissue.

Methods: The ApoE3*Leiden.CETP mouse model that is characterized by a human-like lipoprotein profile was treated for 15 weeks with western type diet +/- 0.3% niacin. Gonadal White Adipose Tissue (gWAT) was harvested bilaterally: one pad was snap-frozen for gene expression and fatty acid composition by GC/MS. From the other gWAT pad, adipocytes were isolated and incubated in medium to determine fatty acid secretion by LC/MS.

Results: As expected, body and adipose tissue weight did not change due to niacin treatment. Gene expression of gWAT measured by micro-array analysis was subjected to pathway analysis, which showed upregulated poly unsaturated fatty acid (PUFA) synthesis after niacin, mostly due to Elongase5/6 genes. Fatty acid composition of the gWAT showed a decreased level of PUFAs, predominantly the essential fatty acid precursors for PUFAs. As essential fatty acid intake was similar, enzyme-specific substrate/product ratios were analysed to examine changes in essential fatty acid turnover. The ratios that were found affected all consisted of elongation steps: the C18→C20 elongations were increased and C20→C22 elongations were decreased after niacin treatment, indicating increased C20 PUFA secretion. PUFA secretion from cultured adipocytes showed that essential fatty acid secretion was not affected. However, arachidonate(AA) and eicosapentanoate(EPA) showed a trend and docosahexanoate(DHA) was secreted more due to niacin.

Conclusion: Niacin treatment led to increased expression of genes involved in PUFA synthesis. Although gWAT lipids contained fewer PUFAs, the turnover of PUFAs was increased in adipocytes from niacin treated animals, as was their secretion of PUFAs.

1. Conflict of interest: Nonw to declare.

2. Funding: Netherlands Consortium for Systems Biology.

P12:

Weight loss maintenance in young children with overweight: a two-year, multimedia based, multidisciplinary intervention with a cognitive behavioural approach

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Introduction: The prevalence of childhood overweight and obesity is still increasing, becoming an important public health issue. Weight loss treatments for overweight children have been associated with significant physical and psychosocial health benefits. Although some evidence supports long-term efficacy, maintaining weight loss remains a challenge. Most interventions are marked by a considerable relapse. Therefore, we developed a family based multidisciplinary maintenance program for young children.

Methods: Since 2012, the department Paediatrics of Hospital Gelderse Vallei in Ede (the Netherlands) has designed an outpatient maintenance program for overweight children aged 3 to 8 years who finished our one-year multidisciplinary treatment program AanTafel!. The maintenance program aims at persistence of reduction of body mass index (BMI) and retaining the adapted healthier lifestyle.

Results: A two-year multidisciplinary maintenance program has been developed, using a cognitive-behavioural approach to weight maintenance with the focus on parents' motivation and capacity to continue weight maintenance behaviour over time. The family-based program comprises extended education of parenting and planning techniques and focuses on relapse prevention and social support. Challenges of establishing and sustaining new eating and activity behaviours are discussed in groups and individually. Face-to-face contacts are supported by a digital workbook on the internet. Additional information (text, video) is provided and assignments can be fulfilled. The digital workspace is connected with the electronic patient record system. A secure message system allows the interchange of individually tailored information between parents and health care professionals, and encourages parents adherence to the program.

Conclusion: Weight regain continues to remain a challenge for a number of parents with obese children aged 3-8 years after completing a treatment program. Therefore, a two-year multidisciplinary maintenance program extending treatment contact and content has been developed. This program takes a cognitive-behavioural approach to weight maintenance and extensively uses multimedia approaches to complement face-to-face contacts.

1. Conflict of interest: none

2. Funding: none

P13:

Thermoneutrality results in prominent diet-induced body weight differences in C57BL/6J mice, not paralleled by diet-induced metabolic differences

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Introduction: Mice are usually housed at 20–24 °C. At thermoneutrality (28 °C) larger diet-induced differences in obesity are seen. We tested whether this leads to large differences in metabolic health parameters.

Methods: We performed a 14-wk dietary intervention in C57BL/6J mice at 28 °C and assessed adiposity and metabolic health parameters for a semi-purified low fat (10 energy%) diet and a moderate high fat (30 energy%) diet.

Results: A large and significant diet-induced differential increase in body weight, adipose tissue mass, adipocyte size, serum leptin level, and, to some extent, cholesterol level was observed. No adipose tissue inflammation was seen. No differential effect of the diets on serum glucose, free fatty acids, triacylglycerides, insulin, adiponectin, resistin, PAI-1, MMP-9, sVCAM-1, sICAM-1, sE-selectin, IL-6, ApoE, fibrinogen levels, or HOMA index was observed. Also in muscle no differential effect on mitochondrial density, mitochondrial respiratory control ratio, or mRNA expression of metabolic genes was found. Finally, in liver no differential effect on weight, triacylglycerides level, aconitase/citrate synthase activity ratio was seen.

Conclusions: Low fat diet and moderate high fat diet induce prominent body weight differences at thermoneutrality, which is not paralleled by metabolic differences. Our data rather suggest that thermoneutrality alters metabolic homeostasis.

1. Conflict of interest: No conflict of interest.

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P14:

Correctly diagnosing children with overweight and obesity: the use of BMI-percentiles

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Introduction: The 5th Dutch Nationwide Growth Study shows an increase in the prevalence of children with overweight and obesity. In 2009 12% of the Dutch children are overweight and 2% are obese. These children with obesity are at risk to develop health problems. The World Health Organization has defined overweight and obesity on the basis of age and gender specific percentiles of the Body Mass Index (BMI). BMI-percentiles and the possibility to plot them in a growth curve with the use of an electronic medical record can help health professionals to correctly diagnose childhood overweight and obesity. A literature study was conducted to investigate the effect of using BMI-percentiles on correctly diagnosing children with overweight and obesity.

Methods: PubMed was used to identify relevant papers. Inclusion criteria were i) any type of study design, (ii) reported percentages (correct) diagnosis of overweight/obesity, (iii) the use of BMI-percentiles or growth curves, and (iv) children aged 2 -19 years and (v) literature reviews. Studies were excluded if they reported on (i) diseases related to overweight and obesity, (ii) interventions on overweight/obesity, and (iii) the appropriateness of BMI as tool for diagnosis compared to other tools.

Results: Nine studies met the inclusion criteria. All studies demonstrate more favorable outcomes on correctly diagnosing overweight/obesity with BMI-percentiles, but only four studies showed statistical significance. The meta-analysis provided a significant positive effect of the use of BMI-percentile (OR[95% CI]: 2.35 [1.61;3.44]), but the absolute increase in correct diagnosis ranged from 8 to 26% only.

Conclusion: The use of BMI-percentiles does increase correct diagnosis of childhood overweight/obesity, but the clinical relevance is considered limited.

1. Conflict of interest: No

2. Funding: No

P15:

Adipose ChREBP- β expression increases after a hypercaloric diet and is associated with induction of GLUT4 expression

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Introduction: Adipose tissue expression of the Carbohydrate Responsive Element Binding Protein (ChREBP)- β , a recently discovered isoform, is regulated by GLUT4 and predicts insulin-stimulated glucose disposal. While adipose ChREBP- β expression is downregulated in obesity, the direct effects of excess nutrient ingestion are unknown.

Methods: To study the effect of caloric excess on subcutaneous adipose tissue (SAT) expression of CHREBP and GLUT4, 35 healthy men (BMI 22.2 [19.6-24.9] kg/m²) consumed a hypercaloric, high-sugar or high-fat-high-sugar diet (40% extra calories) or a control (eucaloric) diet for 6 weeks. Before and after the diet, we performed a 2-step hyperinsulinemic-euglycemic clamp, and measured SAT and liver fat by MRS. SAT biopsies were obtained to measure gene expression by qPCR.

Results: Prior to the diet, both SAT ChREBP- α and ChREBP- β correlated with GLUT4 expression ($r_s = 0.427$, $P = 0.010$ and $r_s = 0.576$, $P < 0.001$, resp.). ChREBP- β , but not - α expression inversely correlated with BMI ($r_s = -0.510$, $P = 0.002$) and amount of SAT ($r_s = -0.437$, $P = 0.011$) and liver fat ($r_s = -0.376$, $P = 0.028$). ChREBP- β expression correlated positively with basal endogenous glucose production (EGP) ($r_s = 0.411$, $P = 0.014$), but not with peripheral insulin sensitivity. After the hypercaloric diet, insulin sensitivity did not change, ChREBP- α trended towards an increase ($P = 0.069$) and ChREBP- β increased significantly ($P = 0.045$). The change in ChREBP- β correlated strongly with the change in GLUT4 expression ($r_s = 0.572$, $P = 0.001$). In the control diet group, insulin sensitivity and ChREBP and GLUT4 expression did not change.

Conclusion: SAT ChREBP- β is linked to hepatic glucose metabolism. We show that overeating induces SAT ChREBP- β expression in association with increased GLUT4 expression, suggesting a role for ChREBP- β as an early adaptive response in adipose-tissue handling of nutrient excess.

1. Conflict of interest: none

2. Funding: none

P16:

Striatal dopamine transporter binding correlates with body composition, energy expenditure, and visual attention bias for food cues

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Introduction: It is currently believed that a downregulated dopaminergic system in obesity stimulates food-motivated behavior in pursuit of reward, but the physiological role of dopamine (DA) in energy balance regulation is not well established. Since motivation for food is an essential evolutionary mechanism for survival and lean body mass is a well-known determinant of survival, we hypothesized that the striatal dopaminergic system might be involved in maintaining energy balance and lean body mass.

Methods: We therefore included 36 lean, healthy, male subjects and measured striatal DA transporter (DAT) binding using ¹²³I-FP-CIT SPECT, body composition using bioimpedance analysis, resting energy expenditure (REE), visual attention bias for food and degree of impulsivity using response-latency based computer tasks. Ad libitum food intake was self-reported online.

Results: Striatal DAT binding correlated with lean body mass ($p=0.009$, $r=-0.47$), fat mass ($p=0.003$, $r=-0.53$) and lean:fat mass ratio ($p=0.02$, $r=0.40$) but not with body mass index (BMI; $p=0.07$). Moreover, striatal DAT binding positively correlated with REE expressed as kcal per kg ($p=0.02$, $r=0.42$) and with visual attention bias for food ($p=0.004$, $r=0.54$), but not with impulsivity ($p=0.71$). Furthermore, visual attention bias for food positively correlated with ad libitum total caloric intake ($p=0.002$, $r=0.55$), protein intake ($p=0.04$, $r=0.37$) and carbohydrate intake ($p=0.04$, $r=0.37$).

Conclusion: Based on our results we propose a physiological role for the striatal DA system in maintaining energy balance by responding to changes in body composition. When fat and/or lean mass changes, the striatal DA system acts to adjust energy expenditure and/or energy intake through modulation of visual attention to food. As obese subjects have a reduced lean: fat mass ratio, our proposed mechanism could explain the downregulated dopaminergic system as shown in the striatum of obese subjects.

1. Conflict of interest: none.

2. Funding: The project was funded by a PhD scholarship grant awarded by the AMC executive board.

P17:

Serotonin Transporter binding in the hypothalamic region is associated with insulin sensitivity in obese women

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Introduction: The brain serotonergic and dopaminergic systems are related to obesity in humans. Obesity is also associated with insulin resistance, but at present it is unclear whether serotonin and dopamine relate to insulin sensitivity independent of obesity. We hypothesized that the brain serotonin and dopamine systems both have independent relationships with insulin sensitivity.

Methods: In a cohort of lean (n=8), insulin sensitive obese (ISO) and insulin resistant obese (IRO) women (total obese cohort n=10) we measured serotonin transporter (SERT) binding in the hypothalamic region and striatal dopamine transporter (DAT) binding with 123-I-FP-CIT SPECT. Insulin sensitivity was assessed using an oral glucose tolerance test and the Matsuda Index.

Results: Body mass index (BMI) was not significantly different between ISO and IRO women (p=0.41). Striatal DAT binding did not differ between, lean, ISO and IRO women and did not correlate with BMI or insulin sensitivity. SERT binding in the hypothalamic region was significantly lower in IRO women compared to lean (p=0.03) and ISO subjects (p=0.03). Moreover, SERT binding positively correlated with insulin sensitivity (p=0.02, r=0.73) in the obese women, but SERT binding did not correlate with BMI (p=0.25).

Conclusion: We conclude that SERT binding in the hypothalamic region, but not striatal DAT binding, is associated with insulin sensitivity in obese women independent of body weight.

1. Conflict of interest: none.

2. Funding: The project was funded by a PhD scholarship grant awarded by the AMC executive board.

P18:

DNA methylation mediates the effect of maternal smoking during pregnancy on birth weight of the offspring

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Introduction: Maternal smoking during pregnancy is associated with low birth weight in offspring, which, in turn, could be associated with increased catch-up growth. The development of chronic diseases is therefore believed to start during pregnancy as a result of exposure to adverse intra-uterine environments, also known as foetal programming. We hypothesize that long-lasting effects of maternal smoking during pregnancy may have adverse health consequences during the offspring's entire life course via DNA methylation. We studied the effect of maternal smoking during pregnancy on DNA methylation in cord blood and its mediating effect on birth weight.

Methods: We used cord blood of 129 Dutch children exposed to maternal smoking vs. 126 unexposed to maternal and paternal smoking. DNA methylation was measured using the InfiniumHumanMethylation450 Beadchip. First, we performed an epigenome-wide association study (EWAS), adjusted for maternal age, education, pre-pregnancy BMI, gender and gestational age. We continued with gene-based mediation analysis, after principal component analysis in the significant signals. Finally, we performed functional network analysis.

Results: We found 71 differentially methylated cytosine-phosphate-guanine (CpG) sites (False Discovery Rate <0.05), of which 23 also survived Bonferroni correction. These 23 CpGs mapped to nine genes: AHRR, GFI1, MYO1G, CYP1A1, NEUROG1, CNTNAP2, FRMD4A, LRP5 and TRAPPC9. CpGs in GFI1 and close to NEUROG1 mediated the effect of maternal smoking on birth weight (Sobel test $p < 0.05$). Differential methylation of these two genes explained 38.7% and 21.9% of the effect of maternal smoking on birth weight. Functional enrichment analysis pointed towards activation of the immune system.

Conclusion: Maternal smoking during pregnancy was associated with cord blood methylation differences. Functional network analysis suggested that the differentially methylated genes play a role in activating the immune system. This is the first study to show a mediating role of methylation in the association between maternal smoking during pregnancy and birth weight of the offspring.

1. Conflict of interest: None

2. Funding: This work was supported by the Biobanking and Biomolecular Research Infrastructure Netherlands [CP2011-19]. The GECKO Drenthe birth cohort was funded by an unrestricted grant of Hutchison Whampoa Limited, Hong Kong.

P19:

Human brown adipose tissue recruitment

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Introduction: Upon mild cold exposure people can increase their energy expenditure (EE) without shivering, called nonshivering thermogenesis (NST). When rodents are adapted to cold shivering disappears, while EE remains elevated and BAT recruitment takes place. Recently, we showed that this occurs in humans as well; cold acclimation resulted in BAT recruitment in parallel with an increased NST. Here we present a new methodology 'fixed volume' within [¹⁸F]FDG-PET/CT-imaging that can be used to compare BAT activity levels.

Methods: Traditionally BAT activity is determined by a glucose uptake 'threshold' technique. After an intervention both glucose uptake rate and volume may change, obscuring volume specific changes in BAT activity. The 'fixed volume' methodology encompasses the drawing of regions of similar volume (8 x 8 x 8 mm). Glucose uptake rates obtained with both methods were compared before and after a 10-day cold acclimation period. For this purpose, 17 young, healthy and lean humans participated (9F/8M). Cold-induced BAT activity was measured using dynamic and static [¹⁸F]FDG-PET/CT-imaging. For this measurement an individualized cooling protocol was used, ensuring maximal nonshivering thermogenesis (1).

Results: Static imaging revealed that BAT volume and activity (standard uptake value; SUV) increased significantly upon cold acclimation (volume: 665±451 vs. 913±458 cc (p<0.05) and SUV mean: 2.4±0.7 vs. 2.8±0.5 SUV mean (p<0.01), respectively). Glucose uptake rate calculated by the 'threshold' technique did not increase (6.9±3.0 vs. 7.6±2.5 μmol/min/100g (p>0.05)) (1). However the 'fixed volume' methodology revealed that glucose uptake rate increased significantly (22.5±12.5 vs. 33.5±16.8 μmol/min/100g (p<0.05)).

Conclusion: This study shows that BAT is recruited after cold acclimation in human adults (1). An important outcome of the 'fixed volume' methodology is that cold acclimation also increases glucose uptake rate. With this method an absolute quantification of glucose uptake rates can be obtained.

1. Conflict of interest: -

2. Funding: Research related to this abstract was financed by Netherlands Organization for Scientific Research (TOP 91209037) and by the EU FP7 project DIABAT (HEALTH-F2-2011-278373) both to W.D. van Marken Lichtenbelt.

P20:

Sugar-Sweetened Beverage intake in toddlers and body composition up to 6 years: The Generation R Study

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Background and objective Intake of sugar sweetened beverages (SSBs) has been associated with higher body mass index (BMI) in childhood, but potential effects of SSBs in infancy are unclear. We aimed to examine the associations of SSB consumption at 14 months with BMI development until 6 years and body composition at age 6.

Methods This study included 2,371 Dutch children from the population-based Generation R Study. Information about SSB intake at 14 months was assessed using a Food Frequency Questionnaire. BMI was calculated from weight and height measurements and standard deviation scores were calculated using Dutch reference growth curves. Body composition was measured using dual-energy X-ray absorptiometry (DXA) scan.

Results In girls, higher SSB intake at 14 months was associated with a higher BMI up to 6 years (SD increase 0.11 (95%CI 0.00; 0.23) for the highest versus the lowest tertile of intake at age 6). We observed a tendency towards a higher android/gynoid fat ratio in girls in the highest tertile of SSB intake (SD increase 0.15 (95%CI -0.02; 0.31), versus the lowest tertile), but no association with body fat percentage or overweight. In boys, there was no association between SSB intake and BMI or body composition.

Conclusions Higher SSB intake at 14 months was associated with a higher BMI up to age 6 in girls, but not in boys. Our results imply that the unfavorable effects of SSB consumption already start early in life. Dietary advice to parents of children below 2 years of age might contribute to prevention of childhood adiposity.

1. Conflict of interest: -

2. Funding:

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P21:

The effect of lifestyle interventions on cardiometabolic health in severe mentally ill residential patients

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Introduction: Poor cardiometabolic health in severe mentally ill patients contributes to a life expectancy that is 15-25 years less compared to the general population. This is partly related to unhealthy lifestyle behaviours. The aim of the Effectiveness of Lifestyle Interventions in Psychiatry trial (ELIPS) is to improve cardiometabolic health in severe mentally ill residential patients by addressing the obesogenic environment, focussing on diet and physical activity.

Methods: ELIPS is a cluster randomised controlled lifestyle trial in severe mentally ill patients. All residential and long-term clinical care teams in Friesland and Groningen (N=29) were randomised to intervention (INT, N=15) or control (CON, N=14). The intervention was aimed at team level. Lifestyle coaches created a team-tailored lifestyle plan according to preset ELIPS goals and a strict protocol. In the 3-month implementation phase lifestyle coaches trained teams to create a healthy environment and stimulate health behaviours in patients. In the 9-month monitoring phase teams were assisted by a lifestyle coach to achieve the preset goals. Patients in the control arm received care as usual. Anthropometry, metabolic and psychological outcomes were measured at baseline (T0), 3 (T3) and 12 (T12) months. Data were analysed using multi-level linear mixed models with adjustment for baseline values. Numbers represent estimated marginal means±se.

Results: Preliminary analysis based on imputed data show no significant differences in waist circumference in INT (N=802, WCT3=103.4±0.65, WCT12=103.3±0.71 cm) when compared to control (N=844, WCT3 103.8±0.65, WCT12 = 103.5±0.63 cm, P=0.15).

BMI tended to be lower at 3 months in INT (BMIT3=28.3±0.22) when compared to controls (BMIT3=28.7±0.21), but this effect was not sustained at 12 months (INT BMIT12=28.6±0.22, CON BMIT12 = 28.4±0.22, Pinteraction=0.053). Analyses based on effectuated intervention will follow.

Conclusion: A lifestyle intervention addressing the obesogenic environment of severe mentally ill residential patients shows no sustained improvements in waist circumference or BMI in intention-to-treat analyses.

1. Conflict of interest: None

2. Funding: ZonMW project number 171101002.

P22:

Vitamin D is inversely associated with BMI and inflammatory markers in morbid obesity

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Introduction: Obesity has been associated with low vitamin D levels (VitD) and systemic inflammation. VitD may be associated with inflammation in obesity. It is unknown whether these associations pertain to morbid obesity. The aim of this study was to analyse VitD in relation to different degrees of obesity in morbidly obese subjects and to investigate its relationship with inflammatory markers.

Methods: Morbidly obese subjects scheduled for bariatric surgery were included. Baseline characteristics and laboratory values were collected according to standard protocol in our clinic. C3 and CRP were measured in reflection of systemic inflammation. All subject were categorized in quintiles according to BMI. Using ANOVA the relation between BMI and metabolic and inflammatory parameters was analysed. Pearson's correlation coefficients were also calculated.

Results: The cohort consisted of 478 subjects (102 males; aged 18-63 years). There were no differences within the quintiles in terms of classic cardiovascular risk factors, glucose and insulin levels. Significant differences were found for plasma C3 with 1.61 ± 0.26 g/L ($x \pm SD$) in the lowest quintile versus 1.82 ± 0.27 g/L in the highest, for CRP 6.76 ± 6.05 and 12.69 ± 8.45 mg/L, respectively and VitD with 46.51 ± 20.43 and 31.60 ± 15.31 nmol/L, respectively (P ANOVA < 0.001 for each). VitD was negatively associated with C3 ($r = -0.133$; $P = 0.004$) and CRP ($r = -0.107$; $P < 0.05$). C3 was positively correlated with CRP ($r = 0.394$; $P < 0.001$).

Conclusion: Surprisingly, BMI was not correlated with classic cardiovascular risk factors in morbidly obese subjects. However, a positive correlation was observed between BMI and C3 and CRP. This may be linked to systemic inflammation, which may arise from the tissue. Low VitD may contribute to systemic inflammation due to its anti-inflammatory properties. Few studies describe the relation between these inflammatory variables and VitD, but results are conflicting. In this analysis a significant negative association with inflammatory markers was seen.

1. Conflict of interest: the authors declare that there is no conflict of interest

2. Funding: the authors have no support or funding to report

P23:**Effects of timing of saturated fat and liquid sugar intake on obesity in rats and circadian rhythms in hypothalamic cells.**

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Introduction: Timing and composition of food intake can contribute to metabolic disturbances like obesity, but to date it is unknown which factor is most disruptive to energy homeostasis.

Methods: In a rat model we assessed the nutrient that attributed the most to time-of-day-dependent weight gain. Male Wistar rats were subjected to chow ad libitum ('chow'), or a choice diet with saturated fat, a 30% sugar solution, chow and tap water; either ad libitum ("ad lib") or with access to fat ("LF") or sugar ("LS") only during the light phase. Energy intake and expenditure were monitored during 5 weeks. Subsequently, in a hypothalamic in vitro cell model, we assessed the influence of fat and sugar on the rhythmic expression of clock genes. The immortalized, hypothalamic murine cell line mHypoE-37 was used, which exhibits robust circadian rhythms of core clock genes, including Per2 and Bmal1. Cells were exposed to either 25 μ M of the saturated fatty acid palmitate, or 0.5 or 5.5 mM sugar. mRNA expression of clock genes was assessed over a 36 h period.

Results: After 31 days, rats restricted to daytime sucrose (LS) showed the highest food efficiency (i.e. gained most body weight per ingested calorie) and showed a lower and inversed respiratory exchange ratio (RER) pattern. Incubation with 25 μ M palmitate significantly increased Bmal1 mRNA expression levels in mHypoE-37 neuronal cells, whereas 5.5 mM glucose significantly altered acrophase and amplitude of Per2 mRNA levels.

Conclusion: Sugar consumption during the inactive period results in increased food efficiency due to a shifted oxidation pattern. This is likely to predispose the animal to obesity. Furthermore, palmitate and glucose were found to disturb normal clock gene expression in vitro, indicating that fatty acids and glucose could disrupt clock gene rhythmicity in hypothalamic neurons. Further studies are underway to assess putative molecular mechanisms involved in these processes.

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P24:

Physical activity improves healthy aging. However, only in combination with a healthy diet

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Introduction: Biological aging is characterized by a decline of vital functions, likely due to wear and tear of the metabolic system. Limiting dietary fat, calorie restriction and increased physical activity are thought to have positive effects on biological aging. We aim to understand the mechanisms linking metabolic performance and biological aging. Here we assess how these mechanisms are modulated by diet quality and physical activity.

Methods: C57BL/6J01aHsd mice are studied either feeding a high fat (HF, 45% fat) diet or a low fat (LF, 6% fat) diet. Each diet group is further subdivided in an ad libitum feeding group with access to running wheel (RW+) or without (RW-). These diet groups are studied over time in different cohorts of mice. We present body weight, food intake, energy expenditure and glucose tolerance at young and older age. In parallel cohorts, the effects of treatments on survival are determined.

Results: RW access increased food intake at both ages. At young age, this increased food intake appeared necessary to oppose body weight loss. At old age, however, the increased food intake in the RW+ condition may drive weight gain. No differences in energy expenditure were found between RW+ and RW- groups at young age. At older age, however, RW+ mice had lower energy expenditure in LF, but higher energy expenditure in HF conditions. HF diet caused glucose intolerance at young age irrespective of RW access. Interestingly, the aged mice feeding the HF diet with access to RW were most glucose intolerant.

Conclusion: This questions the beneficial effects of physical activity to prevent HF diet induced disturbance in body weight and glucose homeostasis towards old age. This is also reflected in the survival curves, where physical activity in the LF diet condition increases median life span, but not in the HF condition.

1. Conflict of interest: There are no conflicts of interests.

2. Funding: NWO

P25:

Novel association between branched chain amino acids, β -aminoisobutyric acid and abdominal visceral adiposity: a metabolomics study

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Introduction: Branched chain amino acids (BCAA) are elevated in obesity and are associated with metabolic risk factors. β -aminoisobutyric acid (B-AIBA) is a recently identified small molecule myokine that is inversely associated with cardiometabolic risk. The association of these metabolites with detailed body composition parameters and each other are not known. We hypothesized that BCAA and B-AIBA would be preferentially associated with abdominal visceral adipose tissue (VAT) and inversely to each other.

Methods: Forty-eight normal-weight and obese men and women were studied. Subjects underwent abdominal CT scan for VAT and subcutaneous adipose tissue (SAT), DXA-scan for total body fat, and a 2-hour oral-glucose-tolerance-test (OGTT). Metabolic profiling was performed using LC-MSMS for 65 polar metabolites. We performed a targeted statistical analysis to determine the relationship of BCAA and B-AIBA with body composition and metabolic parameters.

Results: Fifteen normal-weight (BMI 22.6 \pm 0.3kg/m²; waist-circumference 80.1 \pm 2.1cm; mean \pm SEM) and 33 obese (BMI 35.3 \pm 0.8kg/m²; waist-circumference 110.8 \pm 2.0cm; mean \pm SEM) subjects were studied. BCAA were higher (p=0.005) and B-AIBA tended to be lower (p=0.08) in obese vs. normal-weight subjects. BCAA were significantly associated with VAT (R=0.49; p=0.0006) and trended to an association with SAT (R=0.29; p=0.06) but was not associated with total body fat percentage (R=0.1; p=0.53). BCAA were related to parameters of insulin resistance (IR) including fasting insulin (R=0.48; p=0.0006), HOMA (R=0.48; p=0.00007), HbA1c (R=0.36; p=0.014). B-AIBA was not associated with BCAA (R=-0.04; p=0.8) but was inversely associated with parameters of IR (fasting insulin: R=-0.38, p=0.008; HOMA: R=-0.38, p=0.009; HbA1c: R=-0.33, p=0.03). B-AIBA was also inversely associated with SAT (R=-0.37; p=0.01) and total body fat percentage (R=-0.42; p=0.004) but only trended to an association with VAT (R=-0.27; p=0.07).

Conclusion: BCAA and B-AIBA are both associated with parameters of IR but are not associated with each other. BCAA are more strongly associated with VAT while B-AIBA is more strongly associated with SAT and total body fat.

1. Conflict of interest: none

2. Funding: AR is supported by the EFSD Albert Renold travel award and the Global Dairy Platform for a visit to Harvard Medical School and Massachusetts General Hospital.

P26:

Concomitant intracarotid Infusion of a lipid emulsion and glucose towards the brain increases endogenous glucose production without a change in Neuropeptide Y expression

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Introduction: Providing rats the choice of saturated fat and liquid sugar in addition to chow induces glucose intolerance and increases hypothalamic neuropeptide Y (NPY) expression, whereas providing either fat or sugar only in addition to chow does not. Although NPY can modulate glucose metabolism, at present it is unknown whether direct effects of fat and sugar on NPY expression cause the observed diet-induced effect on glucose. We hypothesized that direct infusion of lipids and sugar towards the brain increases glucose concentration through an increase in endogenous glucose production (EGP) induced by an increase in NPY expression.

Methods: We used a 2-hours intracarotid infusion of either heparinized Intralipid 20% (IL), IL and glucose 1% (IL + G) or control saline (NaCl) at a rate of 5µl/min in male Wistar rats fasted overnight. We assessed EGP using a stable isotope dilution method. Blood samples were taken throughout the experiment and animals were decapitated 30 minutes after the end of infusion

Results: NaCl infusion had no effect on glucose concentrations while IL significantly decreased glucose. IL+G did not affect glucose concentrations, but when comparing to IL, glucose was significantly higher ($P < 0.01$). EGP increased upon IL + G infusion only. In situ hybridization showed no differences in NPY mRNA expression between groups. Surprisingly, IL significantly reduced POMC mRNA expression compared to rats infused with NaCl ($P < 0.05$).

Conclusion: Taken together, these data show that intracarotid IL infusion towards the brain decreases glucose concentrations and POMC mRNA. Infusion of IL + G increases EGP which may counteract the glucose lowering effect of IL only. The increase in EGP was independent of changes in NPY or POMC.

1. Conflict of interest: none

2. Funding: ZonMW

P27:

Oxygen restriction as a sensitive challenge test to reveal short-term diet-induced health effects

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Introduction: Challenge tests stress homeostasis and may reveal deviations in health that remain masked under unchallenged conditions. Ideally, challenge tests are non-invasive and applicable in an early phase of a study. The response to oxygen restriction (OxR; mild normobaric 12% O₂) measures the flexibility to adapt metabolism. Metabolic inflexibility is one of the hallmarks of the metabolic syndrome.

Methods: Mice were fed a low-fat (LF) or high-fat (HF) diet for only five days. Indirect calorimetry was used to assess the response to OxR. Serum markers, including protein glycation/oxidation, and gene expression in liver and adipose tissue were analysed.

Results: Although HF mice had a higher body weight after five days of feeding, HF and LF mice did not differ in calorimetric values under normal conditions nor in fasting state. Exposure to OxR, however, revealed differences in substrate use and the level of oxygen consumption between both dietary groups. Furthermore, transcript levels differed significantly indicating differences in their adaptation to OxR. The adaptation in HF mice appeared to be dampened, associated with increased serum markers of protein glycation/oxidation, whereas these changes were absent in LF mice.

Conclusion: An oxygen restriction challenge test is a promising new method to test food products on potential beneficial effects for health.

1. Conflict of interest: No conflict of interest

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P28:

Food parenting practices and child dietary behavior: prospective relations and the moderating role of general parenting

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Introduction: Research on parenting practices has focused on individual behaviors while largely failing to consider the context of their use, i.e., general parenting. We examined the extent to which food parenting practices predict children's dietary behavior (classified as unhealthy: snacking, sugar-sweetened beverage; and healthy: water and fruit intake). Furthermore, we tested the moderating role of general parenting on this relationship.

Methods: Within the KOALA Birth Cohort Study, in the Netherlands, questionnaire data were collected at 6 and 8 years (N=1654). Correlations were computed to assess the association between food parenting practices and general parenting (i.e., nurturance, behavioral control, structure, coercive control, and overprotection). Linear regression models were fitted to assess whether food parenting practices predict dietary behavior. Moderation analyses were performed by evaluating interactions with general parenting.

Results: Instrumental and emotional feeding, and pressure to eat were found to have associations with undesirable child dietary behavior (increased unhealthy intake/decreased healthy intake), whereas associations were in the desirable direction for covert control, encouragement and restriction. The associations of encouragement and covert control with desirable child dietary behaviors were found to be stronger for children who were reared in a positive parenting context.

Conclusion: Future research should assess the influence of contextual parenting factors moderating the relationships between food parenting and child dietary behavior as the basis for the development of more effective family-based interventions.

1. Conflict of interest: The authors declare that they have no competing interests.

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P29:

Effects of increased protein intake on renal acid load and renal hemodynamic responses

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Introduction: High protein diets may be beneficial for weight loss. It has been shown that consumption of protein compared to maltodextrin lowers blood pressure (BP). Dietary proteins may also have negative effects on kidney function, possibly via an increased acid load. The aim of this study was to compare the effects of 4 weeks of protein (group P) or maltodextrin (group M) supplementation on urinary predicted renal acid load in 24-h urine (uPRAL). In a subgroup of participants we also measured postprandial renal hemodynamic responses.

Methods: 94 men and women (BMI 25-35 kg/m²) with untreated elevated BP were randomized into group M or group P. Maltodextrin or protein (60g/d) isocalorically replaced other carbohydrates in the diet for 4 weeks. uPRAL was calculated from 24h urinary sodium, potassium, magnesium, calcium, chloride, sulfate and phosphate at baseline and after 4 weeks. 24h-urine pH and pCO₂ were also determined. In a subgroup (N= 52) Glomerular filtration rate (GFR), renal plasma flow (RPF), renal vascular resistance (RVR) and filtration fraction (FF) were measured in the fasting state and for 4hours after a maltodextrin or protein supplemented breakfast (20g). This test was done at baseline and after 4 weeks.

Results: uPRAL was increased after 4 weeks of protein supplementation (P = 0.01), whereas no change was found with maltodextrin (P = 0.31). Urinary pH and pCO₂ were lower in group P compared to group M after 4 weeks (P < 0.04). Postprandial responses of RPF, GFR and RVR did not differ between groups at the start of the intervention nor after 4 weeks. Postprandial FF was significantly higher in group M after 4 weeks (P < 0.001).

Conclusion: This study shows that increased intake of dietary proteins increases urinary acid excretion. However, we found no evidence for postprandial hyperfiltration after protein intake.

1. Conflict of interest: none

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P30:

Adapting an existing effective lifestyle intervention to individuals with low SES of different ethnic origins

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Introduction: Different lifestyle-intervention studies have demonstrated the potential health benefits that can be achieved with a healthy diet and adequate levels of physical activity. To date the question is thus not whether lifestyle-interventions can be effective, but under which circumstances specific groups will benefit from them. An important target group for lifestyle-interventions are individuals with lower socioeconomic status (SES) and some ethnic minorities. They often do not meet the recommended guidelines for a healthy diet and Physical activity, are less often participating in lifestyle-interventions and are more likely to drop out early. Therefore, the aim of this study is to tailor an effective lifestyle-intervention to the needs of individuals with low SES of different ethnic origins.

Methods: In order to investigate which adaptations would be needed, the following activities were performed: a. Gathering information on the current health status of the target population; b. Interviewing the target population about their daily practices, their perceptions of a healthy lifestyle and their preferences with regard to intervention components; c. Exchanging experiences with (health)professionals, researchers, community-workers and a communication expert; d. Assessing the possibilities in the local setting.

Results: The following changes were made to the intervention programme to align program components with the perceptions of the target group: more group meetings on nutrition, taking price concerns and social context into account; women-only activities; all activities nearby; and ethnic-specific nutrition advice. Additional adaptations had to be made to the study design, recruitment strategy, inclusion criteria, main outcome and measurements to be able to meet the needs of the target population.

Conclusion: Involving the target group, (health)professionals, researchers and the community in the adaptation phase of the lifestyle-intervention made it possible to better tailor the programme to the needs of the target group and make the research design more suitable for the public setting.

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P31:

The effect of ambient light intensity on postprandial glucose and insulin levels

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Introduction: The increasing prevalence of type 2 diabetes correlates to the increased exposure of artificial light. Specialised retinal ganglion cells transmit light information to the hypothalamus via the retino-hypothalamic tract and thus modulate hormonal secretion and autonomic activity. Light has time dependent autonomic effects in humans and administration of a light pulse to rats directly alters metabolic gene expression in liver. However, the direct effects of light intensity on human carbohydrate and lipid metabolism have never been investigated. The aim of this study was to investigate the effect of ambient light intensity on postprandial glucose and lipid levels.

Methods: In a randomised cross-over design, 8 healthy lean men (age: 22.4 ± 1.7yrs; BMI: 22.1 ± 1.3 kg/m²) with a normal sleep/wake pattern were admitted to the clinical research unit in the evening. After a standardised mixed meal (800 kcal) they were allowed to sleep in darkness (1 lux) for 8 hours. In the morning they were exposed to either bright light (4000 lux) or dim light (10 lux) for 5 hours. Sixty minutes after lights on, subjects consumed a liquid mixed meal (600 kcal, 54 energy% carbohydrates, 29 energy% fat, 17 energy% protein). Blood samples were taken at fixed time points for 5 hrs.

Results: The incremental area under the curve (AUC) of postprandial glucose levels was not different between dim (12,439 ± 123) and bright (12,439 ± 133) light (P = 0.24). Furthermore, the AUC of plasma insulin (521,908 ± 32,067 vs 534,799 ± 26,779; P = 0.73), C-peptide, free fatty acids and triglycerides were not different between the two light conditions.

Conclusion: In conclusion, in our study light intensity did not affect postprandial levels of glucose and insulin in healthy lean men.

1. Conflict of interest: no

2. Funding: Dutch Technology Foundation (STW, 12189)

P32:

Rate of weight loss and loss of fat free mass in overweight and obese subjects

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Introduction: Diet-induced weight loss is accompanied by a loss of fat free mass (FFM). Indirect evidence suggests a positive correlation between rate of weight loss (rapid or slow) and loss of FFM, although direct proof is lacking. Therefore, our objective was to investigate the effect of rate of weight loss on FFM loss in overweight and obese subjects.

Methods: Weight and body composition were determined before and after either a 5-week very-low-caloric diet (VLCD: 500 kcal/d) (n= 25) or a 12-week low-caloric diet (LCD: 1250 kcal/d) (n= 22) and after a subsequent 4-week weight-stable period. Body composition was measured using air-displacement plethysmography (BodPod).

Results: Diet-induced weight loss was similar at the end of the diet in both groups (VLCD: 8.8±0.4 kg and LCD: 8.6±0.6 kg) and at the end of the weight-stable period (VLCD: 9.4±0.5 kg and LCD: 8.8±0.6 kg) (both P>0.1). FFM loss at the end of the diet was higher in the VLCD-group compared to the LCD-group expressed both as absolute values (1.6±0.2 kg and 0.6±0.2 kg respectively, P= 0.002) or as percent of weight loss (18.0±2.1 % and 7.7±2.6 %, P=0.003). A trend remained at the end of the weight-stable period (VLCD: 0.8±0.2 kg and LCD: 0.3±0.2 kg, P= 0.081) and (9.4±2.4 % and 2.9±2.3 %, P=0.058)

Conclusion: Loss of FFM was higher after rapid than slow diet-induced weight loss with similar total weight loss. Measuring body composition under conditions of negative energy balance overestimates loss of FFM compared with weight stable conditions.

1. Conflict of interest: No conflict of interest

2. Funding: ZonMw TOP

P33:

Short term effect of chicory root fibre on appetite ratings and energy intake

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Introduction: It has been shown that certain fibres can enhance satiety and lower energy intake. This effect largely depends on food matrix, degree of hydration and dosage. Dried chicory root pulp (CRP) is a good fibre-source. After inulin is extracted from chicory roots, the remaining CRP still contains much dietary fibre. We hypothesized that adding CRP to foods may enhance satiety and lower food intake. Moreover, we expected a larger effect when CRP is in a hydrated food (semi-liquid) than in a solid food (granola-bar).

Methods: We performed a randomized crossover trial with five treatments: a high fibre semi-liquid (14g CRP), a low fibre semi-liquid (7g CRP), a control semi-liquid (no CRP), a high fibre bar (14g CRP) , and a control bar (no CRP). Data of 15 lean men (20 ± 3 years) and 15 lean women (21 ± 3 years) were included. Satiety feelings were rated before and multiple times after consumption of the foods. Ninety minutes after consumption, ad libitum energy intake was measured at lunch.

Results: High fibre foods enhanced satiety feelings more than their controls (p-values < 0.05). The bars enhanced satiety feelings more than semi-liquids (p-values ≤ 0.01). The low fibre semi-liquid did not differ from its control (p = 0.09). Energy intake was not affected by addition of CPR (p = 0.44).

Conclusion: In conclusion, addition of 14g CRP enhanced satiety feelings in both semi-liquid and solid foods. In contrast to our hypothesis, the solid product with CRP was the most satiating. No effect was found on short term energy intake.

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P34:

Measuring the Brain Reward Response to Visual and Olfactory Food Cues using fMRI – Pilot Results

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Introduction: Olfactory and visual cues of palatable food are omnipresent in our environment. Heightened neural responsivity to these cues may increase craving in the absence of hunger, leading to overeating and eventually overweight. Palatability of foods generally increases with increasing energy density. With this pilot study we assess the validity of an fMRI paradigm measuring reward activation during exposure to cues (olfactory and visual) of high energy and low energy dense foods.

Methods: Functional and anatomical MR images of nine healthy male participants (age 22 ± 2.1 years; BMI 22.3 ± 1.4 kg/m²) were acquired using a 3T MRI scanner. During scanning, olfactory and visual cues of high energy dense and energy dense foods (30 per category) were presented one by one in pseudo randomized order. Each odour was presented for 2 s using a Burghart olfactometer. Pictures were projected onto a screen inside the scanner for 2 s and were viewed via a mirror.

Results: ROI analyses in SPM8 revealed greater right insula activation during high energy versus low energy food cues. Further, exposure to olfactory cues compared to visual cues lead to greater activation of limbic reward areas (left anterior cingulate, left putamen, hippocampus) and the insula. During exposure to visual cues the orbitofrontal cortex and left hippocampus showed greater activation.

Conclusion: Greater activation in the insula in response to high energy cues may be related to a greater salience. Greater limbic activation during olfactory cues appears to confirm the strong connections between the olfactory and limbic reward network. Results suggest that this fMRI paradigm is suitable for use in a subsequent study into the effects of gastric bypass surgery on food cue responsivity in the brain.

1. Conflict of interest: -

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