

Literature releases on fats and health in June 2011

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1 Relationship of dietary fats, oils or fatty acids with health

• Cardiovascular diseases

n-3 Fatty Acids in Cardiovascular Disease. Raffaele De Caterina. N Engl J Med 2011;364:2439-2450.

No abstract available.

Consumption of High-Oleic Acid Ground Beef Increases HDL-Cholesterol Concentration but Both High- and Low-Oleic Acid Ground Beef Decrease HDL Particle Diameter in Normocholesterolemic Men. L. Anne Gilmore et al. J Nutr 2011;141(6):1188-1194.

On the basis of previous results from this laboratory, this study tested the hypothesis that ground beef high in MUFA and low in SFA would increase the HDL-cholesterol (HDL-C) concentration and LDL particle diameter. In a crossover dietary intervention, 27 free-living normocholesterolemic men completed treatments in which five 114-g ground beef patties/wk were consumed for 5 wk with an intervening 4-wk washout period. Patties contained 24% total fat with a MUFA:SFA ratio of either 0.71 (low MUFA, from pasture-fed cattle) or 1.10 (high MUFA, from grain-fed cattle). High-MUFA ground beef provided 3.21 g more 18:1(n-9), 1.26 g less 18:0, 0.89 g less 16:0, and 0.36 g less 18:1(trans) fatty acids per patty than did the low-MUFA ground beef. Both ground beef interventions decreased plasma insulin and HDL2 and HDL3 particle diameters and increased plasma 18:0 and 20:4(n-6) (all $P \leq 0.05$) relative to baseline values. Only the high-MUFA ground beef intervention increased the HDL-C concentration from baseline ($P = 0.02$). The plasma TG concentration was positively correlated with the plasma insulin concentration ($r = 0.40$; $P < 0.001$) and negatively correlated with HDL-C ($r = -0.47$; $P < 0.001$) and plasma 18:0 ($r = -0.24$; $P < 0.01$). Plasma insulin and HDL diameters were not correlated ($r = 0.01$; $P > 0.50$), indicating that reductions in these measures were not coordinately regulated. The data indicate that dietary beef interventions have effects on risk factors for cardiovascular disease that are independent (insulin, HDL diameters) and dependent (HDL-C) on beef fatty acid composition.

Alpha-Linolenic Acid Intake and 10-Year Incidence of Coronary Heart Disease and Stroke in 20,000 Middle-Aged Men and Women in The Netherlands. de Goede J et al. PLoS One 6(3):e17967.

Background: Whether intake of alpha-linolenic acid (ALA), the plant-derived n-3 polyunsaturated fatty acid (PUFA), could prevent cardiovascular diseases is not yet clear. We examined the associations of ALA intake with 10-year incidence of coronary heart disease (CHD) and stroke in the Netherlands. **Methods:** Data were collected from a general population of 20,069 generally healthy men and women, aged 20 to 65 years. Habitual diet was assessed at baseline (1993–1997) with a validated 178-item food frequency questionnaire. Incidences of CHD and stroke were assessed through linkage with mortality and morbidity registers. Hazard ratios (HR) were calculated with multivariable Cox proportional hazards models, adjusted for age, gender, lifestyle, and dietary factors. **Results:** During 8–13 years of follow-up, we observed 280 incident CHD events (19% fatal) and 221 strokes (4% fatal). Intakes of energy-adjusted ALA in quintiles ranged from less than 1.0 g/d in the bottom quintile (Q1) to more than 1.9 g/d in the top quintile (Q5). ALA intake was not associated with incident CHD, with HRs varying between 0.89 and 1.01 (all $p > 0.05$) in Q2–Q5 compared with the bottom quintile of ALA intake. For incident stroke, however, participants in Q2–Q5 had a 35–50% lower risk compared with the reference group. HRs were 0.65 (0.43–0.97), 0.49 (0.31–0.76), 0.53 (0.34–0.83), and 0.65 (0.41–1.04) for Q2–Q5 respectively. **Conclusion:** In this general Dutch population, ALA intake was not associated with incident CHD. The data suggested that a low intake of ALA may be a risk factor for incident stroke. These results warrant confirmation in other population-based studies and in trials.

Dietary fat and cholesterol and risk of cardiovascular disease in older adults: The Health ABC Study. D.K. Houston et al. Nutr Metab Cardiovasc Dis 2011;21(6):430-437.

Background and aims: Although dietary fats and cholesterol have previously been associated with risk of cardiovascular disease (CVD) in middle-aged populations, less is known among older adults. The purpose of this study was to determine the association between dietary fats, cholesterol, and eggs

and CVD risk among community-dwelling adults aged 70–79 in the Health, Aging and Body Composition Study. **Methods and results:** Diet was assessed using an interviewer-administered 108-item food frequency questionnaire (n = 1941). CVD events were defined as a confirmed myocardial infarction, coronary death, or stroke. Relative rates of CVD over 9 years of follow-up were estimated using Cox proportional hazards models. During follow-up, there were 203 incident cases of CVD. There were no significant associations between dietary fats and CVD risk. Dietary cholesterol (HR (95% CI): 1.47 (0.93, 2.32) for the upper vs. lower tertile; P for trend, 0.10) and egg consumption (HR (95% CI): 1.68 (1.12, 2.51) for 3+ /week vs. <1 /week; P for trend, 0.01) were associated with increased CVD risk. However, in sub-group analyses, dietary cholesterol and egg consumption were associated with increased CVD risk only among older adults with type 2 diabetes (HR (95% CI): 3.66 (1.09, 12.29) and 5.02 (1.63, 15.52), respectively, for the upper vs. lower tertile/group). **Conclusions:** Dietary cholesterol and egg consumption were associated with increased CVD risk among older, community-dwelling adults with type 2 diabetes. Further research on the biological mechanism(s) for the increased CVD risk with higher dietary cholesterol and frequent egg consumption among older adults with diabetes is warranted. **Keywords:** Cardiovascular disease; Dietary fat; Dietary cholesterol; Eggs; Older adults; Type 2 diabetes.

Dairy calcium intake modifies responsiveness of fat metabolism and blood lipids to a high-fat diet. Janne K. Lorenzen and Arne Astrup. *Br J Nutr* 2011;105(12):1823-1831.

Abstract: Intervention studies have demonstrated that saturated fat increases total and LDL-cholesterol concentrations, and it is therefore recommended that the intake of high-fat dairy products be limited. However, observational studies have found an inverse relationship between the intake of dairy products and incidence of CVD. We aimed to study whether the Ca content of dairy products influences the effect of dairy fat on the lipid profile. The study had a randomised cross-over design. Subjects (n 9) were randomised to one of the sequence of four isoenergetic 10 d diets: low Ca and low fat (LC/LF: approximately 700 mg Ca/d, 25 % of energy (fat)); high Ca and LF (HC/LF: approximately 2800 mg Ca/d, 25 % of energy fat); LC and high fat (LC/HF: approximately 700 mg Ca/d, 49 E% fat); or HC and HF (approximately 2800 mg Ca/d, 49 E% fat). Blood variables were measured before and after each diet period, and faeces and urine were collected at the end of each diet period. A two-way ANOVA was used to examine the effect of Ca and fat intake. Independent of Ca intake, the HF diet increased the concentrations of total (9 %; P < 0.0001), LDL (14 %; P < 0.0001)- and HDL (13 %; P = 0.0002)-cholesterol compared with the LF diet. However, independent of fat intake, the HC diet decreased the concentrations of total (4 %; P = 0.0051) and LDL-cholesterol (10 %; P < 0.0001) but not HDL-cholesterol compared with the LC diet. In addition, total:HDL-cholesterol was decreased (5 %; P = 0.0299), and HDL:LDL was increased (12 %; P = 0.0097) by the HC diet compared with the LC diet. Faecal fat excretion was increased by both the HC (P < 0.0001) and HF (P = 0.0052) diets. In conclusion, we observed that dairy Ca seems to partly counteract the raising effect of dairy fat on total and LDL-cholesterol, without reducing HDL-cholesterol. **Key Words:** Dairy products; Calcium; Blood lipids; LDL; Faecal fat excretion.

Dairy, dairy, quite contrary: further evidence to support a role for calcium in counteracting the cholesterol-raising effect of SFA in dairy foods. Bruce A. Griffin. *Br J Nutr* 2011;105(12):1713-1714.

Invited commentary Janne K. Lorenzen and Arne Astrup. *Br J Nutr* 2011;105(12):1823-1831.

Effects of Diets High in Walnuts and Flax Oil on Hemodynamic Responses to Stress and Vascular Endothelial Function. Sheila G West et al. *J Am Coll Nutr* 2011;29(6):595-603.

Background: Polyunsaturated fatty acids (PUFA) have beneficial effects on cardiovascular risk, although the mechanisms are incompletely understood. In a previous article, we showed significant reductions in low-density lipoprotein cholesterol and several markers of inflammation with increasing intake of alpha-linolenic acid (ALA) from walnuts and flax. **Objective:** To examine effects of ALA on cardiovascular responses to acute stress, flow-mediated dilation (FMD) of the brachial artery, and blood concentrations of endothelin-1 and arginine-vasopressin (AVP). **Design:** Using a randomized, crossover study design, cardiovascular responses to acute stress were assessed in 20 hypercholesterolemic subjects, a subset of whom also underwent FMD testing (n = 12). Participants were fed an average American diet (AAD) and 2 experimental diets that varied in the amount of ALA

and linoleic acid (LA) that they contained. The AAD provided 8.7% energy from PUFA (7.7% LA, 0.8% ALA). On the LA diet, saturated fat was reduced, and PUFA from walnuts and walnut oil provided 16.4% of energy (12.6% LA, 3.6% ALA). On the ALA diet, walnuts, walnut oil, and flax oil provided 17% energy from PUFA (10.5% LA, 6.5% ALA). **Results:** The ALA and LA diets significantly reduced diastolic blood pressure (–2 to –3 mm Hg) and total peripheral resistance (–4%), and this effect was evident at rest and during stress (main effect of diet, $p < 0.02$). FMD increased (+34%) on the diet containing additional ALA. AVP also increased by 20%, and endothelin-1 was unchanged.

Conclusions: These results suggest novel mechanisms for the cardioprotective effects of walnuts and flax, and further work is needed to identify the bioactives responsible for these effects. **Key words:** alpha-linolenic acid, walnuts, flax, psychological stress, blood pressure, endothelial function, total peripheral resistance, omega-3 fatty acids.

CLA Does Not Impair Endothelial Function and Decreases Body Weight as Compared with Safflower Oil in Overweight and Obese Male Subjects. Maria Pfeuffer et al. *J Am Coll Nutr* 2011;30(1):19-28.

Objective: Conjugated linoleic acid (CLA) showed a wide range of beneficial biological effects with relevance for cardiovascular health in animal models and humans. Most human studies used olive oil as a reference. This study assessed the effect of CLA as compared with safflower oil on endothelial function and markers of cardiovascular risk in overweight and obese men. Heated safflower oil and olive oil were given for additional descriptive control. **Methods:** Eighty-five overweight men (aged 45–68 years, body mass index 25–35 kg/m²) were randomized to receive 4.5 g/d of the CLA isomeric mixture, safflower oil, heated safflower oil, or olive oil in a 4-week double-blind study. Endothelial function was assessed by peripheral arterial tonometry (PAT) index determination in the fasting and postprandial state (i.e., 4 hours after consumption of a fat- and sucrose-rich meal). **Results:** CLA as compared with safflower oil consumption did not impair fasting or postprandial PAT index but decreased body weight. CLA as compared with safflower oil did not change total, low-density lipoprotein (LDL), or high-density lipoprotein (HDL) cholesterol; triglycerides; insulin sensitivity indices; C-reactive protein; soluble adhesion molecules; oxidized LDL; lipoprotein a (Lp[a]); paraoxonase; or platelet-activating factor acetylhydrolase (PAF-AH) activity, but significantly reduced arylesterase activity and increased concentrations of the F2-isoprostane 8-iso-prostaglandin F (PGF)₂α.

Conclusion: CLA did not impair endothelial function. Other parameters associated with metabolic syndrome and oxidative stress were not changed or were slightly improved. Results suggest that CLA does not increase cardiovascular risk. Increased F2-isoprostane concentrations in this context may not indicate increased oxidative stress. **Key words:** endothelial function, metabolic syndrome, cardiovascular disease, PAT index.

Postprandial lipid responses to an alpha-linolenic acid-rich oil, olive oil and butter in women: A randomized crossover trial. Julia Svensson et al. *Lipids Health Dis* 2011;10:106.

Background: Postprandial lipaemia varies with gender and the composition of dietary fat due to the partitioning of fatty acids between beta-oxidation and incorporation into triacylglycerols (TAGs). Increasing evidence highlights the importance of postprandial measurements to evaluate atherogenic risk. Postprandial effects of alpha-linolenic acid (ALA) in women are poorly characterized. We therefore studied the postprandial lipid response of women to an ALA-rich oil in comparison with olive oil and butter, and characterized the fatty acid composition of total lipids, TAGs, and non-esterified fatty acids (NEFAs) in plasma. **Methods:** A randomized crossover design (n= 19) was used to compare the postprandial effects of 3 meals containing 35 g fat. Blood samples were collected at regular intervals for 7 h. Statistical analysis was carried out with ANOVA (significant difference = $P < 0.05$). **Results:** No significant difference was seen in incremental area under the curve (iAUC) plasma-TAG between the meals. ALA and oleic acid levels were significantly increased in plasma after ALA-rich oil and olive oil meals, respectively. Palmitic acid was significantly increased in plasma-TAG after the butter meal. The ratios of 18:2 n-6 to 18:3 n-3 in plasma-TAGs, three and seven hours after the ALA-rich oil meal, were 1.5 and 2.4, respectively. The corresponding values after the olive oil meal were: 13.8 and 16.9; and after the butter meal: 9.0 and 11.6. **Conclusions:** The postprandial p-TAG and NEFA response in healthy pre-menopausal women was not significantly different after the intake of an ALA-rich oil, olive oil and butter. The ALA-rich oil significantly affected different plasma lipid fractions and improved the ratio of n-6 to n-3 fatty acids several hours postprandially.

High Doses of Rosuvastatin are Superior to Low Doses of Rosuvastatin Plus Fenofibrate or n-3 Fatty Acids in Mixed Dyslipidemia. A. P. Agouridis et al. *Lipids* 2011;46(6):521-528.

Abstract: The aim of the study was to compare the efficacy of high-dose rosuvastatin, low-dose rosuvastatin plus fenofibrate and low-dose rosuvastatin plus omega-3 fatty acids with regard to the lipid profile in patients with mixed hyperlipidemia. The primary endpoint was changes in non-high density lipoprotein-cholesterol (non-HDL-C) levels. Study participants were randomly allocated to receive rosuvastatin 40 mg (n = 30, R group), rosuvastatin 10 mg plus fenofibrate 200 mg (n = 30, RF group) or rosuvastatin 10 mg plus n-3 fatty acids 2 g (n = 30, RN group). Non-HDL-C levels were reduced in all groups: in R group by 54%, in RF group by 42% and in RN group by 42%. Significant reductions in total cholesterol (TC), low density lipoprotein (LDL)-C and triglyceride levels were observed in all groups. The reductions in total and LDL-C were greatest in the R group while a more pronounced reduction of triglycerides in the RF group compared with that in the R and the RN group was observed. HDL-C levels were significantly increased only in the RF group. In conclusion, high doses of rosuvastatin and small doses of rosuvastatin plus either fenofibrate or n-3 fatty acids exhibit favorable effects on both LDL-C and non-HDL-C levels. However, rosuvastatin monotherapy more potently reduces these parameters. The combination of rosuvastatin plus fenofibrate leads to a greater decrease in triglyceride levels and a greater increase in HDL-C levels compared with the other two treatments. While awaiting the results of ongoing trials high doses of rosuvastatin may represent the treatment of choice in individuals with mixed dyslipidemia. **Keywords:** Mixed hyperlipidemia – Rosuvastatin – Fenofibrate – n-3 Fatty acids – Metabolic parameters – Non high-density lipoprotein – Triglycerides – High-density lipoprotein.

Coconut oil is associated with a beneficial lipid profile in pre-menopausal women in the Philippines. Alan B Feranil et al. *Asia Pac J Clin Nutr.* 2011;20(2):190-195.

Abstract: Coconut oil is a common edible oil in many countries, and there is mixed evidence for its effects on lipid profiles and cardiovascular disease risk. Here we examine the association between coconut oil consumption and lipid profiles in a cohort of 1,839 Filipino women (age 35-69 years) participating in the Cebu Longitudinal Health and Nutrition Survey, a community based study in Metropolitan Cebu. Coconut oil intake was estimated using the mean of two 24-hour dietary recalls (9.5±8.9 grams). Lipid profiles were measured in morning plasma samples collected after an overnight fast. Linear regression models were used to estimate the association between coconut oil intake and each plasma lipid outcome after adjusting for total energy intake, age, body mass index (BMI), number of pregnancies, education, menopausal status, household assets and urban residency. Dietary coconut oil intake was positively associated with high density lipoprotein cholesterol especially among pre-menopausal women, suggesting that coconut oil intake is associated with beneficial lipid profiles. Coconut oil consumption was not significantly associated with low density lipoprotein cholesterol or triglyceride values. The relationship of coconut oil to cholesterol profiles needs further study in populations in which coconut oil consumption is common. **Key Words:** cholesterol, cardiovascular disease, nutrition, saturated fat, nutrition transition.

- **Cancer**

Serum Phospholipid Fatty Acids and Prostate Cancer Risk: Results From the Prostate Cancer Prevention Trial. Theodore M. Brasky et al. *Am J Epidemiol* 2011;173(12):1429-1439.

Inflammation may be involved in prostate cancer development and progression. This study examined the associations between inflammation-related phospholipid fatty acids and the 7-year-period prevalence of prostate cancer in a nested case-control analysis of participants, aged 55–84 years, in the Prostate Cancer Prevention Trial during 1994–2003. Cases (n = 1,658) were frequency matched to controls (n = 1,803) on age, treatment, and prostate cancer family history. Phospholipid fatty acids were extracted from serum, and concentrations of ω -3, ω -6, and trans-fatty acids (TFAs) were expressed as proportions of the total. Logistic regression models estimated odds ratios and 95% confidence intervals of associations of fatty acids with prostate cancer by grade. No fatty acids were associated with low-grade prostate cancer risk. Docosahexaenoic acid was positively associated with high-grade disease (quartile 4 vs. 1: odds ratio (OR) = 2.50, 95% confidence interval (CI): 1.34, 4.65); TFA 18:1 and TFA 18:2 were linearly and inversely associated with risk of high-grade prostate cancer (quartile 4 vs. 1: TFA 18:1, OR = 0.55, 95% CI: 0.30, 0.98; TFA 18:2, OR = 0.48, 95% CI: 0.27, 0.84).

The study findings are contrary to those expected from the pro- and antiinflammatory effects of these fatty acids and suggest a greater complexity of effects of these nutrients with regard to prostate cancer risk.

- **Diabetes**

Sesame oil exhibits synergistic effect with anti-diabetic medication in patients with type 2 diabetes mellitus. Devarajan Sankar et al. Clin Nutr 2011;30(3):351-358.

Background & aims: Recently, studies have reported that sesame oil lowered blood pressure and improved antioxidant status in hypertensive and diabetic-hypertensive patients. The aim of this study was to evaluate the effectiveness of sesame oil with anti-diabetic (glibenclamide) medication as combination therapy in mild-to moderate diabetic patients. **Methods:** This open label study included sixty type 2 diabetes mellitus patients divided into 3 groups, receiving sesame oil (n = 18), 5 mg/day (single dose) of glibenclamide (n = 20), or their combination (n = 22). The patients were supplied with sesame oil [BNB Sesame oilTM] except glibenclamide group, and instructed to use approximately 35 g of oil/day/person for cooking, or salad preparation for 60 days. 12 h-fasting venous blood samples were collected at baseline (0 day) and after 60 days of the experiment for various biochemical analysis. **Results:** As compared with sesame oil and glibenclamide alone, combination therapy showed an improved anti-hyperglycemic effect with 36% reduction of glucose (P < 0.001 vs before treatment, P < 0.01 vs sesame oil monotherapy, P < 0.05 vs glibenclamide monotherapy) and 43% reduction of HbA1c (P < 0.001 vs before treatment, P < 0.01 vs sesame oil monotherapy, P < 0.05 vs glibenclamide monotherapy) at the end point. Significant reductions in the plasma TC, LDL-C and TG levels were noted in sesame oil (20%, 33.8% and 14% respectively vs before treatment) or combination therapies (22%, 38% and 15% respectively vs before treatment). Plasma HDL-C was significantly improved in sesame oil (15.7% vs before treatment) or combination therapies (17% before treatment). Significant (P < 0.001) improvement was observed in the activities of enzymatic and non-enzymatic antioxidants in patients treated with sesame oil and its combination with glibenclamide. **Conclusions:** Sesame oil exhibited synergistic effect with glibenclamide and can provide a safe and effective option for the drug combination that may be very useful in clinical practice for the effective improvement of hyperglycemia. **Keywords:** Type 2 diabetes; Sesame oil; Glibenclamide; Glucose; HbA1c; Lipid profile; Antioxidants.

- **Pregnancy, early development and mental health**

Maternal supplementation with docosahexaenoic acid during pregnancy does not affect early visual development in the infant: a randomized controlled trial. Lisa G Smithers et al. Am J Clin Nutr 2011;93(6):1293-1299.

Background: The docosahexaenoic acid (DHA) intake of pregnant women is lower than estimates of the DHA accretion by the fetus, and recommendations were made to increase the DHA intake of pregnant women. **Objective:** The objective of this study was to determine whether the supplementation of pregnant women with DHA improved the visual acuity of infants at 4 mo. **Design:** We conducted a blinded assessment of a subset of healthy, full-term infants born to women enrolled in a double-blind, randomized controlled trial called the DHA for Maternal and Infant Outcomes (DOMInO) trial. Women were randomly assigned to consume DHA-rich fish-oil capsules (~800 mg DHA/d in the treatment group) or vegetable oil capsules (control group) from midpregnancy to delivery. The primary outcome was the sweep visual evoked potential (VEP) acuity at 4 mo. The VEP latency at 4 mo was a secondary outcome. **Results:** Mean (\pm SD) VEP acuity did not differ between treatment and control groups [treatment group: 8.37 ± 2.11 cycles per degree (cpd), n = 89; control group: 8.55 ± 1.86 cpd, n = 93; P = 0.55]. VEP latencies also did not differ between groups. Irrespective of the group, maternal smoking in pregnancy was independently associated with poorer VEP acuity in the infant. **Conclusions:** DHA supplementation in women with singleton pregnancies does not enhance infant visual acuity in infants at 4 mo of age. Visual acuity in infancy is adversely associated with maternal smoking in pregnancy.

Dietary intake of n-3 and n-6 fatty acids and the risk of clinical depression in women: a 10-y prospective follow-up study. Michel Lucas et al. *Am J Clin Nutr* 2011;93(6):1337-343.

Background: The associations between different sources of dietary n-3 (omega-3) and n-6 (omega-6) fatty acids and the risk of depression have not been prospectively studied. **Objective:** The objective was to examine the relation between different n-3 and n-6 types with clinical depression incidence. **Design:** We prospectively studied 54,632 US women from the Nurses' Health Study who were 50–77 y of age and free from depressive symptoms at baseline. Information on diet was obtained from validated food-frequency questionnaires. Clinical depression was defined as reporting both physician-diagnosed depression and regular antidepressant medication use. **Results:** During 10 y of follow-up (1996–2006), 2823 incident cases of depression were documented. Intake of long-chain n-3 fatty acids from fish was not associated with depression risk [relative risk (RR) for 0.3-g/d increment: 0.99; 95% CI: 0.88, 1.10], whereas α -linolenic acid (ALA) intake was inversely associated with depression risk (multivariate RR for 0.5-g/d increment: 0.82; 95% CI: 0.71, 0.94). The inverse association between ALA and depression was stronger in women with low linoleic acid (LA) intake (P for interaction = 0.02): a 0.5-g/d increment in ALA was inversely associated with depression in the first, second, and third LA quintiles [RR (95% CI): 0.57 (0.37, 0.87), 0.62 (0.41, 0.93), and 0.68 (0.47, 0.96), respectively] but not in the fourth and fifth quintiles. **Conclusions:** The results of this large longitudinal study do not support a protective effect of long-chain n-3 from fish on depression risk. Although these data support the hypothesis that higher ALA and lower LA intakes reduce depression risk, this relation warrants further investigation.

Prenatal DHA Status and Neurological Outcome in Children at Age 5.5 Years Are Positively Associated. M. Victoria Escolano-Margarit et al. *J Nutr* 2011;141(6):1216-1223.

Beneficial effects of perinatal DHA supply on later neurological development have been reported. We assessed the effects of maternal DHA supplementation on the neurological development of their children. Healthy pregnant women from Spain, Germany, and Hungary were randomly assigned to a dietary supplement consisting of either fish oil (FO) (500 mg/d DHA + 150 mg/d EPA), 400 μ g/d 5-methyltetrahydrofolate, both, or placebo from wk 20 of gestation until delivery. Fatty acids in plasma and erythrocyte phospholipids (PL) were determined in maternal blood at gestational wk 20 and 30 and in cord and maternal blood at delivery. Neurological development was assessed with the Hempel examination at the age of 4 y and the Touwen examination at 5.5 y. Minor neurological dysfunction, neurological optimality score (NOS), and fluency score did not differ between groups at either age, but the odds of children with the maximal NOS score increased with every unit increment in cord blood DHA level at delivery in plasma PL (95% CI: 1.094–2.262), erythrocyte phosphatidylethanolamine (95% CI: 1.091–2.417), and erythrocyte phosphatidylcholine (95% CI: 1.003–2.643). We conclude that higher DHA levels in cord blood may be related to a better neurological outcome at 5.5 y of age.

Pre- and post-term growth in pre-term infants supplemented with higher-dose DHA: a randomised controlled trial. Carmel T. Collins et al. *Br J Nutr* 2011;105(11):1635-1643.

Abstract: The effect of the dietary n-3 long-chain PUFA, DHA (22 : 6n-3), on the growth of pre-term infants is controversial. We tested the effect of higher-dose DHA (approximately 1 % dietary fatty acids) on the growth of pre-term infants to 18 months corrected age compared with standard feeding practice (0.2–0.3 % DHA) in a randomised controlled trial. Infants born < 33 weeks gestation (n 657) were randomly allocated to receive breast milk and/or formula with higher DHA or standard DHA according to a concealed schedule stratified for sex and birth-weight (< 1250 and \geq 1250 g). The dietary arachidonic acid content of both diets was constant at approximately 0.4 % total fatty acids. The intervention was from day 2 to 5 of life until the infant's expected date of delivery (EDD). Growth was assessed at EDD, and at 4, 12 and 18 months corrected age. There was no effect of higher DHA on weight or head circumference at any age, but infants fed higher DHA were 0.7 cm (95 % CI 0.1, 1.4 cm; P = 0.02) longer at 18 months corrected age. There was an interaction effect between treatment and birth weight strata for weight (P = 0.01) and length (P = 0.04). Higher DHA resulted in increased length in infants born weighing \geq 1250 g at 4 months corrected age and in both weight and length at 12 and 18 months corrected age. Our data show that DHA up to 1 % total dietary fatty acids does not adversely affect growth. **Key Words:** Infants; Prematurity; Fatty acids; Growth.

Fatty Acids Intake and Depressive Symptomatology in a Greek Sample: An Epidemiological Analysis. Demosthenes B Panagiotakos et al. *J Am Coll Nutr* 2011;29(6):586-594.

Background: Depression is associated with an increased risk of cardiovascular disease, but the association with dietary habits is not well understood. The aim of this work was to statistically model the association of depressive symptoms with fatty acids intake in persons free of cardiovascular disease. **Method:** A random multistage sampling, stratified by gender and age, was performed during 2001–2002. In the present work, psychological and dietary data from 453 men (19–89 years) and 400 women (18–84 years) were analyzed. Depression was assessed with the Zung's Self-rating Depression Scale (ZDRS). After a validation for the investigated population, plasma fatty acids in the form of their methyl esters were determined by gas chromatography, while dietary fatty acids were determined through a semiquantitative food frequency questionnaire and local food composition tables. **Results:** Women had significantly higher scores on the ZDRS as compared with men (47 ± 9 vs. 43 ± 10 , $p < 0.001$). Multiadjusted data analysis after adjusting for age, gender, lifestyle, and dietary habits revealed that increased polyunsaturated fatty acid (PUFA) and monounsaturated fatty acid (MUFA) concentrations, and, more specifically, high concentrations of plasma total n-3 fatty acids ($b \pm SE$: -1.9 ± 0.5 , $p = 0.03$), docosahexaenoic acid (-2.91 ± 1.04 , $p = 0.02$), eicosapentaenoic acid (-2.54 ± 0.84 , $p = 0.03$), α -linoleic acid (-16.8 ± 7.3 , $p = 0.01$), and linoleic acid (-3.97 ± 0.21 , $p = 0.03$), were associated with lower scores in the depression scale used. **Conclusion:** These results indicate that increased PUFA and MUFA concentrations are associated with diminished depressive symptomatology among apparently healthy adults. **Key words:** depression, eating, fatty acids, epidemiology.

Plasma Levels of trans-Fatty Acids are Low in Exclusively Breastfed Infants of Adolescent Mothers. Roseli de Souza Santos da Costa et al. *Lipids* 2011;46(6):537-543.

Abstract: The purpose of this study was to determine the levels of trans-octadecenoic acid (C18:1-trans) and trans-isomers of linoleic acid (18:2-trans), as well as long-chain polyunsaturated fatty acids (LC-PUFA), in the plasma from infants of adolescent mothers at 3 months of age, exclusively breastfed, and the relationship with the levels of the same isomers in plasma and milk of the mothers. Samples of blood and mature milk were obtained from 49 healthy adolescent mothers and their exclusively breastfed infants treated at the Instituto Fernandes Figueira-Fundação Oswaldo Cruz (IFF-FIOCRUZ) in Rio de Janeiro, Brazil. trans-Fatty acids (TFA) were analyzed by gas chromatography. The results of this study showed low levels of TFA in milk (1.53%), maternal plasma (0.50%), and plasma of infants (0.74%). The results show that, although TFA have been found in the plasma of the studied infants, the LC-PUFA levels are kept within normal limits. No association between TFA presence and parameters of nutritional status of the infants was observed, probably due to the low levels of these fatty acids found in this study. **Keywords:** Fatty acids – trans-Fatty acid – Mature milk – Plasma – Adolescents – Infants.

High dietary and plasma levels of the omega-3 fatty acid docosahexaenoic acid are associated with decreased dementia risk: the rancho bernardo study. L. B. Lopez et al. *J Nutr Health Aging* 2011;15(1):25-31.

Objective: This study examined the association of plasma DHA, dietary DHA, and fish intake with dementia and Alzheimer's Disease (AD) in older adults. **Design:** Case-cohort study. **Setting:** Clinic visit in 1991–93. **Participants:** 266 community dwelling men and women aged 67–100 years (mean=80.2). **Measurements:** Participants had neurological and neuropsychological evaluations for dementia in 1991–93. Plasma DHA was measured in blood samples obtained at that visit. Dietary intakes of DHA and fish were obtained from an earlier (1988–91) visit. Three DHA exposure variables were used in separate analyses; plasma DHA, dietary DHA, and consumption of cold-water fish. All-cause dementia included AD and other types of possible or probable dementia. **Results:** Among these 266 participants, 42 had dementia and 30 had possible or probable AD. Plasma DHA in the highest tertile was associated with a 65% reduced odds of all-cause dementia (95% CI: 0.17, 0.92) and a 60% reduced odds of AD (95% CI: 0.15, 1.10). Dietary DHA in the highest tertile was associated with a 73% reduced odds of all-cause dementia (95% CI: 0.09, 0.79) and a 72% reduced odds of AD (95% CI: 0.09, 0.93). Fish intake had similar, though not significant, reduced odds of dementia (OR = 0.51; 95% CI: 0.20, 1.32) and AD (OR = 0.55; 95% CI: 0.20, 1.48). **Conclusions:** Plasma and dietary DHA appear to protect against dementia. Increasing DHA intake from marine sources may be

recommended for reducing dementia risk. **Key words:** Alzheimer's disease – cognitive function – dementia – docosahexaenoic acid (DHA) – omega-3 fatty acids.

Omega-3 polyunsaturated fatty acid supplements and cognitive decline: Singapore longitudinal aging studies. Q. Gao et al. *J Nutr Health Aging* 2011;15(1):32-35.

Objective: To determine the association between long chain omega-3 polyunsaturated fatty acid (n-3 PUFA) supplements intake and cognitive decline in an older Chinese population. **Design:** Prospective cohort study. **Setting:** The Singapore Longitudinal Aging Studies (SLAS), a community-based study in urban region of Singapore. **Participants:** 1,475 Chinese adults aged ≥ 55 years. **Measurement:** Omega-3 PUFA supplements intake and Mini-Mental State Examination (MMSE) were assessed at baseline. MMSE was reassessed at a median of 1.5 years after baseline and cognitive decline was defined as at least 2-points drop in MMSE score from baseline to follow-up. Odds ratios (ORs) of association between n-3 PUFA supplements intake and cognitive decline were calculated in logistic regression models controlling for baseline confounding variables. **Results:** Daily n-3 PUFA supplements intake was significantly ($p=0.024$) associated with lower risk of cognitive decline ($OR=0.37$, 95% C.I. 0.16–0.87) after controlling for age, gender, education, number of medical comorbidity, the presence of vascular risk factors/diseases, smoking, alcohol drinking, depression, APOE e4 allele carrier status, nutritional status, level of leisure activities, baseline MMSE and length of follow-up. The association remained significant ($p=0.015$) after excluding participants with baseline cognitive impairment (MMSE <24), diabetes, stroke, and cardiac diseases ($OR=0.23$, 95% C.I. 0.07–0.75). No statistically significant association ($OR=1.02$, 95% C.I. 0.81–1.27) of fish consumption with cognitive decline was found. **Conclusion:** Daily n-3 PUFA supplements consumption was independently associated with less cognitive decline in elderly Chinese. **Key words:** Omega-3 polyunsaturated fatty acid – supplements – cognition – dementia – chinese.

Long chain omega 3 polyunsaturated fatty acids supplementation in the treatment of elderly depression: Effects on depressive symptoms, on phospholipids fatty acids profile and on health-related quality of life. Mariangela Rondanelli et al. *J Nutr Health Aging* 2011;15(1):37-44.

Objective: Recent observations showed that long chain omega 3 polyunsaturated fatty acids (n-3 LCPUFA) could represent a potential treatment for elderly depression. To determine if a n-3 LCPUFA containing supplement improves depressive symptoms, changes phospholipids acids profile and ameliorates Health related quality of life (HRQoL) in depressed elderly patients. **Design:** Two-months, randomized, double-blind, placebo-controlled trial. **Setting:** Nursing home in Pavia, Italy. **Subjects:** Forty-six depressed females, aged 66–95 years. **Intervention:** 22 depressed females were included in the intervention group (n-3 group, that received 2.5 g/day of n-3 LCPUFA, with 1.67 grams of EPA and 0.83 grams of DHA), and 24 patients in the placebo group. The primary endpoint was the improvement of depressive symptoms as evaluated by Geriatric Depression Scale (GDS). Secondary endpoints were the evaluation of modifications of erythrocyte membrane phospholipids fatty acid profile and of HRQoL, by using the Short-Form 36-Item Health Survey (SF-36). All parameters were assessed before and after the treatment period of 8 weeks. **Results:** The mean GDS at 2 months was significantly lowered only for the n-3 group. SF-36 physical and mental components were significantly increased in the intervention group. Compliance was good, as confirmed by erythrocyte membrane phospholipid FA concentrations, with significant increase of EPA and DHA in the intervention group. **Conclusion:** The supplementation of n-3 LCPUFA in elderly female patients reduces the occurrence of depressive symptoms, improves phospholipids fatty acids profile and healthrelated quality of life. **Key words:** N-3 long chain polyunsaturated fatty acids – depression – elderly – AA/EPA.

Thirteen-year prospective study between fish consumption, long-chain N-3 fatty acids intakes and cognitive function. E. Kesse-Guyot et al. *J Nutr Health Aging* 2011;15(2):115-120.

Objectives: Because of their structural, anti-inflammatory and antithrombic properties, longchain n-3 fatty acids may be key factors in the aging process. We sought to elucidate the association between intake of long-chain n-3 fatty acids and/or fish and cognitive function evaluated 13 years after dietary assessment. **Design:** Prospective population-based study. **Participants/Setting:** 3,294 adults from the SU.VI.MAX study (Supplementat ion with Antioxidant Vitamins and Minerals study). **Measurements/Statistical analysis:** Subjects underwent a standardized clinical examination which included cognitive tests and self-reported cognitive difficulties scale (2007–2009). Poor scores were

defined using percentiles as cut-off. Dietary data were assessed through repeated 24-h dietary records. Odds ratio (OR), comparing the fourth (Q4) to the first quartile (Q1), of having a poor score were calculated using adjusted logistic regression. **Results:** Self-reported cognitive difficulties were less frequent among subjects with higher intakes of total n-3 long chain fatty acids (OR = 0.72, CI 95%=0.56–0.92) and eicosapentaenoic acid (OR Q4 versus Q1 = 0.74, CI 95%=0.58–0.95), even after adjustment for depressive symptoms. A borderline significant association was also found with high fish consumption (OR Q4 versus Q1 = 0.80, CI 95%=0.63–1.01). **Conclusion:** Cognitive complaints, which may be an early indicator of cognitive decline, are less frequent among the elderly who have a high long-chain n-3 acids intake, as assessed 13 years earlier. **Key words:** Cognition – cognitive difficulties – fish – omega-3 fatty acids.

- **Overweight and obesity**

Growth of infants fed formula rich in canola oil (low erucic acid rapeseed oil). Peter Rzehak et al. Clin Nutr 2011;30(3):339-345.

Background & aims: Canola oil is a variety of rapeseed oil low in erucic acid (<2%). For many years, canola oil has been widely used as an ingredient in infant formula in Europe, but not in North America due to safety concerns. A number of studies have used variable canola content of infant formulas to investigate the effects of linoleic acid: α -linolenic acid ratio on visual function of infants. However, little published data is available to compare the safety of canola versus non-canola containing infant formula. The aim of this study is to investigate whether infant formulas containing canola oil support normal growth in infants as assessed by weight and length gain. **Methods:** Re-analyses of data on infant weight and length gain from a prospective randomized double-blind trial in full-term infants in the German Infant Nutritional Intervention study (GINI). This analysis compared growth in infants receiving infant formulas with or without canola oil from week 4 to month 7. Absolute weight and length, weight and length gain in gram or cm per day and standardized weight and length measurements were analyzed by analyses of variance and a longitudinal random effects model. Standardization was conducted according to the new WHO 2006 age- and sex-specific child growth standards. **Results:** Absolute and standardized weight and length measures did not differ between the formula groups with or without canola oil. This was true for both, analyses within each of the three anthropometric measurement periods (4–6 weeks, 3–4 months, 6–7 months) and for the longitudinal analyses over the whole period from 4 weeks to 7 months of life. Power analyses confirmed that sample size was sufficient to detect a difference of 3 g per day between 14 and 120 days between the two formula groups. **Conclusions:** Infant formula containing canola oil supports normal infant growth as assessed by weight and length gain. **Keywords:** Formula feeding; Canola oil; Weight; Length; Normal growth; German infant nutritional intervention study (GINI).

Effect of a vegetable-oil emulsion on body composition; a 12-week study in overweight women on a meal replacement therapy after an initial weight loss: a randomized controlled trial. Johan Olsson et al. Eur J Nutr 2011;50(4):235-242.

Purpose: The maintenance of an obtained lower weight level is often found to be difficult. The aim of this study was to determine weight maintenance after an initial weight loss by consumption of a meal replacement with a vegetable-oil emulsion associated with prolonged satiety. **Methods:** After a 6-week weight loss period with very low calorie diet (VLCD), subjects with >5% body weight (BW) loss were randomized to a 12-week weight maintenance follow-up period, comparing a partial meal replacement diet containing a vegetable-oil emulsion (test) or dairy fat (control). Anthropometric data and safety variables were collected at baseline and after 4, 8 and 12 weeks. **Results:** A significant weight loss was observed during the 12-week weight maintenance diet in the test and control group, respectively; 1.0 ± 2.1 kg ($p < 0.05$) versus 1.3 ± 2.1 kg ($p < 0.05$) with no significant difference between the groups. Body fat mass (BFM) decreased significantly ($p < 0.05$) in the test group (–1.7%) compared to the control group (–0.8%). **Conclusions:** Addition of a vegetable-oil emulsion to a meal replacement weight maintenance program after an initial weight loss using VLCD was associated with decreased BFM by 0.9% without any change in BW between the two groups. **Keywords:** Weight maintenance – VLCD – Body fat mass – BFM – Body weight – Fat emulsion.

- **Other**

Phytosterol ester processing in the small intestine: impact on cholesterol availability for absorption and chylomicron cholesterol incorporation in healthy humans. Marie Josèphe Amiot et al. *J Lipid Res* 2011;52(6):1256-1264.

Abstract: Phytosterols (plant sterols and stanols) can lower intestinal cholesterol absorption, but the complex dynamics of the lipid digestion process in the presence of phytosterol esters (PEs) are not fully understood. We performed a clinical experiment in intubated healthy subjects to study the time course of changes in the distribution of all lipid moieties present in duodenal phases during 4 h of digestion of meals with 3.2 g PE (PE meal) or without (control meal) PE. In vitro experiments under simulated gastrointestinal conditions were also performed. The addition of PE did not alter triglyceride (TG) hydrolysis in the duodenum or subsequent chylomicron TG occurrence in the circulation. In contrast, cholesterol accumulation in the duodenum aqueous phase was markedly reduced in the presence of PE (−32%, $P < 0.10$). In vitro experiments confirmed that PE reduces cholesterol transfer into the aqueous phase. The addition of PE resulted in a markedly reduced presence of meal-derived hepta-deuterated cholesterol in the circulation, i.e., in chylomicrons (−43%, PE meal vs. control; $P < 0.0001$) and plasma (−54%, PE meal vs. control; $P < 0.0001$). The present data show that addition of PE to a meal does not alter TG hydrolysis but displaces cholesterol from the intestinal aqueous phase and lowers chylomicron cholesterol occurrence in humans. **Key words:** micelles, sitosterol, campesterol, sitostanol, hepta-deuterated cholesterol, isotope enrichment.

Dietary Intakes of Arachidonic Acid and α -Linolenic Acid Are Associated with Reduced Risk of Hip Fracture in Older Adults. Emily K. Farina et al. *J Nutr* 2011;141(6):1146-1153.

PUFA are hypothesized to influence bone health, but longitudinal studies on hip fracture risk are lacking. We examined associations between intakes of PUFA and fish, and hip fracture risk among older adults ($n = 904$) in the Framingham Osteoporosis Study. Participants (mean age ~ 75 y at baseline) were followed for incident hip fracture from the time they completed the baseline exam (1988–1989) until December 31, 2005. HR and 95% CI were estimated for energy-adjusted dietary fatty acid exposure variables [($n-3$) fatty acids: α -linolenic acid (ALA), EPA, DHA, EPA+DHA; ($n-6$) fatty acids: linoleic acid, arachidonic acid (AA); and the ($n-6$):($n-3$) ratio] and fish intake categories, adjusting for potential confounders and covariates. Protective associations were observed between intakes of ALA (P -trend = 0.02) and hip fracture risk in a combined sample of women and men and between intakes of AA (P -trend = 0.05) and hip fracture risk in men only. Participants in the highest quartile of ALA intake had a 54% lower risk of hip fracture than those in the lowest quartile (Q4 vs. Q1: HR = 0.46; 95% CI = 0.26–0.83). Men in the highest quartile of AA intake had an 80% lower risk of hip fracture than those in the lowest quartile (Q4 vs. Q1: HR = 0.20; 95% CI = 0.04–0.96). No significant associations were observed among intakes of EPA, DHA, EPA+DHA, or fish. These findings suggest dietary ALA may reduce hip fracture risk in women and men and dietary AA may reduce hip fracture risk in men.

Effects of dietary fat modification on insulin sensitivity and on other risk factors of the metabolic syndrome—LIPGENE: a European randomized dietary intervention study. A C Tierney et al. *Int J Obesity* 2011;35(6):800–809.

Background: Excessive energy intake and obesity lead to the metabolic syndrome (MetS). Dietary saturated fatty acids (SFAs) may be particularly detrimental on insulin sensitivity (SI) and on other components of the MetS. **Objective:** This study determined the relative efficacy of reducing dietary SFA, by isoenergetic alteration of the quality and quantity of dietary fat, on risk factors associated with MetS. **Design:** A free-living, single-blinded dietary intervention study. **Subjects and Methods:** MetS subjects ($n=417$) from eight European countries completed the randomized dietary intervention study with four isoenergetic diets distinct in fat quantity and quality: high-SFA; high-monounsaturated fatty acids and two low-fat, high-complex carbohydrate (LFHCC) diets, supplemented with long chain $n-3$ polyunsaturated fatty acids (LC $n-3$ PUFAs) (1.2 g per day) or placebo for 12 weeks. SI estimated from an intravenous glucose tolerance test (IVGTT) was the primary outcome measure. Lipid and inflammatory markers associated with MetS were also determined. **Results:** In weight-stable subjects, reducing dietary SFA intake had no effect on SI, total and low-density lipoprotein cholesterol

concentration, inflammation or blood pressure in the entire cohort. The LFHCC n-3 PUFA diet reduced plasma triacylglycerol (TAG) and non-esterified fatty acid concentrations ($P < 0.01$), particularly in men. **Conclusion:** There was no effect of reducing SFA on SI in weight-stable obese MetS subjects. LC n-3 PUFA supplementation, in association with a low-fat diet, improved TAG-related MetS risk profiles. **Keywords:** dietary fat; insulin sensitivity; SFA; LC n-3 PUFA; MetS; LIPGENE.

Consumption of a plant sterol-based spread derived from rice bran oil is effective at reducing plasma lipid levels in mildly hypercholesterolaemic individuals. Sarah Eady et al. *Br J Nutr* 2011;105(12):1808-1818.

Abstract: To establish the effectiveness of a new phytosterol-containing spread derived from rice bran oil (RBO), a randomised, double-blind, cross-over human clinical trial was conducted over 12 weeks. A total of eighty mildly hypercholesterolaemic (total blood cholesterol level ≥ 5 and ≤ 7.5 mmol/l with a serum TAG level of ≤ 4.5 mmol/l) individuals were randomised into two groups (n 40). Group 1 consumed spread only daily for 4 weeks. They were randomised to consume 20 g RBO spread (RBOS), 20 g standard spread (SS) or 20 g phytosterol-enriched spread (PS). After a 4-week period, individuals changed to the next randomised treatment until all three treatments had been consumed. Group 2 consumed spread plus oil daily for 4 weeks. They consumed 20 g RBOS plus 30 ml RBO, 20 g SS plus 30 ml sunflower oil or 20 g RBOS. Blood samples were collected for the analysis of lipid parameters, and 3 d diet records were collected. Compared with SS, RBOS significantly reduced total cholesterol by 2.2 % ($P = 0.045$), total cholesterol:HDL by 4.1 % ($P = 0.005$) and LDL-cholesterol by 3.5 % ($P = 0.016$), but was not as effective overall as PS, which reduced total cholesterol by 4.4 % ($P = 0.001$), total cholesterol:HDL by 3.4 % ($P = 0.014$) and LDL-cholesterol by 5.6 % ($P = 0.001$). In group 2, the addition of RBO to the RBOS produced no differences in cholesterol levels. These results confirm that RBOS is effective in lowering serum cholesterol when consumed as part of a normal diet. **Key Words:** Plant sterols; Cholesterol; Lipoproteins.

Cod Liver Oil, Young Children, and Upper Respiratory Tract Infections. Linda A. Lindsay. *J Am Coll Nutr* 2011;29(6):559-562.

Abstract: Cod liver oil contains long-chain omega-3 fatty acids, as well as vitamins D and A. It was a traditional source of vitamin D in the United States and was used to prevent and treat rickets. In our clinical research, we used liquid cod liver oil of adequate purity and acceptable taste for infants and young children, as well as a children's multivitamin/mineral supplement with selenium and other trace metals. In a cluster-randomized study of pediatric visits for upper respiratory illness during the winter and early spring, these nutritional supplements decreased mean visits/subject/month by 36%–58%. Cod liver oil is culturally valued and has been used as a folk remedy by many low-income minorities in the United States. Nutritional supplements cannot be purchased with SNAP benefits (formerly called food stamps). Inclusion of cod liver oil in state Medicaid formularies would make it available to low-income children, whose families may not be able to pay for it out-of-pocket. **Key teaching points:** • Vitamins A and D and long-chain omega-3 fatty acids have important roles in immunity and inflammation. • Historical development in the United States of vitamin D deficiency/insufficiency and decreased long-chain omega-3 fatty acid consumption has been documented. • Economic and regulatory issues limit the availability of cod liver oil for low-income children in the United States. **Key words:** omega-3, fish oil, EPA, DHA, vitamin D, 25-hydroxyvitamin D, vitamin A, children, infection.

Polyunsaturated fatty acid intake and prevalence of eczema and rhinoconjunctivitis in Japanese children: The Ryukyus Child Health Study. Yoshihiro Miyake et al. *BMC Public Health* 2011,11:358.

Background: The recent increase in the prevalence of allergic disorders might be a consequence of increased intake of n-6 polyunsaturated fatty acids (PUFAs) and reduced intake of n-3 PUFAs. The current cross-sectional study examined the association between intake levels and the prevalence of eczema and rhinoconjunctivitis in Japanese children. **Methods:** Subjects were 23,388 schoolchildren aged 6-15 years residing in Okinawa. The presence of eczema and/or rhinoconjunctivitis was determined according to the criteria of the International Study of Asthma and Allergies in Childhood. A brief diet history questionnaire for children and adolescents was administered to acquire information on dietary factors. Adjustment was made for age, sex, residential municipality, number of siblings, smoking in the household, body mass index, paternal and maternal history of allergic diseases, and

paternal and maternal educational level. **Results:** The prevalences of eczema and rhinoconjunctivitis in the previous 12 months were 7.0% and 8.0%, respectively. Consumption of PUFAs, n-3 PUFAs, α -linolenic acid, n-6 PUFAs, and linoleic acid was positively associated with the prevalence of eczema: the adjusted odds ratios (ORs) between extreme quintiles (95% confidence intervals [CIs], P for trend) were 1.26 (1.07-1.48, 0.04), 1.31 (1.11-1.54, 0.009), 1.31 (1.12-1.55, 0.003), 1.26 (1.07-1.48, 0.01), and 1.27 (1.08-1.49, 0.01), respectively. Arachidonic acid intake was independently inversely related to eczema: the adjusted OR between extreme quintiles was 0.81 (0.69-0.95, 0.0008). Eczema was not associated with eicosapentaenoic or docosahexaenoic acid intake, or with the ratio of n-3 to n-6 PUFA intake. Only arachidonic acid intake was statistically significantly related to the prevalence of rhinoconjunctivitis, showing a clear inverse linear trend: the adjusted OR between extreme quintiles was 0.86 (0.74-0.997, 0.03). **Conclusions:** Consumption of n-3 and n-6 PUFAs, especially α -linolenic acid and linoleic acid, may be positively associated with eczema. Arachidonic acid intake may be inversely related to eczema and rhinoconjunctivitis.

2 Intake of fats, oils or fatty acids

Validation of an Australian electronic food frequency questionnaire to measure polyunsaturated fatty acid intake. Monika Swierk et al. *Nutrients* 2011;27(6):641-646.

Objective: To develop and validate a simple non-invasive method that estimates the intakes of omega-3 and omega-6 polyunsaturated fatty acids (PUFA) in a healthy adult population. **Methods:** A new electronic PUFA food frequency questionnaire (FFQ) was validated by comparison with a 3-d weighed food record and blood biomarkers (erythrocytes and plasma) using the method of triads model and tested for reproducibility. Healthy subjects were recruited from the local Illawarra Region, New South Wales, Australia. **Results:** The PUFA FFQ adequately estimated intakes for eicosapentaenoic acid, docosahexaenoic acid, total long chain omega-3 PUFA, linoleic acid, total omega-6 PUFA, and total PUFA, which were comparable with results from the 3-d food record. Eicosapentaenoic acid, docosahexaenoic acid, and total long chain omega-3 showed high validity coefficients for erythrocytes (and plasma) 0.92 (0.87), 0.69 (0.64), and 0.78 (0.73) ($P < 0.05$), respectively. Spearman's rank correlation coefficients ranged from 0.48 to 0.76 when the PUFA FFQ was tested for reproducibility ($P < 0.05$). **Conclusion:** The electronic PUFA questionnaire was found to be reproducible and is a valid tool to assess PUFA intakes in a healthy adult population. **Keywords:** Biomarkers; Food frequency questionnaire; Polyunsaturated fatty acid intakes; Validation.

The ω -3 and ω -6 fats in meals: A proposal for a simple new label. Nigel Turner et al. *Nutrients* 2011;27(6):719-726.

Objective: The ω -3 and ω -6 polyunsaturated fatty acids (PUFAs) are separate essential dietary fatty acids that play a key role in many physiologic processes in higher animals. The content of these PUFAs is relatively well described for many individual food components. Our goal in this study was to analyze the PUFA content of whole meals and produce a simple measurement to estimate the intake of these fatty acids. **Methods:** The fatty acid profile and macronutrient composition were determined for a range of fast food, cuisine (restaurant-prepared), and home-prepared whole meals commonly consumed by Australians. **Results:** Across the different meals there was significant variation in protein (4-fold), fat (13-fold), and carbohydrate (23-fold) contents. With regard to the fatty acid profile, saturated and monounsaturated fatty acids made up approximately 80% of total fatty acids for most meals. The ω -6 PUFAs were substantially more abundant than ω -3 PUFAs for most meals. The balance of dietary ω -3 and ω -6 PUFAs is an important determinant of their metabolic effects within the body, and accordingly we calculated the percentage of the total PUFA comprised of ω -3 PUFAs and referred to this as the PUFA Balance. This parameter showed the greatest variation among the different meals (>45-fold). **Conclusion:** The relative proportions of ω -3 and ω -6 PUFAs vary greatly across meals. PUFA Balance is a useful tool that will allow individuals to more easily monitor and balance their intake of ω -3 and ω -6 fats. **Keywords:** Dietary fats; Food analysis; Lipid metabolism; ω -3 Fatty acids; ω -6 Fatty acids.

3 Process technological aspects of fats, oils or fatty acids

Formation of 4-Hydroxy-2-(E)-Nonenal in a Corn–Soy Oil Blend: a Controlled Heating Study Using a French Fried Potato Model. Sean I. LaFond et al. *J Am Oil Chem Soc* 2011;88(6):763-772.

Abstract: The formation of 4-hydroxy-2-(E)-nonenal (HNE) in a corn–soy oil blend during frying was investigated. Frozen shoestring potatoes were fried once per hour at 180 °C for 8 h/day over a 4-day period. As a control, oil was also heated under identical conditions, except that no product was fried. HNE was quantified by GC–MS using a stable isotope dilution assay with pentafluorobenzyl hydroxylamine hydrochloride (PFBHA) and trimethylsilyl 2,2,2-trifluoro-n-(trimethylsilyl)acetimidate (BSTFA) derivatization. The HNE concentration in the potato fryers increased throughout the first day of frying. On subsequent days the daily maximum HNE concentration was reached after fresh oil was added and the fryer was brought to the frying temperature. The potato fryer oil reached a maximum concentration of 5.6 ppm during the second day of frying. Similarly, the HNE concentration of the oil in the control fryer increased throughout the first day of heating. On subsequent days the daily maximum HNE concentration varied throughout the experimental period. The control fryers reached a maximum concentration of 6.3 ppm at the end of the second day of heating. Throughout the experimental period there was a tendency for the oil in the control fryer to have a greater concentration of HNE than the oil in the potato fryer. Overall time of the experiment and heating with food versus heating without frying food and their interaction were significant in terms of HNE formation. **Keywords** 4-hydroxy-2-(E)-nonenal – HNE – Unsaturated hydroxy aldehydes – Frying oil – Stable isotope dilution assay.

Strategies for the enzymatic enrichment of PUFA from fish oil. Betty Mbatia et al. *Eur J Lipid Sci Technol* 2011;113(6):717-723.

Abstract: PUFA from oil extracted from Nile perch viscera were enriched by selective enzymatic esterification of the free fatty acids (FFA) or by hydrolysis of ethyl esters of the fatty acids from the oil (FA-EE). Quantitative analysis was performed using RP-HPLC coupled to an evaporative light scattering detector (RP-HPLC-ELSD). The lipase from *Thermomyces lanuginosus* discriminated against docosahexaenoic acid (DHA) most, resulting in the highest DHA/DHA-EE enrichment while lipase from *Pseudomonas cepacia* discriminated against eicosapentaenoic acid (EPA) most, resulting in the highest EPA/EPA-EE enrichment. The lipases discriminated between DHA and EPA with a higher selectivity when present as ethyl esters (EE) than when in FFA form. Thus when DHA/EPA were enriched to the same level during esterification and hydrolysis reactions, the DHA-EE/EPA-EE recoveries were higher than those of DHA/EPA-FFA. In reactions catalysed by lipase from *T. lanuginosus*, at 26 mol% DHA/DHA-EE, DHA recovery was 76% while that of DHA-EE was 84%. In reactions catalysed by lipase from *P. cepacia*, at 11 mol% EPA/EPA-EE, EPA recovery was 79% while that of EPA-EE was 92%. Both esterification of FFA and hydrolysis of FA-EE were more effective for enriching PUFA compared to hydrolysis of the natural oil and are thus attractive process alternatives for the production of products highly enriched in DHA and/or EPA. When there is only one fatty acid residue in each substrate molecule, the full fatty acid selectivity of the lipase can be expressed, which is not the case with triglycerides as substrates. **Keywords:** DHA; EPA; Esterification; Hydrolysis; Lipase specificity.

Comparison of the stability of palm olein and a palm olein/canola oil blend during deep-fat frying of chicken nuggets and French fries. Blanca Estela Enríquez-Fernández et al. *Int J Food Sci Technol* 2011;46(6):1231-1237.

Summary: Stability of palm olein (PO) and a blend 50% palm olein/50% canola oil (POC) during deep-fat frying at 180 °C of French fries (FF) or chicken nuggets (CN) was studied through the determination of physical and chemical parameters in the fresh and used oils. Degradation at the end of the study resulted in total polar compounds of 12–13.5% for PO and 11.5–14.5% for POC and viscosity of 65–123.3 cP for PO and 63–72.8 cP for POC. Lower peroxide values (5.33–6.32) were obtained for the blend (PO had 5.21–8.55). Food type affected colour parameters and p-anisidine value of the oils. For CN, the lowest fat content and higher hardness were obtained when they were fried in PO. CN caused a faster deterioration in the oils, in comparison with FF, especially in POC. Gas chromatography allowed to observe differences in fatty acids composition for both used oils. **Keywords:** Canola oil; chicken nuggets; french fries; frying; oil blends; oil stability; palm olein.

Crystallization of fully hydrogenated and interesterified fat and vegetable oil. Zhang L et al. *J Oleo Sci* 2011;60(6):287-292.

Owing to public concern regarding the adverse health effects of trans fatty acids, an alternative technology to trans fats has recently become an important issue. The interesterification of fully hydrogenated vegetable oil and liquid oil blends is one of the most versatile options. This paper reports a physical analysis of high-melting fat (HMF) prepared through the interesterification of fully hydrogenated soybean oil and regular soybean oil, and through fractionation. The thermal and structural properties of the HMF blended with salad oil at a mass ratio of 4:1 (called the HMF blend, hereafter), which was prepared as a model fat blend for margarine, were assessed using X-ray diffraction (XRD), differential scanning calorimetry (DSC), and polarized light microscopy (POM). To observe the polymorphic transformation, all samples were aged after crystallization, and the development of granular crystals during the aging process was observed. We found that the granular crystals are made of SOS/SSO, POS/PSO, and (SOS+POS)/(SSO+PSO) molecular compounds, all of which easily transform into β form with a double-chain-length structure.

4 Health aspects of fat soluble vitamins

Vitamin A and Retinoid Derivatives for Lung Cancer: A Systematic Review and Meta Analysis. Fritz H et al. *PLoS One* 2011;6(6):e21107.

Background: Despite reported antiproliferative activity of vitamin A and its common use for cancer, there is no comprehensive synthesis of its safety and efficacy in lung cancers. To address this issue we conducted a systematic review of the safety and efficacy of vitamin A for the treatment and prevention of lung cancers. **Methods and Findings:** Two independent reviewers searched six electronic databases from inception to July 2009 for clinical, observational, and preclinical evidence pertaining to the safety and efficacy of vitamin A and related retinoids for lung cancers. 248 studies were included for full review and analysis. Five RCTs assessed treatment of lung cancers, three assessed primary prevention, and three looked at secondary prevention of lung cancers. Five surrogate studies, 26 phase I/II, 32 observational, and 67 preclinical studies were also included. 107 studies were included for interactions between vitamin A and chemo- or radiation- therapy. Although some studies demonstrated benefits, there was insufficient evidence overall to support the use of vitamin A or related retinoids for the treatment or prevention of lung cancers. Retinyl palmitate combined with beta carotene increased risk of lung cancer in smokers in the large CARET trial. Pooling of three studies pertaining to treatment and three studies on secondary prevention revealed no significant effects on response rate, second primary tumor, recurrence, 5-year survival, and mortality. There was a small improvement in event free survival associated with vitamin A compared to controls, RR 1.24 (95% CI 1.13–1.35). The synthetic retinoid bexarotene increased survival significantly among a subset of patients in two RCTs ($p < 0.014$, < 0.087). **Conclusions:** There is a lack of evidence to support the use of naturally occurring retinoids for the treatment and prevention of lung cancers. The retinoid bexarotene may hold promise for use among a subset of patients, and deserves further study.

Serum 25-Hydroxyvitamin D and Risk of Lung Cancer in Male Smokers: A Nested Case-Control Study. Weinstein SJ et al. *PLoS One* 2011;6(6):e20796.

Background: A role for vitamin D in cancer risk reduction has been hypothesized, but few data exist for lung cancer. We investigated the relationship between vitamin D status, using circulating 25-hydroxyvitamin D [25(OH)D], and lung cancer risk in a nested case-control study within the Alpha-Tocopherol, Beta-Carotene Cancer Prevention Study of Finnish male smokers. **Methods:** Lung cancer cases ($n = 500$) were randomly selected based on month of blood collection, and 500 controls were matched to them based on age and blood collection date. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using multivariate-adjusted conditional logistic regression. To account for seasonal variation in 25(OH)D concentrations, season-specific and season-standardized quintiles of 25(OH)D were examined, and models were also stratified on season of blood collection (darker season = November–April and sunnier season = May–October). Pre-determined, clinically-defined cutpoints for 25(OH)D and 25(OH)D as a continuous measure were also examined. **Results:** Overall, 25(OH)D was not associated with lung cancer. Risks were 1.08 (95% CI 0.67–1.75) and 0.83 (95% CI

0.53–1.31) in the highest vs. lowest season-specific and season-standardized quintiles of 25(OH)D, respectively, and 0.91 (95% CI 0.48–1.72) for the ≥ 75 vs. < 25 nmol/L clinical categories. Inverse associations were, however, suggested for subjects with blood collections from November–April, with ORs of 0.77 (95% CI 0.41–1.45, p-trend = 0.05) and 0.65 (95% CI 0.37–1.14, p-trend = 0.07) in the highest vs. lowest season-specific and season-standardized quintiles of 25(OH)D, respectively, and 0.61 (95% CI 0.24–1.52, p-trend = 0.01) for ≥ 75 vs. < 25 nmol/L. We also found 11% lower risk for a 10 nmol/L increase in 25(OH)D in the darker season based on the continuous measure (OR = 0.89, 95% CI 0.81–0.98, $p = 0.02$). **Conclusion:** In this prospective study of male smokers, circulating 25(OH)D was not associated with lung cancer risk overall, although inverse associations were suggested among those whose blood was drawn during darker months.

Inverse association of serum carotenoids with prevalence of metabolic syndrome among Japanese. Koji Suzuki et al. Clin Nutr 2011;30(3):369-375.

Background & aims: Several epidemiological studies have shown that circulating antioxidant levels are inversely associated with metabolic syndrome status. The purpose of this study was to examine the association of serum carotenoid levels, which have potent antioxidant effects, with metabolic syndrome and metabolic syndrome components in Japanese subjects. **Methods:** We conducted a cross-sectional study of 931 subjects (318 men and 613 women), aged 39–70 years, who attended a health examination. Metabolic syndrome was defined according to the diagnostic definition from the Japanese Examination Committee of Criteria for Metabolic Syndrome, which was released in 2005. Serum carotenoids were measured by high-performance liquid chromatography. **Results:** A significantly lower odds ratio (OR) for metabolic syndrome was observed in the highest tertile of serum β -cryptoxanthin (OR:0.45; 95% CI:0.22–0.93 in men and 0.41; 0.17–0.93 in women) and β -carotene (OR:0.45; 95% CI:0.21–0.95 in men and 0.37; 0.15–0.83 in women) compared to the lowest tertiles, in both sexes, but no significant association was found in male smokers. In women, moreover, OR for metabolic syndrome in the highest tertile of serum zeaxanthin/lutein (OR:0.37; 95% CI:0.16–0.84) was significantly lower than in the lowest tertile. Serum levels of β -cryptoxanthin, α -carotene, and β -carotene were significantly decreased with an increasing number of metabolic syndrome components in both sexes. **Conclusions:** These findings indicate that carotenoids may be important factors in the prevention of metabolic syndrome in nonsmokers, but further studies are required in smokers. **Keywords:** Metabolic syndrome; Carotenoids; Obesity; Antioxidant; Cross-sectional studies.

Diet induced thermogenesis, fat oxidation and food intake following sequential meals: Influence of calcium and vitamin D. Wendy Chan She Ping-Delfosa and Mario Soares. Clin Nutr 2011;30(3):376-383.

Background & aims: The mechanisms linking dietary calcium and vitamin D to body weight regulation require confirmation. **Methods:** Eleven subjects, aged (mean \pm SEM) 54 ± 1.2 y and BMI 31 ± 2.4 kg/m², participated in a randomised within-subject, sequential meal protocol comparing a low calcium trial (LCT) to an isoenergetic high calcium trial (HCT). Diet induced thermogenesis (DIT), fat oxidation rates (FOR), serum leptin, subjective feelings of hunger/satiety were measured at fasting and hourly over 8 h. Spontaneous food intake at a buffet and over the following 30 h was recorded. Postprandial responses, calculated as change (Δ) from baseline for each meal, were analysed by paired t-tests and 2×2 repeated measures ANOVA. **Results:** HCT resulted in lesser suppression of Δ FOR ($p = 0.02$) and a significantly greater DIT ($p = 0.01$). Further, the buffet to dinner interval was prolonged ($p = 0.083$) and reported 24 h energy intake following this trial was significantly reduced ($p = 0.017$). Δ leptin following HCT but not LCT was negatively related to 24 h fat intake ($r = -0.81$, $p = 0.016$). **Conclusions:** Higher calcium and vitamin D intake at a breakfast meal acutely increased postprandial FOR and DIT over two successive meals, and reduced spontaneous energy intake in the subsequent 24 h period. **Keywords:** Sequential; Dairy calcium; Vitamin D; Postprandial metabolism; Spontaneous food intake.

Vitamin D and cardiometabolic health: a review of the evidence. Siobhan Muldowney and Mairead Kiely. Nutr Res Rev 2011;24(1):1-20.

Abstract: The cardiometabolic syndrome (MetS) is a clustering of related metabolic abnormalities including abdominal adiposity, insulin resistance, hypertension, dyslipidaemia and increased inflammatory and thrombotic markers, which is linked to increased risk of type 2 diabetes, CVD and

overall mortality. Several cross-sectional and prospective studies have shown an association between low vitamin D status, as indicated by concentrations of serum 25-hydroxyvitamin D (s25(OH)D), and increased prevalence of the MetS and individual CVD risk factors. These epidemiological observations are supported by mechanistic studies but experimental data are limited. The available data from intervention studies are largely confounded as most vitamin D supplementation trials were mainly carried out to explore the role of Ca in CVD and include Ca in the treatment arms. Inadequate consideration of seasonal effects on s25(OH)D concentrations is also a common design flaw in most studies. Further complications arise from shared risk factors such as adiposity and ageing, which predispose individuals to exhibit both a more pronounced risk profile and relatively lower s25(OH)D concentrations. In conclusion, while epidemiological associations are promising and a rationale for low vitamin D status as a potentially modifiable risk factor for CVD is supported by mechanistic data, suitable experimental data from appropriately designed trials are just beginning to emerge. As yet, this body of literature is too immature to draw firm conclusions on the role of vitamin D in CVD prevention. Carefully controlled vitamin D trials in well-described population groups using intervention doses that are titrated against target s25(OH)D concentrations could yield potentially valuable outcomes that may have a positive impact on CVD risk modification. **Key Words:** Vitamin D; CVD; Metabolic syndrome; Type 2 diabetes; Obesity; Hypertension; Inflammation; Insulin resistance.

Relationships between Vitamin D Status and Cardio-Metabolic Risk Factors in Young European Adults. S. Muldowney et al. *Annu Nutr Metab* 2011;58(2):85-93.

Background/Aims: To explore associations between vitamin D and cardiovascular disease risk factors in young European adults. **Methods:** This was a cross-sectional analysis of serum 25-hydroxyvitamin D [s25(OH)D], intact parathyroid hormone (iPTH) and biomarkers of cardiovascular disease risk in 195 healthy 20- to 40-year-olds (109 women) with a BMI between 27.5 and 32.5 from Iceland (64°N; n = 82), Ireland (51°N; n = 37) and Spain (42°N; n = 76) during mid-late winter. **Results:** The median s25(OH)D was 52.8 nmol/l (IQR 38.1–69.9) or 21.1 ng/ml (IQR 15.2–28.0) with a latitude-dependent gradient ($p \leq 0.0001$): Iceland, 41.7 nmol/l (IQR 32.7–54.2) or 16.7 ng/ml (IQR 13.1–21.7); Ireland, 52.9 nmol/l (IQR 35.3–68.6) or 21.2 ng/ml (IQR 14.1–27.4), and Spain, 67.1 nmol/l (IQR 47.1–87.1) or 26.8 ng/ml (IQR 18.8–34.8). Eleven percent of Icelandic participants had s25(OH)D concentrations <25 nmol/l (10 ng/ml) and 66% of Icelandic, 43% of Irish, and 30% of Spanish volunteers had concentrations <50 nmol/l (20 ng/ml), respectively. Overall, 17% met 3 or more of the NCEP/ATP III criteria for cardio-metabolic syndrome (MetS). Participants in the lowest third of s25(OH)D [≤ 42.5 nmol/l (17 ng/ml)] were more likely to have MetS (OR 2.49, $p = 0.045$) and elevated TAG (OR 3.46, $p = 0.019$). Individuals with iPTH concentrations in the lowest third [2.34 pmol/l (22.2 pg/ml)] were more likely to have elevated fasting TAG (OR 4.17, $p = 0.039$), insulin (OR 3.15, $p = 0.029$) and HOMA-IR (OR 2.15, $p = 0.031$), and they were less likely to have elevated IL-6 (OR 0.24, $p = 0.003$). **Conclusion:** There were interactions between s25(OH)D, iPTH and cardio-metabolic risk factors which, given the increasing prevalence of overweight and obesity and a low vitamin D status among adults, require randomised controlled vitamin D intervention studies in overweight persons. **Key Words:** Vitamin D, Serum 25(OH)D, Intact parathyroid hormone, Cardio-metabolic syndrome, Cardiovascular disease risk, Overweight.

Vitamin D and the Prevention of Hypertension and Cardiovascular Diseases: A Review of the Current Evidence. Johanna M. Geleijnse et al. *Am J Hypertension* 2011;24:253-262.

Abstract: Vitamin D plays an essential role in bone mineralization and calcium homeostasis. More recently, there has been growing evidence for a role of vitamin D in extraskeletal health, including beneficial effects in the cardiovascular system. Daylight exposure and vitamin D intake in many western populations are insufficient for maintaining an adequate vitamin D status. It is at present unclear whether vitamin D supplementation could improve cardiovascular health. This paper summarizes the evidence from observational studies and randomized-controlled trials on the relation of vitamin D with blood pressure (BP) and risk of cardiovascular diseases (CVDs). Epidemiological data suggest that optimal vitamin D status is important for CVD prevention, but results from different studies are conflicting and confounding cannot be ruled out. Randomized-controlled trials of vitamin D supplementation and BP have yielded inconsistent results, and trials that addressed the effect of vitamin D on CVDs are lacking. It is therefore premature to recommend supplemental vitamin D intake specifically for the prevention of hypertension or CVDs. Data from large, well-controlled clinical trials in this field with vitamin D supplements of sufficiently high doses are awaited to settle this issue.

Effect of vitamin D nutritional status on muscle function and strength in healthy women aged over sixty-five years. Silvina R. Mastaglia et al. *J Nutr Health Aging* 2011;15(5):349-354.

Background: Vitamin D insufficiency is common in elderly adults, and leads to secondary hyperparathyroidism, bone loss, muscle weakness, and osteoporotic fractures. **Objective:** To evaluate the relation between vitamin D nutritional status and muscle function and muscle strength in women aged over 65 years. **Methods:** Fifty-four postmenopausal women from Buenos Aires (latitude 34° S), average age ($X \pm DS$) 71 ± 4 , were included in the study. Determinations of serum calcium, phosphate, 25 hydroxyvitamin D (25OHD), intact parathormone (iPTH) and calciuria / creatinuria ratio in 24-hour urine samples were performed. Muscle function was assessed by means of walking-speed test, standing balance, and sit-to-stand tests. lower extremity muscle strength was determined using a manual dynamometer. **Results:** 25OHD levels ≥ 20 ng/ml were found to be associated with better lower extremity muscle function and strength. Forty- six % of participants had 25oHD levels ≥ 20 ng/ml. Women with 25OHD levels ≥ 20 ng/ml scored higher on the muscle function tests (11.2 ± 0.9 vs. 10.0 ± 2.1 ; $p < 0.003$) and had stronger knee extensor (13.4 ± 2.7 vs. 11.6 ± 2.5 Kg.; $p < 0.03$) and hip abductor (8.3 ± 2.7 vs. 7.3 ± 3.1 Kg; $p < 0.04$) muscles; strength of their hip flexors tended to be higher but did not reach significantly different values (17.0 ± 3.3 vs. 15.4 ± 2.8 Kg.; $0.1 > p > 0.05$). Negative correlation was observed between iPtH and muscle function ($r = -0.436$; $p < 0.02$). **Conclusion:** 25OHD levels ≥ 20 ng/ml are needed for a better muscle function and strength. assessing vitamin D nutritional status in adults aged ≥ 65 years would allow correcting hypovitaminosis D and improve muscle function and strength. **Key words:** Vitamin D – muscle strength – muscle function – osteoporotic fractures.

Nutritional approach for inhibiting bone resorption in institutionalized elderly women with vitamin D insufficiency and high prevalence of fracture. Jean-Philippe Bonjour et al. *J Nutr Health Aging* 2011;15(5):404-409.

Background: Nutritional approach to the deterioration of bone integrity and increased fracture risk appears to be particularly appropriate in elderly women living in nursing homes. **Objective:** To investigate the beneficial effect of the consumption of soft plain cheese on bone resorption markers in institutionalized elderly women. **Design:** Prospective, randomized crossover controlled study. **Setting:** Six French nursing homes or other institutions for elderly. **Participants:** Institutionalized women ≥ 65 years old with low vitamin D status and calcium intake below 700 mg/day. **Intervention:** Consumption of soft plain cheese made of semi-skimmed milk which was fortified by both vitamin D3 (+ $1.25 \mu\text{g}/100\text{g}$) and milk extracted Ca, thus achieving a total Ca content of 151 mg/100g as compared to about 118 mg/100g for standard fresh cheese. Two servings were taken every day during the 6 weeks that preceded or followed a period of 6 weeks without soft plain cheese consumption. **Measurements:** The primary end point was the change in serum carboxy terminal cross-linked telopeptide of type I collagen (CTX) selected as a marker of bone resorption. **Results:** 29 women aged 73–94 yr were selected, 21 of them with mean age 87.2 ± 6.1 years remained compliant The intervention increased calcium and protein intakes by 51% (904 ± 228 vs. 599 ± 122 mg/d) and 33 % (74.2 ± 17.1 vs. 55.6 ± 12.7 g/d, mean \pm SD), respectively. The dietary intervention was associated with a statistically significant increase in serum levels of both 25OHD and IGF-I, while those of PTH, CTX and TRAP5b were significantly reduced. Compliance was 93,4 %. The daily consumption of two servings of soft plain cheese was well accepted in terms of tastiness and appetite suited portion size. **Conclusion:** This randomized crossover controlled trial demonstrates that in elderly women living in nursing homes, the consumption of soft plain cheese increasing the supply of vitamin D, calcium and proteins, could reduce bone resorption and thereby reduce the risk of incidental fragility fractures in the long term. **Key words** Elderly women – osteoporosis prevention – nutritional intervention – fortified cheese – bone resorption.

5 Interesting reviews

Nontraditional Risk Factors and Biomarkers for Cardiovascular Disease: Mechanistic, Research, and Clinical Considerations for Youth. A Scientific Statement From the American Heart Association. Prabhakaran (Babu) Balagopal et al. *Circulation* 2011;123(23):2749-2769.

Abstract: The rapid increase in the prevalence and severity of obesity in children is likely to lower the age of onset and increase the incidence of cardiovascular disease worldwide. Understanding the pathophysiology and improving the clinical management of cardiovascular disease involve a knowledge of novel risk factors and biomarkers. The clinical and mechanistic roles of these novel biological factors during childhood are currently being investigated. The goals of this scientific statement are to present the existing knowledge and theoretical framework of nontraditional risk factors for cardiovascular disease as they relate to children and adolescents, to describe the relevance and weight of available experimental and clinical evidence and the therapeutic implications pertaining to nontraditional risk factors in the pediatric population, and to stimulate further research with a goal of developing valid and reliable approaches to identify and validate novel risk factors that will aid in the clinical evaluation and perhaps prediction of cardiovascular disease in the pediatric population. Although several biomarkers are promising, substantial research is required before nontraditional risk factors can be used to identify and reduce cardiovascular disease risk in children and adolescents.

Key Words: AHA Scientific Statements • cardiovascular diseases • pediatrics • inflammation • insulin resistance • obesity • risk factors.

Is it prudent to add n-3 long-chain polyunsaturated fatty acids to paediatric enteral tube feeding? John W.C. Sijben et al. *Clin Nutr* 2011;30(3):273-281.

Summary: Nutritional support, as complete enteral tube feeding, is needed by many paediatric patients and must provide sufficient nutrients for normal growth and development. Enteral feeds contain the parent essential fatty acids, linoleic acid and α -linolenic acid, but often do not contain n-3 long-chain polyunsaturated fatty acids. Available data suggest that biosynthesis of eicosapentaenoic acid and docosahexaenoic acid from α -linolenic acid is low in humans and varies between individuals. Long-term enteral feeding with formulae devoid of eicosapentaenoic acid and docosahexaenoic acid may result in low levels in plasma and tissues, potentially affecting immune and neurological function. Currently there is insufficient evidence to define the quantitative eicosapentaenoic acid and docosahexaenoic acid requirements for healthy children, or those with various disease states. Nevertheless, it appears prudent to supply children on long-term enteral nutrition with a dietary source of eicosapentaenoic acid and docosahexaenoic acid. A reasonable approach would be to provide amounts matching intakes of healthy children complying with the advice to consume 1–2 portions of oily fish per week. Further studies are needed to investigate the effects of different amounts of eicosapentaenoic acid and/or docosahexaenoic acid in enteral nutrition on polyunsaturated fatty acid status and the functional and clinical consequences in children. **Keywords:** Long-chain polyunsaturated fatty acids (LC-PUFA); Omega-3; Eicosapentaenoic acid (EPA); Docosahexaenoic acid (DHA); Enteral nutrition; Children.

Ruminant and industrial sources of trans-fat and cardiovascular and diabetic diseases. Anne-Laure Tardy et al. *Nutr Res Rev* 2011;24(1):111-117.

Abstract: The various positional isomers of oleic acid (18 : 1 Δ 9c or 9c-18 : 1) may have distinct biological effects. Detrimental effects of consumption of industrial trans-fatty acids (TFA) (elaidic acid; 18 : 1 Δ 9t) from partially hydrogenated vegetable oils on CVD risk factors are well documented. In addition, epidemiological data suggest that chronic consumption of industrial sources of TFA could alter insulin sensitivity and predispose for type 2 diabetes. However, intervention studies on this issue have remained inconclusive. Moreover, very little information is available on the effect of natural sources of TFA (vaccenic acid; 18 : 1 Δ 11t) coming from dairy products and ruminant meat on the development of CVD and type 2 diabetes. The review focuses on the impact of the consumption of ruminant TFA in relation to cardiovascular risk factors, inflammation and type 2 diabetes. **Key Words:** Trans-fatty acids; Atherosclerosis; Cholesterol; LDL; CVD; Risk factors; Diabetes.

Hydrophilic antioxidants of virgin olive oil. Part 1: Hydrophilic phenols: A key factor for virgin olive oil quality. Milad El Riachy et al. Eur J Lipid Sci Technol 2011;113(6):678-691.

Abstract: Virgin olive oil (VOO) consumption is increasing all over the world due to its excellent organoleptic and nutraceutical properties. These beneficial traits stand from a prominent and well-balanced chemical composition, which is a blend of major (98% of total oil weight) and minor compounds including antioxidants. The main antioxidants are phenolic compounds, which can be divided into lipophilic and hydrophilic phenols. While lipophilic phenols such as tocopherols can be found in other vegetable oils, most hydrophilic phenols in olive oil are exclusive of the *Olea europaea* species endowing it with a chemotaxonomic interest. This review is focused on VOO antioxidant profile and, particularly, on hydrophilic phenols that are divided into different sub-families such as phenolic acids and alcohols, hydroxy-isochromans, flavonoids, secoiridoids, lignans and pigments. Analytical methods for qualitative and/or quantitative determination of these compounds are assessed. The implementation of efficient sample preparation protocols, separation techniques such as liquid chromatography, GC and capillary electrophoresis, as well as detection techniques such as ultraviolet absorption, fluorescence or MS are critical to succeed in the quality of the results. The effects of hydrophilic phenols on increasing VOO stability, its nutraceutical interest and organoleptic properties are also considered. **Keywords:** Analytical methods; Antioxidant activity; Hydrophilic phenols; Sensory characteristics; Virgin olive oil.

Hydrophilic antioxidants of virgin olive oil. Part 2: Biosynthesis and biotransformation of phenolic compounds in virgin olive oil as affected by agronomic and processing factors. Milad El Riachy et al. Eur J Lipid Sci Technol 2011;113(6):692-707.

Abstract: The biosynthesis of the phenolic fraction of olive fruits during ripening and the transformations occurring in this moiety during virgin olive oil (VOO) extraction are discussed in this paper. The influence of agronomical factors that can significantly affect the phenolic profile of VOO is also discussed. Particularly, it is worth emphasizing the role of genetic factors, cultivation and climatic conditions such as water availability, atmospheric temperature, altitude, health status of the fruits, alternate bearing in the olive, and some processing factors such as crushing, malaxation time and temperature or volume of water added during milling. Among these parameters, special attention has been paid to genetic factors due to the high variability observed among *Olea europaea* genotypes for all recorded traits. In this context, interesting experimental results have been obtained with cultivated and wild olive trees, and also with segregating populations resulting from olive breeding programs. To the authors' knowledge, reviews evaluating the influence of the main factors that contribute to the profile of hydrophilic phenols have not been previously published. The discussion concerning olive breeding programs is a major and novel aspect to be emphasized considering recent trends to obtain new olive cultivars that confer better organoleptic properties and better quality to VOO. **Keywords:** Agronomic factors; Genetic variability; *Olea europaea*; Phenolic compounds; Processing factors.