MATERNAL PROTEIN RESTRICTION DURING EARLY LACTATION INDUCES GLUT4 TRANSLOCATION AND MTOR/AKT ACTIVATION IN ADIPOCYTES OF ADULT RATS


Epidemiological and experimental studies have demonstrated that early postnatal nutrition has been associated with long-term effects on glucose homeostasis in adulthood. Recently, our group demonstrated that undernutrition during early lactation affects the expression and activation of key proteins of the insulin signaling cascade in rat skeletal muscle during postnatal development. To elucidate the molecular mechanisms by which undernutrition during early life leads to changes in insulin sensitivity in peripheral tissues, we investigated the insulin signaling in adipose tissue. Adipocytes were isolated from epididymal fat pads of adult male rats that were the offspring of dams fed either a normal or a protein-free diet during the first 10 days of lactation. The cells were incubated with 100 nM insulin before the assays for immunoblotting analysis, 2-deoxyglucose uptake, immunocytochemistry for GLUT4, and/or actin filaments. Following insulin stimulation, adipocytes isolated from undernourished rats presented reduced tyrosine phosphorylation of IR and IRS-1 and increased basal phosphorylation of IRS-2, Akt, and mTOR compared with controls. Basal glucose uptake was increased in adipocytes from the undernourished group, and the treatment with LY294002 induced only a partial inhibition both in basal and in insulin-stimulated glucose uptake, suggesting an involvement of phosphoinositide 3-kinase activity. These alterations were accompanied by higher GLUT4 content in the plasma membrane and alterations in the actin cytoskeleton dynamics. These data suggest that early postnatal undernutrition impairs insulin sensitivity in adulthood by promoting changes in critical steps of insulin signaling in adipose tissue, which may contribute to permanent changes in glucose homeostasis.
Galanin-like peptide (GALP) is expressed in the arcuate nucleus and is implicated in the neuroendocrine regulation of metabolism and reproduction. To investigate the physiological significance of GALP, we generated and characterized a strain of mice with a genetically targeted deletion in the GALP gene [GALP knockout (KO) mice]. We report that GALP KO mice have a subtle, but notable, metabolic phenotype that becomes apparent during adaptation to changes in nutrition. GALP KO mice are indistinguishable from wild-type (WT) controls in virtually all aspects of growth, sexual development, body weight, food and water consumption, and motor behaviors, when they are allowed unlimited access to standard rodent chow. However, GALP KO mice have an altered response to changes in diet. 1) Male GALP KO mice consumed less food during refeeding after a fast than WT controls (P < 0.01). 2) GALP KO mice of both sexes gained less weight on a high-fat diet than WT controls (P < 0.01), despite both genotypes having consumed equal amounts of food. We conclude that although GALP signaling may not be essential for the maintenance of energy homeostasis under steady-state nutritional conditions, GALP may play a role in readjusting energy balance under changing nutritional circumstances.
DIETARY RESISTANT STARCH UP-REGULATES TOTAL GLP-1 AND PYY IN A SUSTAINED DAYLONG MANNER THROUGH FERMENTATION IN RODENTS

ZHOU, JUNE; et al. Dietary resistant starch up-regulates total GLP-1 and PYY in a sustained daylong manner through fermentation in rodents. Am J Physiol Endocrinol Metab, Sep 2008.

Glucagon-like peptide-1 (GLP-1) and peptide YY (PYY) are anti-diabetes/obesity hormones secreted from the gut after meal ingestion. We have shown that dietary resistant starch increased GLP-1 and PYY secretion, but the mechanism remains unknown. Resistant starch (RS) is a fermentable fiber, which lowers the glycemic index of the diet and liberates short chain fatty acids (SCFAs) through fermentation in the gut. This study investigates the two possible mechanisms by which RS stimulates GLP-1 and PYY secretion: the effect of meal or glycemic index and the effect of fermentation. First, because GLP-1 and PYY secretions are stimulated by nutrient availability in the gut, the timing of blood sample collections could influence the outcome when comparing two diets that have different glycemic indexes. Thus, we examined GLP-1 and PYY plasma levels at various time points over a 24 hour period in RS fed rats. Secondly, we tested proglucagon (a precursor to GLP-1) and PYY gene expression patterns in specific areas of the gut for RS fed rats and in the enteroendocrine cell line following exposure to SCFAs in vitro. Results: 1) Dietary resistant starch stimulates GLP-1 and PYY secretion in a substantial daylong manner, independent of meal effect or changes in dietary glycemia. 2) Fermentation and the liberation of PUFAs in the lower gut are associated with increased proglucagon and PYY gene expressions. Lastly, RS fed diabetic mice had improved glucose tolerance, an indicator of increased active forms of GLP-1 and PYY. Conclusion: Fermentation of RS is most likely the primary mechanism for increased endogenous secretions of total GLP-1 and PYY in rodents. Thus, any factor that affects fermentation should be considered when using dietary fermentable fiber to stimulate GLP-1 and PYY secretion.
Homozygous deletion of the gene of the neuronal glucose transporter GLUT3 (Slc2a3) in mice results in embryonic lethality, whereas heterozygotes (Slc2a3+/−) are viable. Here we describe the characterization of heterozygous mice with regard to neuronal function, glucose homeostasis and, since GLUT3 might be a component of the neuronal glucose sensing mechanism, food intake and energy balance. Levels of GLUT3 mRNA and protein in brain were reduced by 50% in Slc2a3+/− mice. Electrographic features examined by electroencephalographic recordings give evidence for slightly, but significantly enhanced cerebrocortical activity in Slc2a3+/− mice. In addition, Slc2a3+/− mice were slightly more sensitive to an acoustic startle stimulus (elevated startle amplitude and reduced prepulse inhibition). However, systemic behavioral testing revealed no other functional abnormalities e.g. in coordination, reflexes, motor abilities, anxiety, learning and memory. Furthermore, no differences in body weight, blood glucose and insulin levels were detected between wild-type and Slc2a3+/− littermates. Food intake as monitored randomly or after intracerebroventricular administration of 2-deoxyglucose or D-glucose, or food choice for carbohydrates/fat was not affected in Slc2a3+/− mice. Taken together, our data indicate that, in contrast to Slc2a1, a single allele of Slc2a3 is sufficient for maintenance of neuronal energy supply, motor abilities, learning and memory, and feeding behavior.
THE UBIQUITIN-PROTEASOME AND THE MITOCHONDRIA-ASSOCIATED APOPTOTIC PATHWAYS ARE SEQUENTIALLY DOWN-REGULATED DURING RECOVERY AFTER IMMOBILIZATION-INDUCED ATROPHY


Immobilization produces morphological, physiological, and biochemical alterations in skeletal muscle leading to muscle atrophy and long periods of recovery. Muscle atrophy during disuse results from an imbalance between protein synthesis and proteolysis but also between apoptosis and regeneration processes. This work aimed to characterize the mechanisms underlying muscle atrophy and recovery following immobilization by studying the regulation of the mitochondria-associated apoptotic and the ubiquitin-proteasome-dependent proteolytic pathways. Animals were subjected to hindlimb immobilization for 4 to 8 days (I4 to I8) and allowed to recover after cast removal for 10 to 40 days (R10 to R40). Soleus and gastrocnemius muscles atrophied from I4 to I8 to a greater extent than extensor digitorum longus and tibialis anterior muscles. Gastrocnemius muscle atrophy was first stabilized at R10 before being progressively reduced until R40. Polyubiquitinated proteins accumulated from I4, whereas the increased ubiquitination rates and chymotrypsin-like activity of the proteasome were detectable from I6 to I8. Apoptosome and caspase-3 or -9 activities increased at I6 and I8, respectively. The ubiquitin-proteasome-dependent pathway was normalized early when muscle stops to atrophy (R10). By contrast, the mitochondria-associated apoptotic pathway was first down-regulated below basal levels when muscle started to recover at R15 and completely normalized at R20. Myf 5 protein levels decreased from I4 to I8 and were normalized at R10. Altogether, our results suggest a two-stage process in which the ubiquitin-proteasome pathway is rapidly up- and down-regulated when muscle atrophies and recovers, respectively, whereas apoptotic processes may be involved in the late stages of atrophy and recovery.
EFFECTS OF REPLACING THE HABITUAL CONSUMPTION OF SUGAR-SWEETENED BEVERAGES WITH MILK IN CHILEAN CHILDREN


Background: During the nutrition transition in Chile, dietary changes were marked by increased consumption of high-energy, nutrient-poor products, including sugar-sweetened beverages (SSBs). Obesity is now the primary nutritional problem in posttransitional Chile.

Objective: We conducted a randomized controlled trial to examine the effects on body composition of delivering milk beverages to the homes of overweight and obese children to displace SSBs.

Design: We randomly assigned 98 children aged 8–10 y who regularly consumed SSBs to intervention and control groups. During a 16-wk intervention, children were instructed to drink 3 servings/d (~200 g per serving) of the milk delivered to their homes and to not consume SSBs. Body composition was measured by dual-energy X-ray absorptiometry. Data were analyzed by multiple regression analysis according to the intention-to-treat principle.

Results: For the intervention group, milk consumption increased by a mean (± SEM) of 452.5 ± 37.7 g/d (P < 0.0001), and consumption of SSBs decreased by –711.0 ± 33.7 g/d (P < 0.0001). For the control group, milk consumption did not change, and consumption of SSBs increased by 71.9 ± 33.6 g/d (P = 0.04). Changes in percentage body fat, the primary endpoint, did not differ between groups. Nevertheless, the mean (± SE) accretion of lean body mass was greater (P = 0.04) in the intervention (0.92 ± 0.10 kg) than in the control (0.62 ± 0.11 kg) group. The increase in height was also greater (P = 0.01) in the intervention group (2.50 ± 0.21 cm) than in the control group (1.77 ± 0.20 cm) for boys but not for girls.

Conclusion: Replacing habitual consumption of SSBs with milk may have beneficial effects on lean body mass and growth in children, despite no changes in percentage body fat. This trial was registered at clinicaltrials.gov as NCT00149695.

**Background**: Most pregnant women gain more weight than the ranges recommended. Excessive weight gain is linked to pregnancy complications and to long-term maternal and child health outcomes.

**Objective**: The objective was to examine the impact of dietary glycemic load and energy density on total gestational weight gain and the weight gain ratio (observed weight gain/expected weight gain).

**Design**: Data are from 1231 women with singleton pregnancies who participated in the Pregnancy, Infection, and Nutrition Cohort Study. Dietary information was collected at 26–29 wk of gestation with the use of a semiquantified food-frequency questionnaire. Linear regression models were used to estimate the associations between quartiles of glycemic load and energy density with total gestational weight gain and weight gain ratio.

**Results**: Dietary patterns of pregnant women significantly differed across many sociodemographic and behavioral characteristics, with the greatest contrasts seen for glycemic load. After adjustment for covariates, compared with women in the first quartile consuming a mean dietary energy density of 0.71 kcal/g (reference), women in the third quartile consuming a mean energy density of 0.98 kcal/g gained an excess of 1.13 kg (95% CI: 0.24, 2.01), and women in the fourth quartile consuming a mean energy density of 1.21 kcal/g gained an excess of 1.08 kg (95% CI: 0.20, 1.97) and had an increase of 0.13 (95% CI: 0.006, 0.24) units in the weight gain ratio. All other comparisons of energy intakes were not statistically significant. Glycemic load was not associated with total gestational weight gain or weight gain ratio.

**Conclusion**: Dietary energy density is a modifiable factor that may assist pregnant women in managing gestational weight gains.
RELATION OF DIETARY GLYCEMIC INDEX, GLYCEMIC LOAD, ADDED SUGAR INTAKE, OR FIBER INTAKE TO THE DEVELOPMENT OF BODY COMPOSITION BETWEEN AGES 2 AND 7 Y

BUYKEN, Anette E; et al. Relation of dietary glycemic index, glycemic load, added sugar intake, or fiber intake to the development of body composition between ages 2 and 7 y. Am. J. Clinical Nutrition, Sep 2008; 88: 755 - 762.

Background: Observational studies in adults suggest that a diet with a high glycemic index (GI) or glycemic load (GL), a high intake of sugary foods, or a low fiber intake may increase the risk of overweight.

Objectives: We aimed to examine prospectively whether dietary GI, GL, added sugar intake, or fiber intake between age 2 and 7 y are associated with the development of body composition. If so, we aimed to ascertain whether these associations are modified by meal frequency.

Design: Linear mixed-effect regression analyses were performed in 380 participants of the Dortmund Nutrition and Anthropometric Longitudinally Designed (DONALD) Study for whom 4–6 weighed 3-d dietary records and anthropometric data were obtained between ages 2 and 7 y.

Results: Changes in dietary GI, GL, or added sugar intake between ages 2 and 7 y were not associated with concurrent changes in percentage body fat (%BF, as estimated from skinfold thicknesses) or body mass index SD scores. An increase in fiber intake was related to a concurrent decrease in %BF between ages 2 and 7 y only in children who consumed <6 meals/d as toddlers (β ± SE from fully adjusted model: –0.26 ± 0.09%BF per 1-SD increase in fiber intake, P = 0.005), whereas children with a higher meal frequency had no concurrent change (0.07 ± 0.07%BF per 1-SD increase in fiber intake, P = 0.3).

Conclusions: Dietary GI, GL, or added sugar intake between ages 2 and 7 y does not appear to influence the development of body composition. Potential benefits associated with increasing fiber intake throughout childhood may be limited to toddlers with a lower meal frequency.
EFFECT OF SEX AND GENOTYPE ON CARDIOVASCULAR BIOMARKER RESPONSE TO FISH OILS: THE FINGEN STUDY


**Background:** The lipid-modulatory effects of high intakes of the fish-oil fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are well established and likely to contribute to cardioprotective benefits.

**Objectives:** We aimed to determine the effect of moderate EPA and DHA intakes (<2 g EPA+DHA/d) on the plasma fatty acid profile, lipid and apolipoprotein concentrations, lipoprotein subclass distribution, and markers of oxidative status. We also aimed to examine the effect of age, sex, and apolipoprotein E (APOE) genotype on the observed responses.

**Design:** Three hundred twelve adults aged 20–70 y, who were prospectively recruited according to age, sex, and APOE genotype, completed a double-blind placebo-controlled crossover study. Participants consumed control oil, 0.7 g EPA+DHA/d (0.7FO), and 1.8 g EPA+DHA/d (1.8FO) capsules in random order, each for an 8-wk intervention period, separated by 12-wk washout periods.

**Results:** In the group as a whole, 8% and 11% lower plasma triacylglycerol concentrations were evident after 0.7FO and 1.8FO, respectively (P < 0.001): significant sex x treatment (P = 0.038) and sex x genotype x treatment (P = 0.032) interactions were observed, and the greatest triacylglycerol-lowering responses (reductions of 15% and 23% after 0.7FO and 1.8FO, respectively) were evident in APOE4 men. Furthermore, lower VLDL-cholesterol (P = 0.026) and higher LDL-cholesterol (P = 0.010), HDL-cholesterol (P < 0.001), and HDL2 (P < 0.001) concentrations were evident after fish-oil intervention.

**Conclusions:** Supplements providing EPA+DHA at doses as low as 0.7 g/d have a significant effect on the plasma lipid profile. The results of the current trial, which used a prospective recruitment approach to examine the responses in population subgroups, are indicative of a greater triacylglycerol-lowering action of long-chain n–3 polyunsaturated fatty acids in males than in females.
ABSTRACT

Copper is an essential nutrient that is toxic in excess. Copper intakes from a balanced diet appear to meet the needs of most healthy individuals, because overt deficiency and toxicity are rare. Some uncertainty, however, persists because of limitations in currently available biomarkers used to assess copper status and the paucity of data available to establish tolerable upper levels of intake. Current policies and regulations pertaining to food fortification, nutritional supplements, and drinking water appear to be effective in providing for adequate copper intakes in many populations, although high levels of exposure, through overzealous fortification, supplementation, or drinking water exposure, may be possible under some circumstances. Surveillance and monitoring programs to evaluate copper exposures of human populations should continue and should be refined as new biomarkers become available.
PROSPECTIVE STUDY OF DIETARY ENERGY DENSITY AND WEIGHT GAIN IN WOMEN


**Background**: Little is known about the long-term effects of dietary energy density (ED) on weight gain.

**Objective**: The objective was to assess the long-term relation between changes in dietary ED and age-related weight gain.

**Design**: We conducted a prospective study of 50,026 women (\# ± SD age: 36.5 ± 4.6 y) in the Nurses’ Health Study II followed from 1991 to 1999. Dietary ED and body weight were ascertained in 1991, 1995, and 1999. Total dietary ED was calculated by dividing each subject's daily energy intake (kcal) by the reported weight (g) of all foods consumed.

**Results**: Dietary ED was positively correlated with saturated fat (r = 0.16), trans fat (r = 0.15), and the glycemic index (r = 0.16), but was inversely correlated with vegetable protein (r = –0.30), vegetables (r = –0.27), and fruit (r = –0.17). ED was not significantly correlated with total fat intake as a percentage of energy (r = 0.08). Women who increased their dietary ED during follow-up the most (5th quintile) had a significantly greater multivariate-adjusted weight gain than did those who decreased their dietary ED (1st quintile) (8-y time period: 6.42 kg compared with 4.57 kg; P for trend < 0.001). However, the amount of weight change over time varied considerably according to the ED values of individual foods and beverages.

**Conclusion**: A high dietary ED reflects a dietary pattern higher in saturated and trans fats and refined carbohydrates. Increases in dietary ED were associated with greater weight gain among middle-aged women during 8 y of follow-up. However, public health recommendations cannot be made simply on the basis of ED values of individual foods and beverages.

ABSTRACT

Aims: In this study, we evaluated the new %CDT by the HPLC method (Bio-Rad, Germany) on a Variant™ HPLC system (Bio-Rad), checked the correlation with well-known methods and calculated the diagnostic value of the test. Methods: Intra-run and day-to-day precision values were calculated for samples with extreme serum transferrin concentrations, high trisialotransferrin and interfering conditions (haemolysed, lactescent and icteric samples). The method was compared with two routine procedures, the %CDT TIA (Bio-Rad, Hercules, CA, USA) and the Capillaries™ CDT (Sebia, France). A total of 350 clinical sera samples were used for a case-control study. Results: Precision values were better in high CDT and medium CDT pools than in low CDT pools. The serum transferrin concentration had no effect on CDT measurement, except in samples with serum transferrin <1 g/L. Haemolysis was the only interfering situation. The method showed high correlation ($r^2 > 0.95$) with the two other methods (%CDT TIA and CZE %CDT). The global predictive value of the test was >0.90 at 1.9% cut-off. Conclusions: These results demonstrate that the %CDT by the HPLC test is suitable for CDT routine measurement; the results from the high-throughput Variant™ system are well correlated with other methods and are of high diagnostic value.
ABSTRACT

Aim: The aim of the present study is to examine the distribution of plasma excitatory and inhibitory amino acids, according to the age and current breath alcohol levels (BrAl±), of alcohol-dependent patients. Participants and Methods: 78 alcohol-dependent patients (mean age = 46.2 ± 11 years, men/women = 54/24) were clinically tested, including the determination of the major excitatory as well as inhibitory amino acids. The independent variables were gender, age and current alcohol consumption measured with the breath alcohol level (BrAl ± status). Results: In comparison to BrAl negatives, BrAl positives had higher plasma levels of glutamic acid (P = 0.01) and proline (P = 0.026), and lower levels of aminobutyric acid (P = 0.002), serine (P = 0.031) and urea (P = 0.01). In the BrAl positives, no age effect was found related to the plasma amino acids. In contrast, the BrAl negatives displayed age-related differences. The older (≥50 years) BrAl negative patients had higher plasma levels of cystine, tyrosine, citrulline and urea, and lower histidine levels, compared to the younger group (<50 years). In general, differences in plasma levels of certain amino acids were dependent on gender, BrAl status, age and biochemical markers (GGT, MCV) of alcohol abuse. Conclusions: Abstaining patients (BrAl−/) display age-related differences in AAs' distribution, while active drinking (BrAl+/) seems to even out those differences, underpinning the hypothesis that drinking mimics changes seen with advanced age.
Exercise and vitamin D are both important for musculoskeletal health. In this issue of the Journal, Scragg and Camargo (Am J Epidemiol 2008;168:577–86) provide a new analysis of relatively old data on physical activity and vitamin D from the Third National Health and Nutrition Examination Survey (1988–1994). This commentary considers the methodological strengths and weaknesses of the study and concludes that the findings are as robust as could reasonably be expected from a cross-sectional design. Consideration is given to whether outdoor exercise is the cause of higher vitamin D levels and, if so, whether mortality gains may accrue from more widespread participation. A note of caution is sounded, given the disappointing results on studies of the prevention of falls and fractures with vitamin D supplementation in community-dwelling populations. However, this is an important observation, and more epidemiologic studies are needed, preferably including care home residents. Applied researchers should consider further studies of vitamin D supplementation in older people, possibly combined with an exercise intervention. Public health professionals and practicing clinicians should recognize that there is a rationale for recommending outdoor exercise, and they should seek to improve universal accessibility.
The decline in vitamin D status among older people is probably due to decreased synthesis of vitamin D by sun-exposed skin and/or decreased outdoor activity. The authors examined the association between outdoor leisure physical activity and serum 25-hydroxyvitamin D in the Third National Health and Nutrition Examination Survey (1988–1994) (n = 15,148 aged ≥20 years). The mean 25-hydroxyvitamin D concentration declined with increasing age, with 79, 73, and 68 nmol/liter for persons aged 20–39, 40–59, and 60 or more years. The proportion that engaged in outdoor activity in the past month was 80% for persons aged 20–39 and 40–59 years but 71% for those aged 60 or more years. In contrast, the mean difference in 25-hydroxyvitamin D between those who participated in outdoor activities daily compared with those who did not participate in the past month was similar for the youngest and oldest age groups: 13 and 16 nmol/liter, respectively. Those persons aged 60 or more years who participated in daily outdoor activities had a mean 25-hydroxyvitamin D concentration similar to that of persons aged 20–39 years: 77 versus 79 nmol/liter, respectively. These nationally representative data suggest that persons aged 60 or more years can synthesize enough vitamin D from daily outdoor activities to maintain vitamin D levels similar to those of young adults.
Type 2 diabetes mellitus is associated with altered immune function and chronic inflammation. Both of these immune conditions are implicated in the pathogenesis of non-Hodgkin lymphoma. The authors performed a systematic review to summarize findings from the current literature on the association between history of type 2 diabetes mellitus and risk of non-Hodgkin lymphoma. Ten case-control studies and three prospective cohort studies were included in this review. Meta-analysis found that a history of type 2 diabetes mellitus was positively associated with overall non-Hodgkin lymphoma risk. However, there was significant heterogeneity between studies. Study design was an important source of heterogeneity. The rate ratio between type 2 diabetes mellitus and non-Hodgkin lymphoma was found to be 1.18 (95% confidence interval: 0.99, 1.42) among case-control studies and 1.79 (95% confidence interval: 1.30, 2.47) among the prospective cohort studies. Weaknesses were identified in some of the included studies in the areas of case and control selection, measurement of covariates and non-Hodgkin lymphoma, and confounding control. Although a positive association between type 2 diabetes mellitus and risk of non-Hodgkin lymphoma was suggested, the evidence is inconclusive because of methodological limitations of the included case-control studies. More prospective studies with improved control of confounding are needed to confirm these findings.
DIETARY SUPPLEMENTS CONTRIBUTE SUBSTANTIALLY TO THE TOTAL NUTRIENT INTAKE IN PREGNANT NORWEGIAN WOMEN


ABSTRACT

**Background**: Use of dietary supplements during pregnancy may give an important contribution to nutrient intake, and for nutrients like folate and vitamin D supplements are recommended. Our objective was to study use and contribution of dietary supplement to nutrient intake among women participating in the Norwegian Mother and Child Cohort Study (MoBa). **Methods**: This study is based on 40,108 women participating in MoBa which is conducted by the Norwegian Institute of Public Health. The women had filled inversion 2 of the food frequency questionnaire in MoBa between February 2002 and February 2005. **Results**: 81% reported use of one or more dietary supplements. The most commonly used category was cod liver oil/fish oil supplements (59%) followed by singular folic acid supplements (36%) and multivitamin/multimineral supplements (31%). The nutrient contribution of the dietary supplements varied from 65% for folate and vitamin D to 1% for potassium among supplement users. The dietary intake of vitamin D, folate, iodine and iron did not reach the Nordic Recommendations for pregnant women. **Conclusions**: Use of supplements improved the intake of folate, iron and vitamin D, but not sufficiently to reach the recommended amounts.
ABSTRACT

Background: Coenzyme Q10 (CoQ10) is a naturally occurring compound that plays a fundamental role in cellular bioenergetics and is an effective antioxidant. Numerous health benefits of CoQ10 supplementation have been reported, resulting in growing demands for its use in fortifying food. Due to its insolubility in water, the enrichment of most food products is not easily achievable and its in vivo bioavailability is known to be poor. Water solubility was increased significantly with the use of an inclusion complex with β-cyclodextrin. This complex is widely used as Q10Vital® in the food industry, while its in vivo absorption in humans has not previously been studied. Methods: A randomized three-period crossover clinical trial was therefore performed in which a single dose of CoQ10 was administered orally to healthy human subjects. The pharmacokinetic parameters of two forms of the novel CoQ10 material were determined and compared to soft-gel capsules with CoQ10 in soybean oil that acted as a reference. Results: The mean increase of CoQ10 plasma concentrations after dosing with Q10Vital® forms was determined to be over the reference formulation and the area under the curve values, extrapolated to infinity (AUC_{inf}), were also higher with the tested forms; statistically significant 120 and 79% increases over the reference were calculated for the Q10Vital® liquid and powder, respectively. Conclusions: The study revealed that the absorption and bioavailability of CoQ10 in the novel formulations are significantly increased, probably due to the enhanced water solubility.
ABSTRACT

Objective: Several studies on cataract have suggested that antioxidant micronutrients such as α-tocopherol, retinol and ascorbic acid may help to protect against cataractogenesis. Our objective was to determine the serum concentration of these antioxidant vitamins in subjects with cataract to see if there is any correlation between the levels of essential vitamins and the development of cataract.

Methods: The study was performed on a total of 88 patients and healthy controls who were given physical examinations that included a complete eye examination. Ascorbic acid was measured in serum with UV/Vis spectrophotometry, and fat-soluble vitamins were measured in serum by high-performance liquid chromatography according to previously published methods.

Results: The mean serum concentration of α-tocopherol in patients (9.16 ± 2.53 µg/ml) with cataract was lower than in the control group (p < 0.001). Patients had a moderately lower ascorbic acid concentration than the control group, which was not statistically significant. The subjects' serum retinol levels were similar to control group levels and not statistically significant.

Conclusion: While this is a small-scale case study it can nonetheless be viewed as presenting support to help narrow the possibility that antioxidative agents may play a role in delaying cataract formation.
ABSTRACT

Background/Aims: The incidence of childhood insulin-dependent diabetes mellitus (IDDM) is rapidly increasing in Greece. The aim of this study was to examine nutrient patterns of children and adolescents with IDDM in Crete. Methods: A case-control survey of eating habits was conducted among 41 children and adolescents, aged 6-17 years, with IDDM (cases) and healthy sex- and age-matched controls, recruited from Heraklion University Hospital and the village of Rouvas, Crete, respectively. Dietary data was based on 24-hour recall records. Results: Dietary intake was similar between the groups. Both groups exceeded the recommendations for total and saturated fat and consumed lower than recommended amounts of dietary fiber and total carbohydrates. Children with IDDM consumed more dairy products and vegetables and less meats and cereals. Vegetables were consumed by a relatively high proportion of children and adolescents in both groups, but there was a higher proportion of fruit consumers amongst the IDDM group. For those who ate fruit and vegetables, intake approximated current recommendations of 400 g/day. Conclusions: The need to increase complex carbohydrates and reduce the consumption of total and saturated fat, in order to approach the traditional dietary pattern of Crete for this population, should be addressed via appropriate nutrition education programmer.
EFFECT OF SMOKING HABIT ON CIRCULATING ADIPOKINES IN DIABETIC AND NON-DIABETIC SUBJECTS


ABSTRACT

Background: Despite the well-known inverse association between smoking and body weight, there have been conflicting reports on the association between smoking and adipokines such as leptin and adiponectin. Aim: To determine and compare whether tobacco smoking (cigarettes or sheesha) affects circulating levels of adiponectin and/or influences leptin and leptin receptor (sOb-R) concentrations and free leptin in diabetic and non-diabetic subjects. Methods and Subjects: Fasting plasma adiponectin, leptin, sOb-R, glucose, insulin, and lipid profile were determined in 236 subjects grouped as control subjects (n = 53); non-diabetic cigarette smokers (n = 34), non-diabetic sheesha smokers (n = 38), diabetic nonsmokers (n = 75) and diabetic smokers (n = 36). Uni- and multivariate regression analyses were used to determine the associations of these variables with body mass index (BMI) and smoking. Results: When compared to control subjects, smoking cigarettes or sheesha was associated with significantly higher glucose, insulin resistance, total cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-C) and lower serum leptin, sOb-R and free leptin. The effects of smoking on BMI, leptin and sOb-R were dose-dependent. Binary logistic regression analysis showed that smoking is a significant determinant of BMI; leptin, sOb-R, free leptin index, adiponectin and LDL-C. Conclusions: We conclude that smoking sheesha does not reduce the metabolic effects of smoking. Smoking may modify leptin receptors and modulate leptin synthesis but the weight-lowering effect may not be related to leptin-induced anorectic signals.