Ultra violet (UV) light is the most common cause of skin cancers in human. Several effects of UVB (290–320 nm) are thought to contribute to skin carcinogenesis. The generation of free radicals and related oxidants produced by UVB exposure, cause to carcinogenesis by directly damaging DNA and activating several cytokines. Vitamin E (α-tocopherol) has been reported to be a potent antioxidant. We examined the inhibitory effect on UVB-induced skin carcinogenesis in hairless mice model. Hairless mice were divided into three groups of 21 mice each as follows: group 1: Vitamin E oral feeding group (including 500 IU α-tocopherol); group 2: Normal diet group (including 20 IU), and group 3: Vitamin E deficient group (including 0 IU). After initiation by DMBA, all groups were irradiated twice a week at a dose of 3.43 kJ/m² for 20 weeks. The number of diameter more than 1 mm tumors was counted once a week during the repeated UVB irradiation. Both tumor incidence and multiplicity were remarkably inhibited in Vitamin E diet group, and showed the significant inhibitory effect on UVB-induced mouse skin carcinogenesis.

The main objective of the present study was to evaluate the antioxidant activity of D and G in ex vivo, using human primary lymphocytes separated from peripheric blood of healthy subjects. To this aim we supplemented cells with D and G at different concentrations between 0.01 µM and 2.5 µM, for 24 hours; we chose this range considering that plasma concentration of isoflavones, in not habitual consumers of soybeans products is 0.04 µM, while in habitual consumers it is 6 µM. After supplementation we induced oxidative stress to DNA by treatment with H₂O₂ 500 µM, and to cellular membrane by treatment with Fe²⁺ 100 µM. DNA and lipid oxidative damages were evaluated by the Comet Assay and MDA quantification in HPLC, respectively.

The results obtained in our conditions demonstrated that the concentrations between 2.5 µM and 0.05 µM of D and between 2.5 µM and 0.1 µM of G significantly decreased oxidative damage to DNA with respect to control cells (P < 0.05): the concentration of 2.5 µM D and G seemed to offer most protection. Differently, the preventive effect of D and G against oxidative damage to cellular membrane has been demonstrated only with supplementation of 2.5 µM (P < 0.05).

In conclusion these findings are consistent with an antioxidant activity of D and G in human primary lymphocytes especially with respect to DNA oxidative damage. Furthermore, since the protective effect of these isoflavones has been found with concentrations reachable in plasma of not habitual consumers of soybeans, it seems possible suggest a functional role of these compounds also in western population.
groups were 8–33% below USA RDA, EU reference values were lower about 21–60%.

Values for vitamin E maintained in the range of 20–57% below USA DRI and 17–43% for DACH one.

The highest discrepancy was seen for pregnancy and lactation for all compared reference values.

The observed differences are due mainly to the new criterions for equivalents calculations as well as new research evidences for these nutrients.

PS.A4

Effects of Dietary Conjugated Linoleic Acid Isomers (CLA) and Vitamin E on Fatty Acid Composition and Cholesterol Content of Hen Egg Yolks

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In view of health benefits of both conjugated linoleic acid isomers (CLA) and antioxidant vitamins (e.g. tocopherols) in humans, the objective of this study was to develop functional eggs, by feeding hens with CLA isomers (0 vs. 1.5%) and α-tocopherol (0 vs. 120mg/kg of diet). Thirty-six 25-week-old laying hens were randomly distributed into four groups of 9 hens each and maintained in individual laying cages, throughout 12 weeks of experiment. They were assigned to four commercial layer diets (2,770kcal ME/kg; 16.7% CP) containing the following combinations of treatments: I – 0.0% CLA, II – 0.0% CLA + 120mg vit.E/kg of diet, III – 1.5% CLA and IV – 1.5% CLA + 120mg vit.E/kg of diet. The laying performance of hens, fatty acid composition and cholesterol content of egg yolk lipids were determined. Feed intake of hens was not affected (124, 123, 126, and 123 g/d). The rate of laying was increased by vitamin E (95.2, 96.5, 93.8 and 97.0%), Egg mass varied inconsistently (63.7%, 61.0%, 61.2% and 61.4%) and feed conversion efficiency, when expressed per one egg, was improved by vitamin E (131.4, 128.0, 130.5 and 128.0%). No CLA was detected in the egg yolk lipids of hens fed the CLA-free diets (I and II), whereas feeding the CLA-supplemented diets (III and IV) resulted in substantial deposition of CLA isomers (6.4 and 61.2%) and decreased MUFA (46.6, 42.1, 25.9 and 28.7%), without apparently affecting PUFA content (19.4, 23.9, 19.5 and 19.7%). Vitamin E, when fed to hens in the CLA-free diet (I vs. II), tended to increase SFA and decrease MUFA, while increasing the proportion of PUFA. In contrast, vitamin E fed in the CLA-supplemented diet (III vs. IV), tended to decrease SFA and increase MUFA, without affecting PUFA content. The cholesterol content of eggs, when expressed in mg per g of yolk, tended to be reduced by both dietary CLA and vitamin E (16.3, 15.4, 14.9 and 13.8 mg/g). We conclude that in spite of alleviating properties of vitamin E in the CLA-supplemented diet, adverse effects of CLA feeding to laying hens on fatty acid profile of egg yolks still persist. Therefore, unless these adverse (atherogenic) changes are eliminated, the CLA-enriched eggs cannot be considered functional food products.

PS.A5

In vitro and in vivo Absorption and Metabolism of Some Flavonoids from Blood Orange Juice

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The health benefits of a diet rich in fresh fruits and vegetables preventing cancer, cardiovascular and other chronic diseases are determined by a wide number of scientific investigations. The aim of this work is to evaluate the absorption and metabolism of cyanidin-glucoside (Cy-glu) and hesperidin from blood orange juice (BOJ) both in vitro and in vivo. For in vitro test the food source was extracted (BOJe) through a solid phase extraction (SPE) method in order to remove sugars and other hydrophilic compounds. The upper part of 22 Sprage-Dawley rat’s small intestine (30 cm) was divided into three equal sections. The different sections were everted and incubated, in flux, with BOJ, BOJe, blood orange juice (SOJ) and flavonoid standard solutions. The HPLC-DAD results demonstrated that anthocyanins and hesperidin were not hydrolysed to their aglycones and were poorly absorbed by rat intestine. In fact, the rate of absorption was about 0.4 and 0.2 for Cy-glu and hesperidin, respectively. The bioavailability and metabolism of Cy-glu and hesperidin were also evaluated in human both in acute (600ml BOJ) and by cross-over trials in 16 healthy women volunteers supplemented for 21 days with 600ml BOJ, corresponding to 21.2 and 120 μg/day of Cy-glu and hesperidin, respectively. At time zero and after (a) 30 min for 5 h (acute trials) or (b) 21 days supplementation period (cross-over trials), the blood was withdrawn, acidified, centrifuged and plasma purified by a SPE C8 cartridge. The fraction containing analysed were analysed by a HPLC coupled to a DAD and mass spectrometer detector. Acute trials demonstrated Cy-glu absorption and the Cmax (12.28 ± 5.82 ng/ml) was reached after 90 min. Regarding cross-over trial, it seems to indicate that Cy-glu plasma levels don’t increase after 21 days BOJ consumption.

PS.A6

Absorption of Labelled Alpha-Tocopherol After Ingestion of Different Breakfasts

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Vitamin E (VE) is absorbed by passive diffusion with dietary fat in the upper intestine and subsequently incorporated into chylomicrons (CMs). Lehmann et al. (1977) demonstrated that fat is essential for maximal absorption of VE. In this study we aim to determine whether the physical properties of a meal affect VE absorption and to clarify whether the fat content of semi skimmed milk with cereal is sufficient for maximal absorption of VE over 9 h.

Eight healthy volunteers were recruited. The 4 breakfasts investigated were toast with butter (fat 17 g); cornflakes with whole milk and cream (fat 17 g); cornflakes with semi skimmed milk (fat 2 g), and water alone. The volunteers fasted for 12 h then consumed a 150 mg deuterium labelled (δ4) RRR-alpha-tocopherol acetate capsule with each breakfast. 10 ml blood samples were taken at baseline and 0.5, 1, 1.5, 2, 3, 6 and 9h.
9 hr after ingestion of the capsule. Plasma was separated and CMs were isolated using a method adapted from Weintraub et al. (1986).

The plasma and CM d-alpha-tocopherol increased significantly with time (p < 0.001) when the VE capsule was consumed with each breakfast except water. Incremental area under curve for d-alpha-tocopherol in plasma (values expressed as micromol/h mean ± SEM); toast and butter 31.0 ± 7.6; cereal with whole milk 15.7 ± 5.2; cereal with semi skimmed milk 0.5 ± 0.3 and water 0.0. A greater rate of absorption was observed between 3 and 6 h when the capsule was ingested with toast and butter compared to cereal with whole milk (p = 0.02) and cereal with semi skimmed milk (p < 0.001).

Results show that the physical properties of toast and butter compared with milk and cereal significantly affect the rate and amount of VE absorption up to 9 h. A breakfast consisting of cereal with semi skimmed milk does not provide sufficient fat for maximal absorption of VE up to 9 h. These results have important for future studies.

abcValues not sharing the same subscript are significantly different (p < 0.02).

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**PS.A7**

**Olive Oil, Ancient Component in Modern Nutrition**

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The scientific world recognises the beneficial role of the olive oil both in the nutrition field and that one linked to the cardio-vascular, metabolic, gastro-enteritis pathologies and so on. In the Mediterranean area, the production of olive oil dates back to a long time ago: Linneo called it ‘Olea Europea’; recent researches have discovered the origin were in ‘Asia and Africa’. The Greeks, after knowing his properties devoted this plant to Athena, because she was her creator; according Columella *Olea prima arborum est*. It had particular value in the religious (Pagan, Islamic, Hebraic), also in the artistic and social field. Plinio and Cicero thought Aristeo Atienese started the oil production which Omero defined the ‘liquid gold’. In nutritionist and medical scientific field (Ippocrate, Galeno, Discoride), from the empirism to the positivism, its merits have always been known. The cultivated areas start with Spain which is at the first place followed by Italy, Tunisia, etc., and so on, where 98% of oil is produced. Obtained by drupes through the squeezing, drawing or refinement, there are different types of oil: the finest one is the extra-virgin oil. It’s a mixture of triglycerides comprised of 98% lipids (65–80% monounsaturated oleic acid, 7–20% saturated fatty acid and 4–18% of polyunsaturated fatty acids and of 2% non lipid mixture. It has got physical chemical qualities (EEC regulations 2,568/91 and 1,019/2002), hygienic-sanitary, nutritionist qualities. The European and American ‘Panels’ and above all Prof. Ancel Keys showed a right use of olive oil, which is the main element of Mediterranean diet. It has good effects on diabetes, obesity cardio-vascular diseases, hypertension, intestine, stomach, calculus, skin and cancers.

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**PS.A8**

**Influence of Protein Diet with Aloe Extract Additive on the Behaviour of Testing Animals**

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The aim of the research was to assess the chance of implementing protein diet with Aloe extract additive. There was also tested the influence of additive on the behaviour of testing animals.

The tested material included curds of cottage cheese obtained in result of souring milk. The test was carried out on three months’ old Wistar female rats weighing 200 g for 7 days in order to prove whether further toxicological tests are necessary.

Animals used in the experiment were monitored 24 hours a day for seven days, to assess their: appearance, behaviour, changes in body weight, hunger and thirst, functioning of their digestive system of the rats.

The animals in test groups were orally served two kinds of diet: standard fodder and cottage cheese curd with Aloe supplement. Animals fed cheese curd containing Aloe extract suffered a slight loss in weight, whereas weight of animals in control group increased at the same time.

Water consumption was similar in groups fed standard fodder and cottage cheese with supplement Aloe.

The trends of observed changes are described by four polynomial equations.

Major differences were observed in the functioning of the digestive systems of animals fed cottage cheese with the supplement. The results indicate that the Aloe extract additive may be implemented to the diet. Implementation of this diet can not exceed a short period of time.

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**PS.A9**

**NAPUS 2000 – Long Chain Omega-3-Fatty Acids and Increased Tocopherol Levels in Oilseed Rape**

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This project, sponsored since 1999 by the German Federal Ministry of Research (BMBF), comprises 19 partners (universities, food industries; plant breeders). It focuses on the production of an oilseed, rape (*Brassica napus*), with improved nutritional value and on
its complete use. The contents of tocopherols, proteins and lecithins are improved and long chain polyunsaturated fatty acids (LCPUFAs) and resveratrol are newly introduced. Traditional breeding methods and genetic engineering techniques are applied. In addition, processing trials, nutritional research, economic studies, and socio-economical assessments are conducted.

The aim is to create plant sources of eicosapentaenoic acid (EPA, ω-3:20:5), docosahexaenoic acid (DHA, ω-3:22:6) and arachidonic acid (ARA, ω-6:20:4). All genes required for ARA/EPA biosynthesis have been cloned from various sources. Several constructs containing these genes have been expressed successfully in yeast and the first constructs have been transformed into model plants, including linoseed. Expression of these genes in rapeseed is under development.

Two genes that have already been isolated are believed to have a major influence on tocopherol biosynthesis and are presently transferred into rapeseed for studying heterologous over-expression. The first transgenic plants have been developed and harvested in greenhouses, and seed analyses proved higher contents of tocopherols.

Furthermore, studies on stabilisation of LCPUFA oils under different storage conditions have already been carried out. Moreover, animal and human feeding studies have been performed in order to find out what effects EPA and DHA will have in vivo with the main focus on lipid metabolism and influences on metabolic biotransformation.

PS.A10

Edible Wild Greens: A Potentially Rich Source of Antioxidants in the Italian Diet

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Background: The Mediterranean diet has been associated with a lower incidence of cardiovascular diseases and cancer, partly due to its high proportion of antioxidants compounds such as vitamins, polyphenols and carotenoids. In Southern Italy, in particular in the Ragusa area (Sicily), the consumption of vegetables includes different wild greens, which are traditionally harvested throughout the country and consumed cooked (usually boiled) and dressed with olive oil.

Aim: On the basis of the basic descriptive statistics of 6,185 food frequency questionnaires, in the Ragusa EPIC cohort the wild greens represent 30.0% and 24.2% of the total daily intake of cooked leafy vegetables in men and women (9.1 and 7.2g/day, respectively). However, no information is available on the composition in antioxidant compounds of such foods. To this aim, the composition in carotenoids, chlorophylls, polyphenols, ascorbic acid and the total antioxidant activity (TAA) measured by three different assays has been evaluated in 6 different type of boiled wild greens (Sinapis incana, Sinapis nigra, Diplotaxis erucoides, Cichorium intybus, Borrage officinalis and Asparagus acutifolius) harvested in the Ragusa area.

Results: The results demonstrated that the analysed vegetables are a good source of ascorbic acid (from 0.3 to 14.9mg/100g), carotenoids (from 4.8 to 15.1mg/100g) in particular lutein and β-carotene, chlorophylls (from 10.4 to 82.7mg/100g), and total polyphenols (from 28.4 to 296.0mg/100g) such as quercetin, kaempferol and rhamnetin. Moreover, the TAA values resulted as high as the most antioxidant vegetables analysed raw such as spinach and turnip tops.

Conclusion: Edible wild greens are a rich source of antioxidant compounds in the Southern Italian diet. The old-fashioned habit of collecting them in the wild should be integrated by proper agronomical practices in order to increase and/or diffuse their consumption.

PS.A11

Chemopreventive Activity of Naturally Occurring Compounds on Nitric Oxide Donors Induced Mouse Skin Carcinogenesis

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The present study was carried out to examine the chemopreventive activity of Brazilian traditional medicine, Tabebuia avellanedae (TH) ext. and its including compounds, and antioxidants, polyphenols and curcumin etc. on the nitric oxide (NO) donors induced carcinogenesis. We previously reported that a kind of NO donors, peroxynitrite (PN), induced tumor initiating activity using mouse on two-stage mouse skin carcinogenesis. Female SENCAR mouse (6 weeks of age) were treated topically with single dose of PN solution, followed by TPA twice a weekly for 20 weeks. Tumor incidence were 100% with 5 to 6 per mouse at end of experiment. TH and antioxidants were orally fed with drinking water for only 2 weeks, before and after initiation and following promoting treatment with drinking water only. In our observation, TH and antioxidants treated group cause about 60% reduction in the average number of tumors per mouse after 20 weeks of experiment, respectively. These data suggested that antioxidants are promising candidates as chemopreventive agents for infectious and inflammatory induced carcinogenesis.

PS.A12

Consumption of Antioxidant Rich Beverages and Risk of Breast Cancer in French Women


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Coffee, (herbal) tea, fruit juices and wine are important sources of dietary antioxidants. They may prevent damages to DNA caused by free radicals and thereby protect against cancer. Previous epidemiological studies, however, have not shown consistent results. We have, therefore, evaluated the relation between these beverages and breast cancer in a prospective cohort study among French women.

For the present analyses 4,396 women without history of cancer who were participants of the SU.VI.MAX Study (a primary...
placebo-controlled randomised prevention trial evaluating the effects of antioxidant vitamins and minerals supplementation on chronic diseases were included. Beverage consumption was estimated using three non-consecutive 24-hour recalls. Incident cancer cases were identified through clinical examinations performed every other year including e.g. mammography, and through a monthly health questionnaire.

During the median 6.6 years of follow-up 95 breast cancers were diagnosed. In a multivariate model, adjusted for age, smoking, number of children, use of oral contraception, family history of breast cancer and menopausal status, an inverse association between herbal tea consumption and the risk of breast cancer was observed (relative risk compared to non-drinkers was for 1–149 ml/day: 0.93 (95% CI: 0.48–1.80) and for ≥150 ml/day: 0.43 (95% CI: 0.20–0.94), p for trend 0.04). Further adjustment for BMI, and lifestyle factors such as physical activity and consumption of fruit and vegetables did not change these results and supplementation was no confounding factor in this relation. Consumption of coffee, tea, fruit juices or wine were not associated with the risk of breast cancer.

The results of this study indicate that consumption of herbal tea may play a role in the prevention of breast cancer.

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**PS.A13**

Effect of Genistein Against Copper Induced Lipid Peroxidation of Human High Density Lipoproteins (HDL)

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Several studies demonstrated that polyphenolic compounds such as isoflavonoids exert a protective effect against human diseases such as cancer, cardiovascular disease and atherosclerosis. The isoflavone genistein is the most abundant polyphenolic compound naturally present in soybeans, soy products and cereals. Several studies demonstrated that genistein exerts a protective effect against lipid peroxidation of low density lipoproteins (LDL). Aim of our study was to investigate whether genistein protects high density lipoproteins (HDL) isolated from normolipemic subjects against Cu\(^{2+}\)-induced lipid peroxidation. Our results demonstrated that genistein (0.5–2.5 μM) exerts an inhibitory effect against Cu\(^{2+}\)-induced lipid peroxidation of HDL, as shown by the lower increase in the levels of conjugated dienes in lipoproteins oxidized after preincubation with different concentrations of genistein. The protective effect exerted by genistein was confirmed by fluorescence studies. The analysis of Tryptophan and Laurdan (6-dodecanoyl-2-dimethyl-aminonaphthalene) fluorescence emission spectra demonstrated that the alterations of apoprotein structure and physico-chemical properties, that accompany Cu\(^{2+}\)-triggered peroxidation, were lower in HDL preincubated in the presence of genistein with respect to oxidized lipoproteins. The protective effect of genistein was realized at genistein concentrations similar to those observed in human plasma, therefore we suggested that antioxidant activity exerted by genistein against lipid peroxidation of HDL could be of physiologic relevance.

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**PS.A14**

Benefits of Selenium Enriched Food Consumption by Humans and Animals with Low Selenium Intake

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Many areas of the world are selenium (Se) deficient. To prevent health hazard from nutritional Se deficiency and obtain benefits for humans and animals, its intake should be increased. The objective of this study was to determine health benefits and bioavailability of Se from foods enriched with Se. In Se deficient soils of Serbia crops were produced by applying our procedure for foliar Se supplementation. Foods processed from Se enriched crops were consumed at least 3 months by Se deficient subjects and animals. Influence of increased daily Se intake on Se status and anti-oxidant protection was monitored. At periodic intervals, samples of blood, hair or feather, urine and faeces were collected. Consumption of Se enriched food by humans and animals living in low Se areas, increased daily Se intake on average 170% in humans and over 500% in animals such as Japanese quails. Investigations of Se and the activities of selenium dependent enzyme glutathione peroxidase (GSHPx) in humans and animals showed that applied foods are suitable for overcoming selenium deficiency problems in humans and animals. Bioavailability of Se from the applied foods was higher than bioavailability of Se from Se enriched brewery yeast (SeY) although in both cases the dominant Se form is L-(+)-selenomethionine (SeMet). Investigations of oxidative stress indicators showed that humans and animals consuming foods produced from Se enriched crops have the best antioxidant protection, better than those supplemented with SeY. The lowest antioxidant protection has Se deficient subjects and animals. The correlation analysis showed that dietary Se in humans and animals positively correlates with Se and GSHPx activity in the investigated tissues and negatively with thiobarbituric acid reactive substances (TBARS) and oxidized glutathione (GSSG). Investigations conducted on patients with colon cancer indicates that food rich in SeMet may be effective in reducing the risk of colon cancer, but this finding needs to be confirmed by much broader investigations.

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**PS.A15**

Comparative Effects of Flaxseed and Sesame Seed on Gamma-Tocopherol Concentration in Rats

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Flaxseed and sesame seed both contain more than 40% fat and about 20% protein, and vitamin E in both consists mostly of gamma-tocopherol. Furthermore, both contain considerable amounts of plant
lignans. However, flaxseed contains 54% alpha-linolenic acid, but sesame seed only 0.6%, and the chemical structure of flaxseed and sesame lignans is different. In this study, two experiments were performed to investigate the differential effects of flaxseed and sesame seed on gamma-tocopherol, thiobarbituric acid-reactive substances (TBARS) and cholesterol concentrations in plasma and tissue in rats fed diets containing the same amounts of gamma-tocopherol (60 mg/kg) without alpha-tocopherol. In Experiment 1, rats were fed four experimental diets for 4 wks: vitamin E-free (−VE), gamma-tocopherol (T), flaxseed (FS) and sesame seed (SS) containing diets. In Experiment 2, rats were fed five diets: FS, SS, flaxseed oil (FO), FO with sesamin (FOS) and defatted flaxseed (DF). In these experiments, the SS and FOS diets induced significantly higher gamma-tocopherol concentrations in plasma and liver compared with FS, FO, and DFF diets. These results clearly showed that sesame lignans produced higher gamma-tocopherol concentrations in plasma and tissue. FS, FO and FOS groups showed lower plasma total cholesterol compared with SS and DFF groups. Higher TBARS concentrations in plasma and liver were observed in FS and FO groups but not in FOS group. These results suggest that sesame seed and its lignans induced higher gamma-tocopherol and lower TBARS concentrations, while flaxseed lignans had no such effects. Further, alpha-linolenic acid exhibited strong plasma cholesterol lowering effects and higher TBARS concentrations.

Results:

Total fat intake and intake of monounsaturated, polyunsaturated and n-6 fatty acids was not associated with CRP levels. In contrast, in the age adjusted models, intake of n-3 fatty acids, dietary fiber, vitamin C, vitamin E and calcium was significantly inversely associated with CRP. However, further adjustment for additional covariates significantly attenuated the observed associations and they became non-significant for all dietary variables although a trend towards higher CRP levels was still seen in the groups with a low fiber and calcium intake. The attenuation of the observed associations was mainly mediated by the addition of smoking status to the models since smokers had markedly different dietary patterns compared to non-smokers.

Conclusions:
The intake of several dietary constituents which presumably affect the risk for diabetes and coronary heart disease was inversely associated with hs-CRP levels. However, these associations were strongly confounded by smoking status.

PS.A17

Antioxidant Activity of Alkylresorcinols

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Alk(en)ylresorcinols are phenolic lipids that have an n-alkyl or alkenyl side chain at resorcinol C-5. These phytochemicals are present in 11 families of plants [1]. The family Gramineae (cereal grains) is the most important dietary source of these compounds. Compared with other cereal grains rye has the highest alkylresorcinol content [2–5].

5-n-Alkylresorcinols found in rye have chain lengths of 15, 17, 19, 21, 23, 25 and 27 carbon atoms and occur in the relative amounts of 1.0%, 16.2%, 28.1%, 26.9%, 14.3%, 13.3% and 0.3%, respectively [5]. We have prepared these compounds (chain lengths 15, 17, 19, 21, 23 carbon atoms) by a Wittig reaction in good yields.

Alkylresorcinols have a number of beneficial health effects [1] and they may be a factor in the protective effects of whole-grain foods against certain cancers and heart disease [6]. Dietary antioxidants may alleviate the first stage in the development of atherosclerosis by limiting LDL oxidation. We have investigated the in vitro antioxidant activity of alkylresorcinols using the ferric reducing ability of plasma (FRAP) assay [7] and by measuring their ability to affect formation of Cu2+–induced conjugated dienes from isolated LDL cholesterol [8].

References

Chlorella, a type of unicellular green algae, contains essential amino acids, minerals, and fibers. Administration of Chlorella has been shown to play some biochemical functions, such as promoting the growth rate of animals, ameliorating blood glucose and lipids in animals, boosting immune function, preventing stress-induced ulcer, and influencing oxidative stress in ethionine treated rats. Thus, the aims of this study were to examine anti-oxidative effects of Chlorella by measuring the conversion of xanthine to uric acid and superoxide through the effects of xanthine oxidase.

Bovine milk xanthine oxidase (1mU/mL) was incubated with 15 mM xanthine in the presence and absence of the test compounds at 25°C. Uric acid formation was determined by absorbance at 290nm. The initial rate was calculated from the linear portion of each reaction, from 0.5 to 2.5 min in most cases.

Chlorella (80 mg/ml) produced slight inhibition on uric acid production (36.3%), however, the aqueous Chlorella extract, dose between 5 and 40 mg/ml, produced inhibition rate over 50%. Allopurinol (50 μg/ml), a known xanthine oxidase inhibitor and used as a positive control, produced an inhibitory rate about 45%. Further studies are to determine the effective component of Chlorella and its IC50 in inhibiting xanthine oxidase.

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**PS.A19**

**The 10 Basic Requirements for a Scientific Paper Reporting Antioxidant, Antimutagenic or Anticarcinogenic Potential of Test Substances in vitro Experiments and Animal Studies in vivo**

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There is increasing evidence that chemicals/test substances cannot only have adverse effects, but that there are many substances that can (also) have a beneficial effect on health. Food and Chemical Toxicology regularly publishes papers in this area. Since the journal has every intention in continuing to do so in the near future, it has become essential that studies reported reflect an adequate level of scientific scrutiny. Therefore a set of essential characteristics of studies has been defined. These basic requirements are default properties rather than non-negotiable: deviations are possible and useful, provided they can be justified on scientific grounds. The 10 basic requirements for a scientific paper reporting antioxidant, antimutagenic or anticarcinogenic potential of test substances in vitro experiments and animal studies in vivo concern the following areas: (1) Hypothesis-driven study design, (2) The nature of the test substance, (3) Valid and invalid test systems, (4) The selection of dose levels and gender, (5) Reversal of the effects induced by oxidants, carcinogens and mutagens, (6) Route of administration, (7) Number and validity of test variables, (8) Repeatability and reproducibility, (9) Statistics, and (10) Quality Assurance.


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**PS.A20**

**Evidence for Formation of (3′-Dehydro)-Lutein from Both Lutein and Zeaxanthin in Humans**

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**Background and Objective:** The macular pigments lutein and zeaxanthin have both been hypothesised to reduce the risk of age-related macular degeneration. Because pharmacokinetic information on these xanthophylls and their metabolites is still very limited, we have investigated their plasma kinetics by multiple dosing studies in healthy volunteers.

**Design:** The plasma concentration response to lutein and zeaxanthin intake at two dosages each was investigated in open label, parallel group studies. Lutein was dosed at 4.1 and 20.5 mg per day in capsules (Lutein 5% TG, Roche Vitamins) and dosing groups included 8 subjects per group (4 volunteers of each gender). In the zeaxanthin trial, doses of 1 and 10 mg (Zeaxanthin 5% TG, Roche Vitamins) per day were administered to 10 subjects per dosing group (5 volunteers of each gender). After a 7 days run-in period subjects were dosed with either lutein or zeaxanthin for 42 consecutive days (dosing period). Plasma concentration time profiles were monitored over the dosing period and 25 or 34 days post-dosing in the lutein and zeaxanthin study, respectively.

**Results:** Average baseline concentrations were 0.17 and 0.048 μmol/L for lutein and zeaxanthin, respectively. Concentrations increased during the dosing period, reaching plateau levels. Steady state concentrations at day 42 were 0.59 and 1.64 μmol/L for lutein and 0.20 and 0.92 μmol/L for zeaxanthin for lower and higher doses, respectively. Efficient half-life was similar for lutein and zeaxanthin and was approximately 5 to 7 days. In both the lutein and the zeaxanthin trials, plasma concentrations of 3′-dehydro-lutein increased in parallel with xanthophyll concentrations during the dosing period, and decreased post-dosing. Steady state xanthophyll concentrations were linearly related with the corresponding 3′-dehydro-lutein levels. Formation of 3′-dehydro-lutein from each of the xanthophylls was supported by kinetic modelling.

**Conclusion:** The studies provide strong evidence for formation of 3′-dehydro-lutein from both lutein and zeaxanthin.
Background: Lycopene and β-carotene are a non-provitamin A and provitamin-A carotenones respectively. The major contributors to the intake of lycopene in developed countries are tomatoes and by-products and watermelon; β-carotene is widely present in fruits and vegetables. Some epidemiological evidences suggest that a high intake of tomatoes (lycopene is a marker of intake) are associated with lower risk of prostate cancer. In addition, emerging technologies are being used in the food industry which may affect both retention and bioavailability of carotenoids contained in commercially available food products.

Objective: To assess the effect of different industrial processes on the bioavailability of lycopene and β-carotene (absorption) in control subjects.

Methods: In a crossover study, twelve apparently healthy subjects (aged 20–30) consumed vegetable soup (‘gazpacho’) (250 ml × 2, ingested with meals) processed differently (‘minimally processed’, ‘high-pressure’, ‘electric pulses’ or ‘freshly prepared orange juice’) during three periods of 14 days with 1-month washout in between. Blood samples were collected at baseline (during 8 hours) and on day 7 and 14 for HPLC analysis of carotenoids.

Results: Lycopene and β-carotene in serum (multiple dose-test) and chylomicrons (single dose-test) is being analyzing by HPLC. Lycopene and β-carotene content of the different gazpachos used in the study is also analyzed. ANOVA and GLM for repeated measures will be performed using SPSS statistical package.

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Lycopene and chylomicrons (single dose-test) is being analyzed by HPLC. The study is also analyzed. ANOVA and GLM for repeated measures were performed, with control subjects.
Honey is a natural product which is increasingly present in human nutrition on account of its composition, and it also easily complies with tendencies of organic food production. A major class of compounds found in honey are flavonoids, plant phytochemicals that cannot be synthesized in the human body. Flavonoids are polyphenols with high antioxidant capacity which has been associated with reduced risk of several chronic diseases. Considering the fact that every plant contains a unique combination of flavonoids, different honey types also have dissimilar flavonoid profiles and thus can have qualitatively different effects on the body. On the other hand, some of them are widespread in many plant species, like quercetin which occurs in most honey types and has been suggested to protect against heart disease and cancer. In this work, a HPLC analysis of 50 honey samples indicates honey as a good flavonoid source which may be used as a healthy alternative to sugar in many products, thereby enriching an array of foods with natural antioxidants.

Objectives: We wanted to investigate how much formula milk and stored breast milk, commonly used in hospitals, could be pro-oxidant sources for newborn babies.

Methods: To have a general idea of milk oxidative status, we determined Total antioxidant capacity and lipid peroxidation products, such as Lipid peroxides, TBARS and Conjugated dienes in fresh and stored (at −20°C) samples of human milk and in different brands of formula milk.

Results and Conclusions: We found remarkable differences between several brands in formula milk for oxidation parameters. In particular, the levels of Lipid peroxides and the Total antioxidant capacity were quite different. It’s interesting that a high content of Lipid peroxides don’t correspond to a low Total antioxidant capacity. No difference was found in Total antioxidant capacity between formula and human milk, even if vitamin content is much higher in formula milk than in human milk. Stored breast milk has a large amount of Lipid peroxides, whose high concentration could be caused by an increased presence of Free Fatty Acids due to Lipoprotein Lipase activity in −20°C frozen milk samples. Even fresh breast milk had a higher concentration of lipid peroxidation products when compared with formula milk, which is probably due to the higher susceptibility of breast milk to degradation during analysis manipulations and light exposure.

Objectives: Breast milk oxidative balance can influence the oxidative status of the newborn baby and modifications such as those occurring in milk during storage can modify antioxidant and prooxidant levels. As it is normal practice to freeze breast milk at −20°C and −80°C for a long period of time in hospitals, we investigated the effect of freezing and thawing on breast milk oxidative status.

Methods: We determined Total antioxidant capacity and Free fatty acids peroxidation products, such as Lipid peroxides, TBARS and Conjugated dienes, in breast milk samples frozen at −20°C and −80°C, with and without EDTA (0.4M), for a variable period of 1–4 weeks and compared them with the values obtained from the same samples analysed fresh.

Results: We noted that storage at both temperatures did not affect Total antioxidant capacity, TBARS and Conjugated dienes, such as EDTA presence. On the contrary, the concentration of Lipid peroxides was strongly increased by both freezing temperatures, and was higher at −20°C than −80°C. EDTA presence, especially at −20°C, had a positive effect reducing Lipid peroxide formation.

Conclusions: Lipid peroxides concentration was strictly correlated with storage temperatures, which could be due to the presence of a residual activity of Bile Salt Lipoprotein Lipase (BSSL) at −20°C, but not at −80°C, that increases Free Fatty Acids (FFAs) content. Lipid peroxides are primary lipid oxidation products and their formation is probably directly connected with a greater amount of FFAs. In fact TBARS and Conjugated dienes, which are secondary lipid oxidation products, were not influenced by either of freezing temperatures.

Nicotine is considered the major compound responsible for smoking addiction and in humans that had inhaled high doses of nicotine through smoking for many years and quit smoking, its withdrawal is related to increase in body weight and changes in nutrition. Most of studies have investigated these aspects on the short-term period after smoking cessation. With the aim to investigate whether effects on food intake and body weight gain are present also long time after nicotine withdrawal, we evaluated food intake, body weight gain and brain nitric oxide formation in female mice, previously subjected to...
nicotine dependence, 120 days after nicotine withdrawal. At the end of the observation period (120 days), the same parameters have been studied also after 24h food deprivation. To induce nicotine dependence, mice received through subcutaneous injection nicotine (2 mg/kg; NM) or saline (M) four injections daily for 14 days. After this period nicotine was discontinued and dependence was assessed by an abstinence scale. Total daily food intake was not different in NM and M for all the observation period (120 days), however, weight of NM was always significantly increased with respect to M animals. After 24h food deprivation, when food was represented, fasting (food deprived) NM ate significantly more than M and showed increase of brain nitrate/nitrite ratio and nitric oxide synthase activity. Results show that changes in feeding behaviour and weight gain are present along after nicotine withdrawal and suggest a possible link with modifications of brain nitric oxide.

**Effect of Fish Oil and Taurine Supplemented Diets on Peroxidation Status in Small Intestine**

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Short-term feeding with a high polyunsaturated fatty acid diet can increase susceptibility to lipid peroxidation but concomitant antioxidant supplementation may counteract this potentially adverse effect. We have studied the oxidative status of the rat small intestine and the effect of supplementing the diet with fish oil (with high content of EPA and DHA) and taurine (Tau), which was chosen for its antioxidant properties. Twenty-one-day-old Sprague-Dawley rats were fed either a control diet (CTL) or a diet supplemented with 30 g/kg of fish oil (ω-3 diet) for two weeks. Both dietary groups had access to drinking water containing no Tau (0%Tau) or 20 g/L of fish oil (ω-3%Tau). Jejunal mucosa was obtained at day 35, and the amount of taurine was measured by HPLC. In these samples malondialdehyde and thiobarbituric acid reactive substances (MDA-TBARS) were measured. Apical membranes were tested for cholesterol (gas chromatography) and taurine (HPLC). The cholesterol content of membranes was not affected by EPA or DHA supplementation, although Tau reduced it by about 10%. Tau was incorporated to the intestinal mucosa (112% and 61% increase in CTL and ω-3 groups, respectively) and the membrane composition also reflected dietary Tau supplementation (0.655 ± 0.06 nmol Tau/mg protein in CTL-0%Tau and 0.969 ± 0.06 in CTL-2%%Tau; n = 6). MDA-TBARS was significantly greater in the small intestine of the fish-oil supplemented rats (0.886 ± 0.08 nmol/mg protein; n = 5) than in CTL (0.582 ± 0.05; n = 5), indicating greater peroxidative damage. This effect was partially reversed by Tau (0.714 ± 0.05, ω-3–2%%Tau; n = 6). These results indicate that taurine reduces oxidative stress produced by LC-PUFA in the small intestine.

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**Effect of Fish Oil and Taurine Supplemented Diets on Serum Composition and Indicators of Oxidative Stress**

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Diets containing marine oil long-chain polyunsaturated fatty acids (LC-PUFA) have beneficial effects against cardiovascular disease. However, peroxidation increases after fish-oil supplementation. Since Taurine (Tau) acts as both direct and indirect antioxidant, we have examined the effect of varying dietary fats and Tau intake on serum lipid profile, Tau concentration, serum peroxidation and erythrocyte antioxidative enzyme activity. Twenty-one-day-old Sprague-Dawley rats were fed with either a control diet (CTL) or a diet supplemented with 30 g/kg of fish oil (ω-3 rich) for two weeks. Both dietary groups had access to drinking water containing no Tau (0%Tau) or 20 g/L of Tau (2%%Tau). In serum, the following variables were measured: fatty acids (gas chromatography), cholesterol (enzymatic kit), Tau (HPLC) and malondialdehyde and thiobarbituric acid reactive substances (MDA-TBARS). In erythrocytes superoxide dismutase (SOD) activity was measured by an enzymatic method. The ω-3 diet had a hypocholesterolemic effect (17% decrease). The analysis of the fatty acid fraction reflected diet composition, with higher proportion of EPA and DHA in CTL than in ω-3 rats. Animals that received 2%%Tau showed higher serum concentration of Tau (751 ± 41 μmol/L) than 0%Tau animals (114 ± 11 μmol/L). Serum MDA-TBARS values were between 4.7 ± 0.14 μmol/L (CTL-2%%Tau) and 5.0 ± 0.15 μmol/L (CTL-0%Tau) and the SOD activity was not affected by the diet. These results indicate that the peroxidative status of serum was similar in both diets and that it was not affected by Tau supplementation.

This study was supported by grant ALJ99–0424 from Ministerio de Educación y Cultura, Spain.

**Effects of DHA-Induced Oxidative Stress on Intestinal Epithelial Barrier Functions**

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Oxidative stress is involved in the pathogenesis of numerous gastrointestinal disorders. Dietary polyunsaturated fatty acids can promote degenerative processes by increasing lipid peroxidation and the subsequent propagation of oxygen radicals. In Caco-2 cells we have recently shown that enrichment of the incubation medium with taurine can prevent the effects of docosahexaenoic acid (DHA) on cell viability, lipid peroxidation and paracellular permeability [1]. We have now examined the role of superoxide radical (O2·−), hydrogen peroxide (H2O2), nitric oxide (NO·) and peroxynitrite (PN, a product of the reaction between O2·− and NO·) as possible mediators of the DHA-induced increase in epithelial permeability. Epithelial permeability was assessed from apical-to-basolateral D-mannitol fluxes and...
transepithelial electrical resistance (TER), in confluent monolayers incubated for 24h without (control) or with added DHA (100 μM) or DHA plus 10 mM taurine. The results show that the addition of catalase, SOD (superoxide dismutase) plus catalase, Tiron (a nonenzymatic cell permeant O2·− scavenger), L-Nil (L-N6-(1-iminoethyl)lysine, an inhibitor of inducible nitric oxide synthase), CPTIO (2-(4-carboxyphenyl)-4,4,5,5-tetramethylimidazoline-1-oxyl-3-oxide, a NO· scavenger), and PN scavengers, such as GSH and urate, significantly prevent the increased D-mannitol permeability induced by DHA. For L-Nil and urate, the reduction of permeability was observed for both mannitol fluxes and TER. However, neither endogenous nor added SOD had any effect on these variables. Our results suggest that H2O2 and PN mediate the enhancement of permeability induced by DHA although direct effects of O2·− and NO· cannot be ruled out. They also show that taurine may behave as a scavenger of the reactive oxygen and nitrogen metabolites induced by DHA.

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Reference

PS.A31
Mechanisms Involved in DHA-Induced Intestinal Barrier Disruption
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We have recently demonstrated in Caco-2 cells that docosahexaenoic acid (DHA) can disrupt intestinal epithelial barrier function [1]. We have now examined various signalling pathways that could be involved in this effect: the phospholipase C (PLC)-mediated signal transduction pathways and the generation of eicosanoids from cyclooxygenase (COX) and lipoygenase (LOX) activity. Epithelial permeability was assessed from apical-to-basolateral D-mannitol fluxes and transepithelial electrical resistance (TER) in confluent monolayers incubated for 1h without (control) or with added DHA (100 μM), together with agents acting on the PLC-activated IP3 and DAG pathways. Cells were also incubated for 24h with COX and LOX inhibitors. The results show that the effects of DHA on epithelial permeability are mediated by PLC activity since specific inhibition of the enzyme with U73122 prevented the changes induced by DHA. The results also indicate that neither protein kinase C (PKC) nor myosin light chain kinase (MLCK) activities nor intracellular calcium concentration mediate the effects of DHA on paracellular permeability. Enhancement of the paracellular pathway by DHA was prevented by COX and LOX inhibitors (indomethacin and AA861, 2-(12-hydroxydoca-5,10-diynyl)-3,5,6-trimethyl-p-benzoquinone, respectively), suggesting the contribution of eicosanoids generated by DHA-enrichment. In conclusion, PLC activity and eicosanoids but not PKC, MLCK activities or calcium concentration participate in the modulation of paracellular permeability by DHA.

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Reference

PS.A32
Experimental Diets for the Prevention of the Development of Familial Amyotrophic Lateral Sclerosis
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Introduction: A previous study were considered 65 sporadic amyotrophic lateral sclerosis (sALS) patients; four familial ALS (fALS) patients bearing the L84F mutation in the SOD1 gene; one healthy subject bearing the same mutation and 65 control subjects. Amino acids plasma levels were evaluated; in the asymptomatic family member branched chain amino acids (BCAA) were much lower than in his affected relatives and in the control range.

Method and Results: The amino acid pool of 5 nutritionally balanced 2000kcal diets was analyzed. The first nutritional scheme was based on a traditional Italian diet, the others were modified to lower the total amount of BCAA. The total amount of proteins and BCAA of the 1st diet was respectively 73 g and 12,700 mg. The percentage of BCAA in the amino acid pool of all the food items were analyzed (range 18.05%–0.078%) to identify those with a low protein-BCAA ratio; using these foods 3 different nutritional schemes were designed. In these diets the total amount of protein and BCAA was respectively 48 g and 7,436 mg with a 41% reduction of the latter. MSUD maximum, a isoleucine, leucine and valine free powdered medical food and special low protein foods were included in the last nutritional scheme. Here the total amount of protein and BCAA was respectively 51 g and 4,899 mg with a 61% reduction of the latter. The BCAA level of this last diet is between the EAR and the RDA. These nutritional schemes may provide an innovative approach to the nutritional management of fALS patients.

PS.A33
Assessment of Plasma and Leucocyte Vitamin C Status in Patients with Asthma
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Vitamin C is a major antioxidant in lung airways and also function against external insulting oxidant sources such as smoke and environmental contaminants. The aim of study was to assess the vitamin C in asthmatic patients, by it’s measurement in plasma and leucocyte.
In a case-control study 50 asthmatic patient and 50 healthy person were randomly selected. The data were obtained by utilizing socioeconomic questionnaire and 24 h dietary recall. 10 c.c blood samples were drawn. Plasma and leucocyte vitamin C concentration were measured colorimetrically. The data were analyzed by FPII and SPSS software. The results indicate that 38 percent and 92 percent of patients had deficient plasma and leucocyte vitamin C concentrations respectively. There was a significant difference in plasma and leucocyte vitamin C concentrations among patients and control group (P < 0.0001).

Analysis of regression showed that a significant dependence was between the duration of asthma and plasma vitamin C status (P = 0.03), but a positive significant correlation was obtained between plasma vitamin C status and dietary vitamin C intake in patients group (r = 0.4, P = 0.001) and healthy group (r = 0.5, P < 0.0001). The interaction of socioeconomic parameters and vitamin C concentration in asthmatic patients in this study was not significant.

In conclusion, present study indicates that while there is an association between vitamin C status and asthma but leucocyte vitamin C status is more sensitive in this regard and deserves further study and consideration.

**PS.A34**

**Corn-Fed Chicken Meat – A Potential Food to Alleviate Macular Disease?**

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Lutein and two stereo-isomers of zeaxanthin are xanthophyll carotenoids found in the retinal pigment epithelium. A lack of these carotenoids may contribute to age-related macular disease (ARMD) and cataract formation. In addition, lutein has been implicated in enhancing immune function and protecting against cancer and cardiovascular disease. Dietary sources of lutein include most fruits and vegetables while corn and egg yolk are sources of zeaxanthin. Recent studies estimate the combined median intake of lutein and zeaxanthin to be around 1.6 mg/d in the UK and Ireland. Despite recent campaigns to encourage consumption of 5 portions of fruits and vegetables a day, the target is not being met. Low intakes of fruits and vegetables lead to low plasma carotenoid concentrations and reduce the amount of xanthophyll pigments available for the eye. Furthermore, bio-availability of carotenoids from fruits and vegetables is reported to be low and micronutrients are generally more bio-available from animal than plant foods. Corn-fed (CF) chicken is a recent introduction to the marketplace in the UK and Ireland. Corn/maize constitutes the main cereal in these chickens’ diet and marigold extract (Tagetes erecta) provides additional carotenoids. This research investigates the potential carotenoid contribution which such meat offers to the diet, compared to meat from standard-fed chickens and to other foods. Results show >20-fold increase in the xanthophyll carotenoid concentrations of muscle tissue of CF compared to standard chicken. This suggests CF chicken is a good source of these carotenoids, even comparable to vegetable sources which are believed to have lower bio-availability. This research investigates the carotenoid content of CF chicken meat and the nature of consumer concerns regarding the meat pigmentation and its benefits.

**PS.A36**

**Effect of Two Lipid Lowering Carotenoid Controlled Diets on Lipids and LDL Oxidation**

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Studies comparing the effects of monounsaturated fat enriched diets and high carbohydrate low-fat diets have often not controlled for carotenoid intake, which could have effects on parameters such as in vitro copper induced low-density lipoprotein (LDL) oxidation. This study compared the effects of a monounsaturated fat enriched diet (38% energy from fat-high in Sunola™) and a high carbohydrate low-fat diet (15% energy from fat, 65% from carbohydrate and 32g fibre) with controlled carotenoid intake on coronary heart disease risk factors including in vitro copper induced LDL oxidation and serum lipids. A randomised crossover dietary intervention study, with two diets of 14–16 days, was conducted in 18 healthy women and 13 men aged 20–70 years. Both diets were isocaloric and contained the same basic foods with a controlled carotenoid content, high in lycopene. Serum lycopene levels were similar at the end of the two diets. In vitro copper induced oxidation of isolated LDL showed a significantly
longer lag phase (mean difference 7.4 minutes in women and 7.5 minutes in men, p < 0.05) after the monounsaturated fat enriched diet compared to the high carbohydrate low fat diet. Serum total cholesterol and LDL cholesterol were not significantly different at the end of the two diets. Serum triglycerides were significantly lower and high-density lipoprotein cholesterol was significantly higher at the end of the monounsaturated fat enriched diet compared to the high carbohydrate low-fat diet. Despite its lipid solubility, lycopene absorption did not appear to have been differentially affected by the two diets. The positive differences seen on the monounsaturated fat (Sunola) enriched diets are not related to altered carotenoid intake or levels, and indicate potential to decrease the risk of coronary heart disease in healthy individuals.

PS.A37
Antioxidant Activity Toward Iron-Promoted Oxidation and HPLC Analysis in Organic Solvent Extracts Generated from Aqueous Infusions of Salvia fruticosa L.
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A plethora of antioxidant containing herbs, originate in the plant kingdom and are habitually consumed as part of people’s daily diets. Among them, the Mediterranean herbs have shown countering effectiveness against ROS related antioxidant activity and potential beneficial action in health. The antioxidant activity of aqueous infusions of one such herb, sage (Salvia fruticosa L.), emerges from specific components present in it. Attempting the investigation of the chemical nature and properties of these components, four organic solvent extracts from aqueous infusions of sage were examined. The solvents, starting from the most non-polar and moving toward the most polar, were hexane, diethyl ether, ethyl acetate and butanol-1. HPLC analysis of these extracts led to the separation of tens of components, of which four were identified and quantified through the use of standard compounds of known HPLC profiles. These compounds are the diterpenes carnosic acid, carnosol, rosmanol, and the phenolic caffeic acid. The antioxidant activity and polyphenol content were determined in the four extracts and in the left-over of the extraction of the original aqueous infusion. In order to determine the antioxidant activity in those extracts, two assays were used, based on the peroxidation of linolenic acid and 2-deoxy-D-ribose oxidation. The total polyphenol content was determined using the Folin-Ciocalteu method. Both polyphenolic and non-polyphenolic substances present in the extracts rise as significant contributors to the observed antioxidant activity of the derived extracts and thus sage itself. In this sense, they reflect the antioxidant potential of the aqueous infusions of sage toward ROS generated through variable mechanism iron promoted oxidative processes.

PS.A38
Antioxidant Activity of Phenolic Compounds Isolated from Plants of the Lamiaceae Family: Importance to Human Nutrition
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Melissa officinalis L., Hyssopus officinalis L., Osicum basilicum L. and Teucrium chamedris L. were examined for their antioxidant capacity and phenolic compound composition. The antioxidant capacity was determined in dried ground plants and in their methanol extracts, with the Rancimat test using sunflower oil as a substrate. Both pulsed in plants and methanol extracts showed antioxidant capacity. The content of total phenolics in the extracts was determined spectrometrically according to the Folin-Ciocalteu assay. The results were expressed as gallic acid equivalents in milligrams per gram dry material. RP-HPLC coupled with Diode Array Detection was employed for the identification and quantification of the phenolic antioxidants, present in methanolic extracts. The presence of (+)-catechin, ferulic acid, caffeic acid, hydroxytyrosol, and apigenin was identified.

PS.A39
Gender-Related Differences in Liver Mitochondrial Morphology and Functionality
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The mitochondrial pool is not homogeneous, and it can be fractioned into various subpopulations, displaying a differential oxidative and thermogenic response to several physiological stimuli. Previous studies have demonstrated the existence of a gender dimorphism in the oxidative capacity of adipose tissue, both in brown and white depots. Thus, given the key role of liver in the energy metabolism regulation, the aim of this work was to study whether a gender-related pattern exists in hepatic mitochondrial subpopulations features. 110-days-old male and female Wistar rats were used. Mitochondria were fractioned into three subpopulations through differential centrifugation (M1 at 1,000 g, M3 at 3,000 g and M8 at 8,000 g). COX (cytochrome c oxidase) and ATP synthase activity, protein content and mitochondrial morphology were analyzed. Female rats showed a higher oxidative and phosphorylative capacity than males, as demonstrated by a higher COX activity, especially in the M3 subtype, as well as a greater ATP synthase activity in every subpopulation. On the other hand, major differences were not found in these parameters at the homogenate level. Mitochondrial morphology was found to be significantly different between genders, showing female rats larger and more rounded-shaped mitochondria. Our results clearly point out the existence of a gender dimorphism in the metabolic properties of liver mitochondria, which is only evident when studying the fractioned mitochondrial pool.
PS.A40
Consumption of Different Types of Tea is Not Related to Iron Status in a Apparently Healthy French Middle-Aged Population
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Polyphenols in tea reduce non-haem iron bioavailability by the formation of insoluble complexes and a high consumption may reduce iron status. However, the time of tea consumption (with or in between meals) and the consumption of other inhibiting of promoting factors such as vitamin C, dietary protein and calcium, also affect iron status. The aim of the present study was to evaluate the relation between different types of tea consumption and iron status, taking these factors into account.

Serum-ferritin status was measured in 1,128 men and 2,078 women of the SU.VI.MAX study, a randomised, placebo controlled primary prevention trial on the effect of antioxidant supplementation on chronic diseases. A specific tea questionnaire was developed and completed by these subjects, which provided information on tea recipes, time and type of tea consumption. Dietary habits were assessed by three 24hr dietary recalls and available in 742 women and 473 men.

Mean serum-ferritin concentration was 169 μg/l (SD: 164) in men and 73 μg/l (69) in women. No relation was observed between serum-ferritin and consumption of black, green or herbal tea in men, pre- or post-menopausal women. Taking vitamin C, calcium, dietary protein intake into account did not change this result. There was no association between the strength of each tea or the time of tea consumption and serum-feritin concentration. When women with a low iron intake (<16 mg/day) were evaluated no association between tea consumption and iron status was observed.

Consumption of green, black or herbal tea does not seem to be related to iron status in an apparently healthy population of middle-aged French men and women.

PS.A41
Relationship Between Soup Consumption, Folic Acid, Beta-Carotene, and Vitamin C and E Status in a French Adult Population
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Soup consumption may contribute to a balanced diet and a healthy nutritional status. Especially vegetable soup may have a satiating effect, but may also be a good source of several vitamins and other microconstituents. The aim of the present study was, therefore, to evaluate the relation between soup consumption and folic acid, beta-carotene and vitamin E and C status in apparently healthy middle-aged French adults.

Participants (2,114 men and 2,874 women) of the SU.VI.MAX study, a randomised placebo controlled primary intervention trial evaluating the effect of antioxidant supplementation on chronic diseases, completed twelve 24-hour dietary records during the first two years after baseline.

In women, 6.7% and in men 8.7% were heavy consumers of soup (soup consumed on 9–12 out of 12 days). Respectively, 46% and 42.5% were regular soup consumers (3–8 out of 12 days), and 47.3% and 48.8% were occasional or non-soup consumers (0–2 out of 12 days). Total energy intake did not differ between soup consumers and non-consumers. In female heavy soup consumers, higher dietary intakes of folic acid, beta-carotene, vitamin C were observed, whereas only vitamin E was higher in men. In these consumers, soups contributed up to 13% of total dietary intake of beta-carotene. For vitamin C, vitamin E and folic acid, soups contributed between 4–5% of total intake. A tendency was observed for a higher vitamin C and folate status in heavy soup consumers, but this was not statistically significant.

Our results suggest that it may be useful to include soup consumption in public health programs to increase vegetable consumption, as it may contribute to a balanced diet and a healthy vitamin status, in the general population.

PS.A42
Health Related Quality of Life and Long-Term Supplementation with Nutritional Doses of Antioxidant Vitamins and Minerals: Not More Than a Placebo Effect? The SU.VI.MAX Study
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We tested the efficacy of supplementation with a combination of antioxidant vitamins and minerals, at nutritional doses, in improving health related quality of life in a healthy French population.

The SU.VI.MAX study is a randomized double-blind, placebo-controlled primary prevention trial. A total of 7,551 subjects (3,151 men aged 45–60 and 4,400 women aged 35–60) took a single capsule daily; 3,809 received a combination of 120 mg vitamin C, 30 mg vitamin E, 6 mg beta-carotene, 100 μg selenium and 20 mg zinc, while 3,742 received the placebo. All subjects completed twice three health related quality of life questionnaires (SF36, Duke Health Profile, ghq12). Mean follow-up time between the two measures was 76.0 (±4.2) months.

Physical dimensions tended to decrease over time while mental dimensions tended to improve. No significant differences were observed between the placebo and the intervention group, even when taking into account the occurrence of health events. Coherent results were observed with the different used instruments. However, about
one third of the subjects believing to be in the placebo group felt worse as compared to only one sixth among subjects thinking to be in the intervention group.

The capacity of nutritional doses of a combination of antioxidants to improve well-being and quality of life in apparently healthy subjects is very modest in itself and is mainly mediated by the major morbid events prevention. Perception of beneficial effects of supplementation on general well-being mainly correspond to a placebo effect.

PS.A43

Effects of Long-Term Supplementation with Nutritional Doses of Antioxidant Vitamins and Minerals on Mortality and Cancer: Results of the SU.VI.MAX Study

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Randomised placebo-controlled trials, in which single or in-pair antioxidant micronutrients are given in high doses over long periods, have not been able to provide proof of a potential beneficial effect, or even suggest harmful effects in subjects at high risk. The aim of the SU.VI.MAX study was to evaluate the effect of supplementation with a combination of antioxidant vitamins and minerals at nutritional doses, on chronic diseases in a healthy French population.

A total of 5,028 men (45–60 yrs) and 7,713 women (35–60 yrs) were included in a randomised double-blind, placebo-controlled primary prevention trial and took a single capsule daily: 6,377 received a combination of 120 mg vitamin C, 30 mg vitamin E, 6 mg beta-carotene, 100 µg selenium and 20 mg zinc, while 6,364 received the placebo. Mean follow-up time was 7.02 (SD: 1.63) years.

In men, fewer deaths and fewer cancers occurred in the intervention group than in the placebo group (p < 0.05). In women, no difference in the occurrence of cancer was observed between the groups, although in situ breast cancer occurred less frequently in the intervention group than in the placebo group. No difference in ischaemic cardiovascular diseases was observed between the two groups in both sexes.

Nutritional doses of a combination of antioxidants, which can be achieved by a diet rich in fruit and vegetables, may have a protective effect on mortality and cancer in apparently healthy men.

PS.A44

Digestive Enzyme Inhibition by Phenolic Compounds from Different Foods

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During the last years the polyphenols beneficial activities on humans health have been well established, but the possible negative effects on the digestive processes are scarcely considered. The aim of this work is to evaluate in vitro the influence of polyphenols from different foods on proteins digestion. The foods considered as polyphenols source are drinks (tea, novello and cabernet wines, coffee and orange juice), vegetables (bieta, broccoli and tomato), fruits (berries, plum and apple), cocoa powder and beans. The polyphenols content in foods were evaluated by Folin assay. An in vitro method was utilised and physiological digestive conditions were mimed. In our experimental conditions the ratio Polyphenols:Protein was 1:70 (w/w) and the casein digestion kinetic (time-end 60 min) evaluated by a spectrophotometric method.

The results obtained show that drinks and vegetables possess a similar inhibitory activity (about 8–10%) and fruits, cocoa powder and “novello wine” have a poor activity (<3%). On the other hand, beans possess the highest inhibitory activity on casein digestion (>40%). Concluding, the polyphenolic fraction of beans and vegetables, particularly rich of tannins, seems to have a high inhibitory effect, while that one of fruits, rich in anthocyanins and flavonoids, shows minor influence.

This would be confirmed also by the results obtained with the ‘novello wine’ (rich in anthocyanins) that does not show the inhibition of the cabernet wine (rich in complex tannins, pigments, tartaric and cinnamic acids). Moreover, an important role would seem to attribute also to chlorogenic acid, the main phenolic compound of the coffee.

More studies need in order to demonstrate how much important are these preliminary results.

PS.A46

Quality and Nutritive Characteristics of Black Wines

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There are a great number of phenol chemical components in grapes and wines which, by their auto-oxidative effect, participate in the prevention of free radicals caused by human body metabolism. These radicals are responsible for the harmful oxidative influence to lipoproteins membrane of cells, multiple unsaturated fatty acids, enzymes, DNK, essential amino acids, etc. Negative influence of these agents results in cardiovascular diseases, inflammatory processes, diabetes, cancer, Alzheimer’s disease and myocardium infarct.
Palm oil is a rich source of Vitamin E (tocopherols and tocotrienols). Tocotrienols are not only known for their antioxidant and lipid-lowering properties, but also as anti-proliferating agents. Studies have demonstrated that tocotrienol-rich fraction (TRF) at a dose of 1 mg/day as compared to control mice, which received oral administration of black glass vessels indicate the importance of light wavelengths passing through the glass, the so-called harmful light which, by its energy, causes or intensify biochemical changes of the nutritive content in bottled wines.

Studies have demonstrated that tocotrienols can inhibit the growth of human breast cancer cells in vitro and in vivo. In this study the effect of tocotrienols on the tumourigenecity in athymic nude mice injected with human breast cancer cells in vitro and in vivo. The results obtained showed 40% tumour incidence in experimental nude mice, which received oral administration of tocotrienol-rich fraction (TRF) at a dose of 1 mg/day as compared to 70% tumour incidence in control mice.

Interferon-gamma (IFN-γ) and interleukin-4 (IL-4) are among major cytokines that have distinct immunological roles. IFN-γ, a Th1 cytokine is a potent activator of macrophages, cytotoxic T lymphocytes and natural killer cells, all of which have crucial roles in defense against arising malignant cells and viral infections. IL-4 on the other hand is a potent activator of B cells and promotes humoral responses. Vitamin E has also been shown to be a contributory factor in supporting the immune system. Thus, the immunoregulatory effects of dietary palm tocotrienols on humoral and cell-mediated immunity were examined in athymic nude mice injected with human breast cancer cells in vitro and in vivo. At necropsy, splenocytes from these mice were isolated and cultured for 24, 48 and 72 hours with concanavalin A stimulation. IFN-γ and IL-4 levels were measured using ELISA at the end of the incubation period. There was a three-fold increase in the levels of IFN-γ in nude mice supplemented with palm tocotrienols with tumour. We also found a two-fold increase of IFN-γ in nude mice supplemented with palm tocotrienols without tumour. No significant difference in the level of IL-4 was observed in control and experimental mice.

We also investigated the immune response in nude mice that were not injected with human breast cancer cells but supplemented with tocotrienols. Results showed that the levels of IFN-γ increased in mice supplemented with tocotrienols and no significant difference was observed in levels of IL-4. These results suggest that palm tocotrienols enhance cell-mediated immune response in athymic nude mice.

In this study, the efficacy of Centella asiatica extract and powder in reducing oxidative stress in Sprague Dawley rats was evaluated. Lipid peroxidation was monitored by measuring malonaldehyde (MDA) level in blood. Activities of free radical scavenging enzymes (superoxide dismutase and catalase) were determined using H2O2 decomposition and nitrobluetetrazolium reduction respectively. Results showed that administration of H2O2 (0.1%) in drinking water of the rats, for twenty five weeks, increased the MDA levels in erythrocytes of all the rats. It is interesting to note that rats receiving Centella asiatica extract, powder and α-tocopherol had lower MDA levels compared to the other rats, which indicate decrease lipid peroxidation in these rats. Increase in catalase activity of the rats appears to be a response to H2O2 accumulation. The decrease in the activity of superoxide dismutase in Centella asiatica- and α-tocopherol supplemented rats suggested the lower requirement for the enzyme and this indicate the protective effect of the plant in combating oxidative stress undergone by the rats. Results revealed that Centella asiatica extract and powder may ameliorate H2O2-induced oxidative stress by decreasing lipid peroxidation via alteration of the antioxidant defense system of the rats.

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**PS.A48**

**Protective Role of Centella asiatica in Hydrogen Peroxide Induced Oxidative Stress Rats**

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**PS.A47**

**Increase in Interferon-Gamma in Athymic Nude Mice Supplemented with Palm Tocotrienols**

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Interferon-gamma (IFN-γ) and interleukin-4 (IL-4) are among major cytokines that have distinct immunological roles. IFN-γ, a Th1 cytokine is a potent activator of macrophages, cytotoxic T lymphocytes and natural killer cells, all of which have crucial roles in defense against arising malignant cells and viral infections. IL-4 on the other hand is a potent activator of B cells and promotes humoral responses. Vitamin E has also been shown to be a contributory factor in supporting the immune system. Thus, the immunoregulatory effects of dietary palm tocotrienols on humoral and cell-mediated immunity were examined in athymic nude mice injected with 1 × 106 MDA-MB-231 human breast cancer cells was determined. Results obtained showed 40% tumour incidence in experimental nude mice, which received oral administration of tocotrienol-rich fraction (TRF) at a dose of 1 mg/day as compared to 70% tumour incidence in control mice.

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**PS.B1**

**Nutritional Status Evaluation of Patients Affected by AL Amyloidosis: A Pilot Study**

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**Introduction:** Amyloidosis is a disorder of protein conformation and metabolism that results in tissue deposition of insoluble fibrils that cause vital organ dysfunction and, ultimately, death. Immunoglobulin light-chain (AL) amyloidosis is the most common type of systemic amyloidosis in Western countries. The prognosis of patients with AL is poor and depends on organ involvement and the patient’s general conditions. Although maintenance of good nutritional status is known to be strongly associated with better general conditions, prolonged survival and better quality of life in many diseases with poor prognosis, to date, no studies assessed nutritional status of AL patients, nor were identified the disease-related conditions likely to benefit from nutritional support.

**Methods:** Total sample consisted of 109 patients, 62 (56.8%) males, (median age 62 years; range: 28–78 years), with AL amyloidosis. Nutritional status was evaluated combining anthropometry, biochemical markers, symptoms and weight history.

**Results:** Sixty-three patients (57.8%) had cardiac involvement; 54 (49.5%) had nephrotic syndrome; 33 (30.3%) had serum creatinine >1.4 mg/dl; 8 (7.3%) were on dialysis; 58 (53.2%) had peripheral oedema. Seventy patients (64.2%) referred fatigue; 60 (55%) unintentional weight loss; 58 (53.2%) had transferring levels below 200 mg/dl. Fifteen patients (13.8%) were on a diet at the moment of survey.

**Conclusions:** Nutritional status of patients with systemic amyloidosis is impaired with regards to several features. This has a significant impact on the general clinical picture and on the patients’ quality of life. Therefore, we believe that AL patients might benefit from routine evaluation of nutritional status. Furthermore, due to the complexity of this systemic disease, the development of a target specific model for the assessment of malnutrition in AL amyloidosis is desirable.

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**PS.B2**

**Melissa officinalis (Lemon Balm) Alleviates Negative Mood Associated with Acute Psychological Stress**

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**Melissa officinalis** (Lemon Balm) has a longstanding history of usage in herbal medicine as a hypnotic and anxiolytic agent. We have recently reported positive cognitive and mood changes associated with Melissa [Kennedy et al., Pharmacol Biochem Behav 72, 953–964]. The present study examined the effects of single dose of *M. officinalis* on mood changes in response to mild, experimentally induced psychological stress. Performance on a series of tasks was also monitored.

Eighteen healthy participants took part in a randomised, placebo controlled, double blind, balanced cross over study. Participants received placebo, 300 mg and 600 mg of Melissa according to a Latin Squares design. Study days were conducted seven days apart. Each comprised of two similar testing sessions, treatment was administered immediately after completion of the first testing session and one-hour prior to commencement of the second. The Defined Intensity Stressor Simulation (DISS) is a multi-tasking platform and was used to induce mild psychological stress. Mood was assessed via self-ratings on Bond-Lader Visual Analogue Scales immediately prior to, and immediately following the DISS.

Results revealed significantly increased ‘calmness’, and reduced ‘alertness’ following the administration of the 600 mg dose of Melissa, in comparison to placebo. A trend towards improved speed of mathematical processing, with no reduction in accuracy, was observed following ingestion of the 300 mg dose.

It appears that *Melissa officinalis*, taken at moderate doses is beneficial in moderating subjective mood in response to mild psychological stress, without impairing performance. The mechanisms underlying these effects remain to be elucidated and further investigation is necessary to establish whether these effects generalise to ongoing stress experienced in more naturalistic settings.

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**PS.B3**

**Patients Submitted to Coronary Artery Bypass: Evaluation by Resistance and Reactance**

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**Introduction:** The purpose was to evaluate effect of different surgical variables, such as perfusion duration and number of grafts (NG), on resistance (R) and reactance (Xc), in patients undergoing coronary artery bypass (CAB).
Methods: 77 patients submitted to CAB were studied. The variable concerning time of extra-corporeal circulation (TECC) was classified in 4 degrees, according to quartiles of cases (0: – <60 min; 1: >60 e-<70 min; 2: >70 e-<90 min; 3: >90 min). R and Xc measurements were compared to TECC and to NG. Ten measurements were performed, until the fourth postoperative day (PD).

Results: Comparison of decrease of Xc before surgery and first measurement at first PD, for different TECC, showed statistically significant difference (SSD) (p = 0.01) between TECC degree 0 and degree 3. Square profile (SP) (p < 0.001), for R and Xc, and interaction (p = 0.04), for R, showed SSD. Averages of R and Xc were classified in two groups: patients with two grafts and patients with three grafts. Analysis of SP showed SSD (p = 0.001) for NG. Comparison of the decrease of R and Xc between patients underwent CAB with TECC >90 min and those with TECC >60 min showed, in all the times, SSD (p = 0.008 for R and p = 0.006 for Xc). Analysis of SP showed SSD (p = 0.001).

Conclusion: Decrease of R and Xc is related not only with surgery procedure, but also with NG and TECC, which enhance stress of surgical trauma.

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**PS.B4**

Estimation of Nutrition State of Polish Soldiers Suffering from Diagnosed Asymptomatic Hepatitis Detected Based on Selected Blood Haematological Parameters

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Poor nutrition state is connected with low haematological indicators levels. According to some researchers it is estimated at 10–15% population of well-developed countries. The aim of the work was estimation of nutrition state of soldiers doing military service, hospitalised because of virus hepatitis B and C and of asymptomatic course (without symptoms of active hepatitis). These infections were detected during volunteer blood donation. Nutrition state estimation was done based on blood haematological indicators and BMI index. (Body Mass Index – BMI). Blood haematological indicators were indicated generally approved diagnostic methods and BMI index was calculated from body height and body mass values. Total of 63 young men, aged 19–23 were examined. Men were fed food ration of mean energy value of 4,244 kcal obligatory in Polish Army. The ration delivered 13% protein originated energy, 30% fat originated and 57% from carbohydrates. Mean body mass of examined was 73.2 kg and body height 180.6 cm. Underweight was indicated among 4.8% of examined men, 90.4% indicated standard weight, 3.2% overweight and 1.6% obesity. Average haematological indicators values such as haemoglobin level, number of leucocytes and erythrocytes, haematocrite and mean erythrocyte volume met the requirements obligatory in Poland. Values of obtained haematological indicators show lack of virus hepatitis B and C influence on soldiers’ nutrition state. BMI value testifies for good nutrition state of examined.

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**PS.B5**

Nutritional Assessment and Therapy in Children with Congenital Cardiopathy Submitted to Surgery Intervention


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Introduction: Our purpose was to evaluate nutritional assessment and therapy in children with severe congenital cardiopathy submitted to cardiac surgery.

Methods: Retrospective study (09/2002–02/2003) with children 2 or less years old. For the nutritional assessment (NA) we used weight/age (W/A), height/age (H/A) and body mass index (BMI). To evaluate nutritional therapy we used average caloric offer (ACO), average protein offer (APO), energetic needs (EN) and basal protein requirements (BPR). We also used the formula ACO/EN and APO/BPR.

Results: We selected 63 children, being: the average age 5.01 months (2 days old to 2 years old), 55.5% (35) boys and 45.5% (28) girls, most frequent complication protracted mechanical ventilation 55.5% (35) and mortality 26.9% (17). In the initial nutritional analysis we observed W/A less or equal to P10 in 37 children (58.8%), H/A less or equal to P50 in 38 (60.3%), BMI less or equal to P10 in 36 (57.14%). At the end of the observation we noted W/A less or equal to P10 in 40 (63.49%), H/A less or equal to P50 in 42 (66.6%), BMI less or equal to P50 in 39 (61.9%). In 39 children (61.9%) we found ACO/EN < 50%, and in 35 children (55.5%) APO/BPR < 70%.

Conclusion: The postoperative period deserves special attention, due to the high demand of energy and protein, caused by surgery stress and/or complications. The comparison between ACO/EN and APO/BPR shows that the caloric-proteic offer was not appropriate.

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**PS.B6**

Psycho-Nutritional Treatment in Severely Malnourished Anorexia Nervosa Patients

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Anorexia nervosa (AN) has among the highest mortality rates of all mental disorders, killing up the 6 percent of their victims. The starvation experienced by persons with AN can cause damage to vital organs such as the heart and brain. The aims of treatment of AN are: to restore a normal healthy body weight, to treat and/or prevent physical complications, to interrupt the perpetuating effect of starvation characterised by a variety of physiological and psychological...
changes, to threat associated psychopathological conditions, including defects in mood regulations, self-esteem and behaviours. Hospital-based program are considered the most appropriate for the most compromised patients. 

In our Eating Disorders Centre in the last six years we treated 44 severely malnourished patients (43 f, one m), affected by AN diagnosed using the Diagnostic and Statistical Manual of Mental Disorders 4th. At the beginning of inpatient treatment the patients showed the following data (mean ± SD): age 22.4 ± 5 yrs; body weight (bw) 36.7 ± 5.1 kg; BMI 13.5 ± 1.4 kg/m² (10.5–15.9 kg/m²). Body composition evaluated by BIA showed TBW 24.2 ± 3.9.

Resting Metabolic Rate (RMR) measured by indirect calorimetry was 864.9 ± 127.1 kcal/day, with a decrease of 36.6 ± 18.6% respect to Estimated Metabolic Rate. We treated these patients with a psycho-nutritional approach, treatment is started in hospital care unit (usually after initial period it was continued in intensive day-hospital care). The medical nutritional therapy consisted in personalised diet plus oral multinutrient feeds (providing non protein energy, protein vitamins and minerals), or in 32 patients on life threatening situation a nasogastric multinutrient feeding to achieve a safe bw. At the time of 368.6 ± 339 day of intensive multidisciplinary therapy we achieved a significant increase of: bw from 36.7 ± 5.1 kg to 47.4 ± 5.2 kg; BMI from 13.5 ± 1.3 to 18.4 ± 1.5 kg/m². Body composition showed an increase of TBW from 24.1 ± 4.31 to 25.3 ± 4.51 and of FM from 10.4 ± 4.7% to 23.4 ± 7.9% of bw. Measured RMR increased from 864.9 ± 127 to 1,132.7 ± 194.9 kcal/day.

A multidisciplinary intensive inpatient treatment for severely malnourished AN patients may achieve significant results, to stabilise these results usually an ambulatory stage of treatment continues the inpatient phase.

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**PS.B8**

**Estimation of the Nutrition State of Patients of Sobering Chamber in Warsaw**

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Ethyl alcohol used for consumption purposes is the most widespread and most often misused substance of narcotic character. Alcohol dependence syndrome is the most frequent form of dependence. Ethyl alcohol input in the diet considerably influences on organism's energy balance. The aim of the work was estimation of the nutritive state of men indulging too freely in alcohol, patients of sobering chamber in Warsaw. Total of 206 men, patients of sobering chamber were examined. Body mass and body height of every examined patient were checked what was the base to calculate Body Mass Index (BMI). This factor is the foundation to estimate protein-energy nutrition state. Based on BMI index using Ferro-Luzzi & co. grading examined persons were classified into following groups: chronic malnutrition, standard or I0 and II0 obesity. Examined group consisted of men aged as follows: up to 29 in 18.9%, 30–39 in 20.4%, 40–49 in 32.5% and over 50 in 28.2%. Men living in the cities and small towns predominated among examined patients (70.4%). There were 14.1% men living in the country and 15.5% was homeless.

Taking into consideration education of the examined persons the largest group made people of technical (37.4%) and elementary education (32.5%). Smaller group made men of secondary education (24.8%) and the smallest (5.3%) men of university education. Chronic energy deficit and malnutrition were found among 6.3% examined. Good nutrition state, meeting standards, was represented by 66.5% of examined persons. The I0 obesity was found amongst 19.4% and II0 obesity indicated 7.8% of examined men. Alarming is obesity stated among ¼ of examined men as well as occurrence of protein-energy malnutrition mostly among homeless people.
**Evaluation of Food Intake and Nutritional Status in Children with Refractory Status Epileptics (RSE)**

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Children affected by RSE are at risk of malnutrition because of feeding difficulty (anorexia, chewing, swallowing difficulties or vomiting) and chronic use of anticonvulsants which may affect bone mineralization. Moreover energy requirement may be altered because of neurological impairment. Differences in some nutrients intake have been analysed between cases and controls, having previously subdivided the sample in tertiles according to intake levels, through an Odds Ratio calculation. OR was 0.64 for vitamins C and E, 0.63 for ω-3 fatty acids, 0.53 for zinc, 0.36 for ω-6 fatty acids, 2.50 for linoleic acid (ω-6). The OR trend for some foods has been found to be similar to the corresponding nutrients' one (OR = 0.36 for fish, OR = 0.53 for olive oil, OR = 2.13 for margarine). Some foods, rich in antioxidants, have shown a protective role: onions (OR = 0.37) and red wine (OR = 0.75). Food allergies detected in some subjects had no clinical significance and were not related to the respiratory symptomatology.

**Diet and Asthma: Which Role do Nutrients Play in Risk Factors and Prevention?**

The ECRHS II Study

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**Introduction**: The well documented increase in asthma prevalence and incidence rates in last years may be ascribed to changes in population’s lifestyle and particularly to changes in dietary habits. Actually, some nutrients can act, in allergic subjects, as a provoking stimulus for acute episodes of asthma, while some nutrients (ω-3 fatty acids, monounsaturated fatty acids, vitamin C, vitamin E, β-carotene and other carotenoids, selenium, manganese, magnesium and flavonoids) could play a protective role towards bronchial asthma, whereas others (ω-6 fatty acids, saturated fats and sodium) could have a negative involvement in the pathology evolution.

**Sampling and methods**: Within the ECRHS II study a side protocol concerning diet and asthma has been set. The selected sample consisted of 67 subjects (33 asthmatic cases and 34 controls), aged 43.3 ± 6.7 years (mean ± SD) with a slightly greater percentage of women in comparison with men (58.2% vs 41.8%).

**Results**: The results show an excessive intake of protein (20.3% in cases and 19.3% in controls), of fats (32.4% in cases and 35.4% in controls, among which saturated fats represented 12.8% in cases and 12.1% in controls) and a poor intake of complex carbohydrates (47.3% in cases and 45.3% in controls). The essential fatty acids intake resulted unbalanced in favour of ω-6 (2.9% in cases and 2.8% in controls, in comparison of 0.5% of ω-3 in both groups).

**Conclusions**: Qualitative and quantitative unbalanced diet is not favourable to asthmatic patients. Intake of foods for which it has been possible to demonstrate beneficial properties must be encouraged: semi-fatty fishes, anchovies and sardines rich in ω-3, fruits and vegetables, important sources of vitamins and other antioxidants, and finally extra vergine olive oil, which contains many antioxidants. The intake of saturated fats, margarine and seed oil (sources of ω-6) must be decreased. It can be advisable the consumption of moderate quantities of red wine, because of its richness in trans-resveratrol and other antioxidants.

**Diet and Colorectal Cancer Risk: What do Patients Know?**

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Poor diet is associated with the development of colorectal cancer (Bingham, 2000; Wilmink, 1997), yet improving people’s diet remains a challenge. This study aimed to establish the dietary knowledge and barriers to change in patients attending a colorectal clinic, where 90% would present with benign disease.
Patients were interviewed using a validated, semi-structured questionnaire to determine nutritional knowledge and collect demographics. Questions assessing nutritional knowledge were marked according to strict criteria and a random sample cross-checked. Data were analysed using t-tests while Pearson’s correlation coefficient was used to determine associations between variables. Differences were considered significant when p < 0.05.

Fifty subjects (mean age 62 SD ± 15.1 years; male:female = 22:28) were interviewed. Twenty-three (46%) were unable to identify why healthy eating is important, while only four (8%) were aware of a connection between diet and cancer. Women had significantly higher nutrition knowledge scores than men (16.3 SD ± 7.1 vs 12.3 SD ± 5.1, p < 0.05). A significant relationship between educational attainment and nutrition knowledge scores was observed (r = 0.534, p < 0.001). Twenty-three (46%) knew that five portions of fruit and vegetable were recommended daily but 31 (62%) were unclear what constituted a portion. Potential barriers to dietary change included the belief that their diet was already healthy (n = 35, 70%) and lack of time (n = 25, 50%).

Despite considerable investment in ‘healthy eating’ campaigns dietary knowledge remains poor, particularly in men and those without formal qualifications. It is disappointing that subjects were unaware of the link between diet and cancer. Most subjects did not think their diet needed improvement and they lacked the practical knowledge necessary to do so. Education strategies that are targeted at those with the poorest knowledge need to be developed. These strategies may have added impact if they are delivered to a receptive target population in a clinical setting.

References

PS.B12
The Effect of Oral L-Carnitine Treatment on Anemia in Hemodialysis Patients
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Background: The studies showed a promising effect of L-carnitine on anemia management.

Objective: Renal anemia significantly affects the morbidity and mortality of dialysis patients. The aim of the present study is to evaluate the effect of oral L-carnitine on anemia in hemodialized patients.

Methods: 20 patients of either sex were randomized into two groups which consisted of anemic patients not treated with L-carnitine (group I, untreated anemic controls, n = 11) and anemic patients treated with L-carnitine (group II, treated anemics, n = 11). Their mean age was 50 ± 4 years and they were dialyzed 3 times per week admitted to University Hospital. Change in hemoglobin and hematocrit levels were examined.

Results: The results revealed an significant increased in hemoglobin (8.54 ± 1.59 mg/dl to 9.24 ± 0.82 mg/dl, p < 0.05) and hematocrit (26.12 ± 4.48% to 28.61 ± 2.6%, p < 0.05) in L-carnitine treated group, and no change was observed in control group. No side effects or adverse reactions were reported in carnitine treated group during the study.

Conclusion: Oral supplementation L-carnitine can improve anemia in hemodialysis patients.

PS.B13
Enteral Nutrition in Postoperative Treatment of Children After Colon Surgery
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Abdomen surgery is a very strong stress factor with negative influence on metabolic parameters of the child. The goal of this investigation was the assessment of surgery influence on nutritive and antioxidant status in children in postoperative period as well as possibility of alimentary correction of changes. There were 20 children aged 3–11 years after colon surgery under our observation randomly sampled into 2 groups. Children of the control group were fed traditional kitchen brews; children of the main group received balanced formula (Nutren, Clinutren Junior) in early postoperative period. The research has shown that children of the main group had less weight loss, 3 times less lean and 3.3 times less fat loss in comparison with the children of the control group. The lymphocytes fall in children of the control group was significantly expressed in comparison with the children of the main group. In the main group children had increased indices of the antioxidant status: 5.8 times higher reduced glutathion level and 1.5 times higher level of glutathion-S-transferase.

The results of our research shows that the use of specially balanced formula in early postoperative period could prevent serious metabolic disorders and increase antioxidant status of sick children.

PS.B14
Prediction of Basal Metabolic Rate in Chronic Haemodialysis Patients
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The estimation of energy requirements in chronic haemodialysis patients can be improved by the development of a disease-specific equation to predict basal metabolic rate (BMR) based on individual characteristics. On the other hand, the usefulness in improving the prediction accuracy of simple measures of body composition, such as those obtained by bioimpedance analysis (BIA), remains uncertain.

Until now we have studied 11 male chronic haemodialysis patients [age 44.6 ± 7.4 y; weight 74.9 ± 11.1 kg; body mass index (weight/height2) 25.7 ± 3.5 kg/m²], 12–14 h after mid-week treatment.
BMR was measured by indirect calorimetry in standardised conditions. As potential predictors of BMR the following variables were considered: 1) individual characteristics: age, height, weight and body mass index; 2) single-frequency BIA measures as such: resistance, reactance, bioimpedance index (weight/resistance), bioimpedance index (weight/reactance) and phase angle. Linear correlation and regression analysis were used for statistical analysis.

In the patients studied resistance was 537 ± 33 ohm, bioimpedance index 56.2 ± 3.3 cm²/ohm, and phase angle 7.6 ± 1.2 degrees. BMR (min 1,308, max 2,141, mean 1,719 kcal/day) was correlated (p < 0.025) with weight, body mass index, and most BIA variables, but not with age and height.

Multiple regression analysis led to the following equations:

1) Considering individual characteristics:
   BMR (kcal/day) = 14.6 × weight + 628 (SEE 160, R² = 0.53), with weight as the only significant predictor;

2) Considering BIA variables plus weight:
   BMR (kcal/day) = 15.9 × bioimpedance index + 826 (SEE 146, R² = 0.61), with bioimpedance index as the only significant predictor.

These preliminary data suggest that in chronic haemodialysis patients BMR can be predicted using either weight or (possibly with a better accuracy) the bioimpedance index.

Conclusions: ANST and NRA are sensitive screening methods, though NRA sets up boundaries for nutritional intervention. SGA identifies patients at high nutritional risk and evaluates nutritional status; weight loss ≥10% was once again the best method that effectively detected mild to extreme nutritional changes.

PS.B16

Resting Metabolic Rate in Patients with Severe Emphysema Before and After Lung Volume Reduction Surgery

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Resting metabolic rate (RMR) is increased in severe emphysema. Lung volume reduction surgery (LVRS) proved effective therapy in palliating symptoms and improving functionality. The aims of our study is to evaluate changes in RMR after LVRS.

Fifteen emphysematous patients (EMPH 64 ± 10 yrs, body mass index-BMI 24 ± 4 kg/m²) were compared with a homogeneous non-emphysematous population of sixteen subjects (CO 68 ± 7 yrs, BMI 26 ± 5 kg/m²). Ten patients were available for the 6-months longitudinal comparison after LVRS. RMR was measured using a whole body respiratory chamber. Anthropometric (height, weight and skinfold thickness), functional (forced expiratory volume in 1 sec) FEV1, residual volume RV, 6 min walking test) and quality of life (SF-36) measurements were also investigated.

Respect to the control the emphysematous patients show a more elevated RMR (4.56 ± 0.59 vs 4.10 ± 0.75 kJ/min; p < 0.0003) also when standardized for body weight and fat free mass (+11% at ANCOVA). Functional and quality of life parameter were accordingly lower (p < 0.0001) in the emphysematous patients. After LVRS BMI was moderately higher (EMPH 25 ± 4 vs LVRS 26 ± 5 kg/m², p = 0.005) with increment of both fat (2.2 kg, p = 0.004) and fat free mass (1.2 kg, NS). RMR is reduced after surgery (4.31 ± 0.54 kJ/min −6%) even after adjustment for FFM (−7% p < 0.05), although remain slight higher than those observed in control group. Functional, and symptomatic data showed a significant improvement.

In conclusion, we found that together with postoperative improvement of functional and symptomatic parameters also some metabolic parameters improves after LVRS, allowing some speculation of the value of RMR in emphysematous patients that will be considered during nutritional support of these patients.

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Clinical Evaluation of a New Nutritional Protocol in Comparison with Total Parenteral Nutrition in a Population of Patients who Underwent a Bone Marrow Allogenic Transplantation

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The bone marrow transplantation represents nowadays the elective therapy for many haematological tumors as leukemias, mielomas and lymphomas. The bone marrow cells could have been taken either from the patient himself (omologh transplantation) or from a compatible donor (allogenic transplantation).

Our institution is routinely involved in the nutritional management of these patients in order to provide adequate nutrition in a qualitative-quantitative evaluation and as reduced as possible low antigenic stimulation. The total parenteral nutrition (TPN) represents the elective nutritional therapy who respects these parameters.

13 consecutive patients underwent an allogenic bone marrow transplantation and were managed by a doctor and a nurse specialists. Clinical nutrition before the transplantation, during the stay in the hospital and after discharge from the haematological unit.

The patients were scheduled to regular evaluations with the aim to avoid TPN and to realize a "tailored" nutritional program less invasive and expensive.

We started our cooperative study in May 2002 and 8/13 patients (61.5%) maintained a good performance and nutritional status without TPN. 2 out of these patients got a nutritional supplementation with glutamine to improve the wellness of the gastrointestinal mucosa.

In the remaining 5 patients, 2 remained on TPN just for few days and only 3 needed a full TPN protocol.

Conclusions: Our alternative nutritional protocol represented a valid alternative to TPN, presented a better compliance by the patients with a good improvement in their quality of life, had an easy application at home after the discharge from the hospital and provided a reduction of the sanitary cost of €10.700 for each patient.

Nutritional Risk and Malnutrition Affect Quality of Life in Haemodialysis Patients

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Rationale: Protein-energy malnutrition is a common phenomenon in chronic haemodialysis that may worsen patients’ Quality of Life (QoL). This study aimed at assessing the relationships between nutritional status, nutritional risk and QoL in chronic haemodialysis patients.

Methods: This prospective cross-sectional study evaluated 60 adult renal failure patients, 36M:24F, age 57.0 ± 18.2 (21–89) years, undergoing chronic haemodialysis (range: 1 month–26 years). Nutritional status was assessed by body mass index and percentage of weight loss since haemodialysis; BAPEN’s Malnutrition Screening score assessed nutritional risk. The multidimensional EuroQol Instrument evaluated QoL dimensions: mobility, self-care, activities, pain/discomfort, anxiety/depression, and an overall health visual analogue scale.

Results: Significant weight loss was observed in 52% of patients; overall 50% were at nutritional risk, 63% (19/60) of whom at high risk. Worse QoL dimension scores were associated with weight loss ≥10% and moderate/high nutritional risk: mobility, p = 0.05 and 0.06, respectively; anxiety/depression, p = 0.03 and 0.04, respectively and usual activities, p = 0.005 and 0.01, respectively. Weight loss and moderate/high nutritional risk were also associated with worse overall health, p = 0.02 and 0.04, respectively. There was no association between body mass index and QoL.

Conclusions: Nutritional deterioration was prevalent in haemodialysis patients; weight loss ≥10% and BAPEN’s screening score did effectively detect nutritional changes that were associated with poorer functional and psychological status. Both nutritional assessment methods should be part of routine clinical practice to identify patients requiring nutritional intervention, thus preventing further nutritional deterioration and henceforth likely to improve their QoL.

Bioelectrical Analysis in HIV Patients Under Antiretroviral Therapy

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HIV induces nutritional status and body composition impairment together with the progression of the disease towards the more severe phases of immunodeficiency. Highly Active Antiretroviral Therapy (HAART) dramatically changed the clinical picture by immunocompetence restoring and viral replication controlling, with prolonged well-being periods and weight gain. It is uncertain if the duration of immune deficiency status before HAART can bring to persistent body composition alterations after immune restoration and viral replication control. Aim of the study was to investigate bioelectrical changes in immunorestored, virologically controlled with HAART patients. 634 HIV patients were studied; 56 (M/F = 27/29) immunorestored (nadir CD4/CD4 <0.8) and virologically controlled (viral load <80 copies/ml) patients were stratified according to disease duration in three groups (≤5 years n = 27; 5–10 years n = 15; ≥10 years n = 14). Anthropometric (W, H) and bioelectrical (R, Xc) measurement were performed; BMI, pA, R/H, Xc/H were derived. Data were compared with those of a control group (n = 60; M/F = 30/30).

Specific infection parameters (CD4 cells, CD4 nadir-lowest value cells count-gain from nadir to visit value, HIV-Ab first diagnosis time, HIV plasma RNA) were examined. Anthropometric (W, H) and bioelectrical features (R, Xc, pA, R/H, Xc/H) did not differ significantly between HIV and controls. An inverse correlation was found between Xc, Xc/H and R/H and viral load (p < 0.001). In immunorestored and virologically controlled by HAART HIV patients,
a previous prolonged infection/immunodeficiency status (as indicated by duration of disease and nadir CD4/visit CD4) do not seem to bring bioelectrical data impairment. Furthermore BIA parameters, suggestive of a good nutritional status are related to the lowest viral load. We can conclude that both immunological function and viral replication control, achieved by HAART, are associated to a balance of body fluids suggestive of a good nutritional disease duration, independently from the disease duration.

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**PS.B20**  
**Adequacy and Failure of Nutritional Assessment Methods in Cancer**  
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**Background and Aims:** Valid nutritional screening and assessment is key for appropriate nutritional intervention. The aim of this prospective cross-sectional study was to investigate relations/association between clinical and anthropometrical data, in order to identify a feasible and sensitive/specific method to assess nutritional risk and/or status for routine practice in cancer patients.

**Methods:** Over 8 months, 78 patients, 53M:25F, age 62.7 ± 9.8 (32–79) years, with cancer of the head-neck (6), oesophagus (3), stomach (9), colon/rectum (39), breast (1) and distant metastases (20) were evaluated. Nutritional evaluation comprised anthropometrical data categorised according to McWhirter’s criteria, Ottery’s Patient-Generated Subjective Global Assessment (PG-SGA) and percentage of weight loss in the previous 6 months.

**Results:** Relative to categorised anthropometrical data, weight loss ≥10% showed a consistently superior performance and the highest significant associations with clinical variables, cancer staging (p = 0.001), location (p = 0.003), duration of the disease (0.05) and nutritional intake (0.03), followed closely by PG-SGA, which showed on average a 3% decrease in the significance of the above mentioned associations. PG-SGA had a very high sensitivity (90%) and specificity (95%) and a strong capacity to detect patients at nutritional risk vs the sensitivity = 27% and specificity = 40% of anthropometrical methods, with the exception of mid-arm circumference (sensitivity = 57%, specificity = 71%).

**Conclusions:** Although weight loss ≥10% is a sensitive and specific tool to screen and identify malnutrition, in cancer patients PG-SGA sets up boundaries for nutritional therapy, thus optimising the efficacy of nutritional assessment and support. In a busy clinic, the simple and quick to obtain mid-arm circumference may become the basic nutritional assessment tool.

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**PS.B21**  
**Nutrients do Play a Role in the Quality of Life of Haemodialysis Patients**  
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**Introduction:** In chronic haemodialysis, adequate nutritional care is key to minimise excessive catabolism and overall deterioration, and may improve patients’ Quality of Life (QoL).

**Aim:** To investigate the association between nutritional intake and QoL in patients undergoing haemodialysis.

**Methods:** This prospective cross-sectional study evaluated 60 chronic renal failure patients, 36M:24F, age 57.0 ± 18.2 (21–89) years, undergoing haemodialysis (range: 1 month–26 years). Data collected comprised: diet history further analysed to detail nutrient intake (DIETPLAN5 2002, UK), micronutrient supplementation, and the multidimensional EuroQol Instrument to evaluate QoL dimensions: mobility, self-care, activities, pain/discomfort, anxiety/depression, and an overall health visual analogue scale.

**Results:** On average, protein intake was lower than recommended in 58% of patients (p = 0.01), as well as for 2 or more micronutrients in 92% of patients, p ≤ 0.01. Worse QoL dimension scores and overall health were associated with deficient protein intake (p < 0.0001); energy deficit was significantly associated with poorer performance of usual activities (p = 0.02), but did not reach significance with overall health, p = 0.07. Worse anxiety/depression were associated with selenium (p = 0.001) and vitamin C deficits (p = 0.05); poorer performance in usual activities was significantly associated with zinc and vitamin B12 deficits (p = 0.05), not reaching significance with reduced iron intake, p = 0.07. Worse overall health scores were associated with deficient intake of zinc (p = 0.04), selenium (p = 0.05), vitamin C (p = 0.03) and vitamin B12 (p = 0.03), not reaching significance with iron, p = 0.06.

**Conclusions:** Protein, antioxidants and key micronutrients involved in protein metabolism, did exert a major effect on patients’ Quality of Life. Given the prevalence of nutrient deficits, the ensuing impaired functional capacity is likely to compromise QoL, thus timely nutrition is warranted.

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**PS.B22**  
**Nutrition Weighs on Quality of Life in Haemodialysis Patients**  
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**Rationale:** In patients with renal failure under chronic haemodialysis we have previously shown that Quality of Life (QoL) is influenced by nutrition. This study further investigates the inter-relationships and relative contributions of disease and nutrition on QoL.

**Methods:** Data in 60 adult patients comprised: co-morbidities (multiple medicines, other chronic diseases), duration of renal failure and of haemodialysis (months), weight changes since haemodialysis,
Dietary Predictors of Schizophrenia and Depression

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The mental disorders of schizophrenia and depression show some characteristics of the metabolic syndrome including insulin resistance and an increased risk of diabetes and coronary heart disease. The prognosis of schizophrenia and the prevalence of depression show considerable international variation, in a manner which parallels that of diabetes and coronary heart disease. It can therefore be hypothesised that nutritional factors may have a strong influence not only on the physical disorders of the metabolic syndrome but also on schizophrenia and depression. In a cross-national ecological analysis, it was found that international variations in the outcome of schizophrenia were predicted primarily by variations in dietary sugar consumption (detrimental effect) and also by dietary consumption of meat and dairy products (detrimental effect) and of pulses (beneficial effect). International variations in the prevalence of depression were primarily predicted by dietary intake of fish and seafood (beneficial effect) and also by dietary intake of dairy products and sugar (detrimental effect) and dietary intake of starchy roots (beneficial effect). Thus, predictors of mental health prevalence and outcome echo those which are relevant to diabetes and heart disease. Our group and others have shown that tissue levels and dietary intake of omega-3 fatty acids are reduced in individuals suffering from depression and that treatment with eicosapentaenic acid (EPA) relieves the symptoms of depression. EPA treatment also leads to modest improvement in schizophrenic symptoms. The use of other nutritional approaches to schizophrenia, including reduced dietary sugar intake, have been reported anecdotally to be successful but never subjected to controlled clinical evaluation.
Laparoscopic Gastric Banding in Morbidly Obese Adolescents

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Background: The member of morbidly obese adolescents which are totally resistant against all conservative weight reducing regimen is dramatically increasing. Out from approximately 100 morbidly obese adolescents (BMI >99th, comorbidity) we had to refer 5 adolescents for surgical treatment.

Patients: Since October 2002 5 male adolescents, mean age 16 years, mean initial weight 164 kg, mean initial BMI 49, were selected for surgery. All of them were obese since their childhood and belonged to an overweight burdened family. 3 of them already showed signs of steatosis hepatis, 2 had hypertension. They got treatments like protein modified fasting cure, dietary and medicinal therapy and psychological help over several years without any success.

Objectives: Is the LGB as ultima ratio an effective and safe method in morbidly obese adolescents?

Methods: An own multidisciplinary team (pediatrician, psychologist, surgeon, dietitian) was established to get final decision for surgery. The surgical procedure was a laparoscopic vertical banded gastroplasty.

Results: The surgical procedure has been performed without any complications. Afterwards a continuous dietary and medical counseling has been performed. Mean weight loss one month after the surgery is 8 kg. All patients reported a markedly reduced hunger after surgery and felt happy about the fact that they were able to loose weight easily for the first time. Two patients have been followed 6 months and lost 20 kg on average.

Discussion: These data and our preliminary experience show that LGB seems to be an appropriate procedure to combat excessive obesity in adolescents. Longterm follow up will be necessary to evaluate the effect of this type of treatment.

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per day is still below the recommendation of five servings in most European countries. Could the consumption of vegetables soups contribute to the daily intake of vegetables? The most straightforward way to do this is to convert the amount of raw vegetables used in the preparation of the soups into the number of servings. This definition does, however, provide little information about whether micronutrients present in the vegetables are preserved during the production process. More detailed information on the micronutrient composition in vegetable soups is desirable as this will further strengthen the idea that processed food can potentially be equally valuable compared to fresh sources to contribute towards achieving ‘Five-a-Day’. The aim of the present study was to evaluate the antioxidant content and to characterise the antioxidant profile present in vegetable soups. We report the analysis of water- and fat-soluble antioxidants present in vegetable soups. Furthermore, we measured the total antioxidant capacity of the soups (TEAC measurement). We compared the TEAC-values and the antioxidant concentrations in the soups with the values of an ‘average’ raw and cooked vegetable. The findings demonstrate that vegetable soups are rich in antioxidants and that all soups investigated provide per serving at least one serving of vegetables based on antioxidant content. Further research is necessary to evaluate the amount of other valuable (micro) nutrients of vegetables in the soups, such as fiber, folate and potassium.

PS.C3
Vitamin B-12 Status in Women Following Plant-Centered or Western Type Diets Mainly Depends on Dairy Consumption

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The growing evidence about favorable health effects of plant-centered diets raises the question about their long-term effect on vitamin B-12 status of women meeting preventive nutrition recommendations. In a cross sectional study, 103 ovo-lacto vegetarians and 120 low-meat eaters (plant-centered diets) were compared to 122 women eating a Western type diet (control group). Those healthy women were aged 25–66 years and on their diet for at least 5 years. Dietary intake was assessed by a 7-day food record and vitamin B-12 status by plasma vitamin B-12 concentrations. The ovo-lacto vegetarians and low-meat eaters consumed more fruits, vegetables, and whole grain products, but less foods of animal origin than the control group. Correspondingly, mean vitamin B-12 intakes and plasma vitamin B-12 concentrations were highest in the control group, followed by low-meat eaters and ovo-lacto vegetarians. Plasma vitamin B-12 concentrations below 150 pmol/L were observed in 11.5% of the control group, 22.5% of the low-meat eaters and 41.7% of the ovo-lacto vegetarians. Ovo-lacto vegetarians reaching an adequate vitamin B-12 status (>250 pmol/L) had a total vitamin B-12 intake of 2.4 µg/d, low-meat eaters of 3.5 µg/d, the control group of 6.2 µg/d. However, the intake through dairy was similar for all subgroups with adequate vitamin B-12 status (about 2 µg/d). In the ovo-lacto vegetarians and control group the consumption of dairy, but not of other vitamin B-12 sources, was significantly higher in the subgroups with adequate plasma concentrations than in those with a lower status (p = 0.074, p = 0.022, respectively). The risk for low vitamin B-12 concentrations is higher with plant-centered diets than with a Western type diet. However, an adequate vitamin B-12 status may be reached, regardless of the diet, provided dairy consumption is sufficient.

PS.C4
Ghrelin and Appetite Responses After Liquid Breakfasts Varying in Energy Content and Carbohydrate Structure

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Plasma concentration of ghrelin, an orexigenic gastric hormone, rises shortly before each meal and decreases immediately after starting a meal (Cummings, et al. NEJM 2002;346:1623–1630). This suggests that ghrelin plays a role in meal initiation. Nevertheless, the role of ghrelin in the regulation of food intake remains largely unknown. We investigated the effects of energy content and carbohydrate structure on plasma ghrelin concentrations and subjective appetite. In a double blind, randomized and cross-over design, the four-hour post-prandial appetite and ghrelin responses to three liquid breakfasts and water (the control for volume) were examined. Twenty healthy, non-obese men consumed the four liquids differing in energy content and in carbohydrate structure (CH) (0 kJ, 675 kJ (simple CH), 2,688 kJ (simple CH), 2,688 kJ (complex CH)). Ghrelin concentrations showed a fast decrease of at least 33% after the high-energetic breakfasts, a fast decrease of 17% after the low-energetic breakfast and a gradual increase of 10% after water intake. Plasma ghrelin concentrations were significantly correlated with subjective measures of appetite (R > 0.75; P < 0.05). In conclusion, ghrelin concentrations respond rapidly and in a dose-dependent way to energy intake, independent of carbohydrate structure and volume. Ghrelin concentrations are significantly correlated to measures of subjective appetite. These data further substantiate that ghrelin plays a pivotal role in meal initiation.

PS.C5
Can Food Supplies Meet Nutritional Targets?

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Introduction: Public health nutrition policies are usually evaluated using demand-side figures, such as food purchase or dietary surveys of population groups. Such surveys are costly to mount and are done only once every few years. An alternative approach using supply-side figures provides a year-by-year account of dietary trends and also draws attention to food supply policies rather than food choices or health education.

Methods: Annual tables from the OECD and the FAO were used to make estimates of the trends in total fat, saturated fat and fruit and...
vegetables being provided to national populations. Estimates were made of the supplies needed theoretically to meet the population dietary targets, based on WHO dietary recommendations for Europe. These estimates were compared with the amounts being supplied, and the discrepancies plotted as trends across time.

Results: Discrepancies between supplies and nutritional needs vary by country and by European region. In several countries of southern Europe fruit and vegetable supplies may be adequate to meet nutritional targets but an over-supply of saturated fats has emerged. In much of northern Europe the supply of fruit and vegetables fails to meet target levels, and saturated fat supplies are excessive. A comparison of supply-side and demand-side estimates of dietary patterns show that both approaches reflect the failure to meet national nutritional targets.

Conclusions: Subject to certain caveats, supply figures can be used to show whether national populations can meet dietary targets, or are likely to fail to meet the targets. The data are available on an annual basis and are thus a valuable adjunct to food consumption surveys. Supply-side figures help to highlight the agricultural and trade policies that urgently need attention in order to improve public health.

**PS.C6**

**Nutritional Status and Dietary Habits of Schoolchildren in Croatia**

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**Aim:** To assess nutritional status and dietary habits of schoolchildren in Croatia.

**Sample and Methods:** Cross sectional nutritional survey was conducted in a random selected schools from ten counties and 4,628 schoolchildren were examined between 1997 and 2001. The nutritional status of schoolchildren was assessed based on their anthropometric measurements and the following anthropometric indexes: height for age, weight for height, body mass index by age and sex compared to the NCHS/WHO reference values. For the food consumption and dietary habits assessment, 24-hour recall was applied.

**Results:** According to the weight-for-height index, 70.5% of children in Croatia are properly nourished, only 1% being undernourished. Similarly as in reference population, body weight was below the expected in 13.9% of the pupils. Increased body weight was found in 10.6% of the children and obesity in 3.8% of the children. BMI > 95 percentile had 5.7% boys and 5.4% of girls. While compared with the reference population, the average height-for-age values were higher in about 15% of examined schoolchildren. There were notable interregional differences, especially between Dalmatia where children were taller in size then in continental northwest region. Despite the satisfactory average daily intake of energy, respectively total amount of food and basic nutrients in most children, the average intakes of vitamin A, calcium and iron were below the recommended levels for schoolchildren.

**Conclusions:** Insufficient intake of some nutrients can be explainable due to the present socioeconomic conditions and also largely to the poor dietary habits. Most of the schoolchildren are well-nourished. It is evident that the prevalence of obesity is steadily arising.
**Aims:** Nutrition Unit and Paediatrics Unit need to develop guidelines for pre-school meals as well as school children including energy and nutrient recommendation as well as for which kind of foods should be served and how much. Each municipality of Modena has been informed about our purpose and has been encouraged to send us every school’s menu (not only pre-school menu). Particularly we support the Mediterranean Diet like a balanced diet, where energy and nutrient requirements can be found eating a variety of foods from different food groups.

**Results:** The first year of work permitted to the Nutrition Unit, to evaluate 113 schools menu, and to give 113 answers about them where we have promoted a balanced diet for public meal at school.

**Conclusions:** This work found a great interest by parents, personnel responsible for childcare as well as public authorities and local representative mass catering sectors. We believe that the school’s meal for infant and children is a really important educational moment and we want to emphasize the importance of children’s food habits in the public health promotion.

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**PS.C9**

**Food Habits in Belgian Pre-School Children**

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**Objective:** To assess the food intake of pre-school children and to compare these results with the Flemish Food Based Dietary Guidelines.

**Design:** A semi-quantitative FFQ, using parents as a proxy.

**Subjects:** In the fall of 2002, fifty Flemish nursery schools were randomly selected, yielding a total of 2,426 children aged 3–6 years. Of these, 1,819 valid questionnaires (918 boys and 901 girls) were collected and analysed (Participation of 76%).

**Results:** The proportion of children who did not eat breakfast daily was 19.4%. Of these, 4.9% only took breakfast once a week. An important group of children (41.4%) took less than 1–2 pieces of fruit daily. Results for vegetables were even worse, 52.1% of the children took less than the minimum daily recommendation of 100 g. Most of the children (77.5%) ate 1–4 pieces of starch products (potatoes, rice, pasta) as recommended and 20.8% ate more than 200 g of these products. In contrast, a large group of children (57.6%) did not reach the recommendation of 3–5 slices of bread daily. In contrast with a high meat consumption, fish was consumed rarely (20.3% ate never fish and 54.6% ate less than the minimum recommendation of 7.1 g weekly). More than half the children (58.8%) did not reach the daily recommendation of 3–4 glasses of milk (products). Not a negligible group of children (51.5%) drank more than 200 ml sugar rich drinks (fruit juice included) each day and 15.5% of these drunk even more than 500 ml each day.

**Conclusion:** The results suggest that a large group of pre-school children does not correspond with the Food Based Dietary Guidelines.

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**PS.C10**

**Do Economic Constraints Lead to the Selection of Energy Dense Diets?**

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**Aims:** To test the hypothesis that lower ED diets are associated with higher diet costs than high ED diets and to investigate the potential causal direction of this relationship.

**Methods:** The ED (MJ/kg) and cost (€/d) of usual food intakes of 837 adults were estimated using the mean retail price of foods and dietary data collected in a cross-sectional survey in the Paris area. The relation between diet cost and ED was assessed on observed diets by classical correlation analysis. Then, isocaloric food baskets fulfilling palatability constraints, while minimizing total departure from the average French diet were obtained by linear programming analysis. To determine if a reduction in diet costs increases dietary ED by necessity, the impacts of cost on ED and of ED on cost were explored by introducing and strengthening first a constraint on cost and then a constraint on ED.

**Results:** The average French diet had an ED of 6.08 KJ/g and 5.39 KJ/g and a cost of 5.31 €/d and 4.31 €/d for men and women, respectively. Within each quintile of energy intake, the cost of the observed diets increased as their ED decreased. The lowest cost achievable food baskets had an ED of 9.00 KJ/g and 8.34 KJ/g and a cost of 2.52 €/d and 1.78 €/d for men and women, respectively. Within a realistic ED range, the impact of cost on ED was much greater than the impact of ED on cost.

**Conclusions:** These results show that high ED diets cost less than low ED diets. Moreover, they suggest that people who want to maintain familiar dietary patterns on a low food budget will preferentially select an energy dense diet. This may have a negative impact on health given the increased risks of obesity associated with the consumption of energy dense diets.

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**PS.C11**

**Simulated Dioxin Exposure in a Scenario of Recommended Fish Intake**

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**Background:** Consumption of fish has been associated with favourable effects on human health, mainly through its rich content of long-chain n-3 PUFA. There is however accumulating evidence for substantial chemical contamination of the marine food chain.

**Objective:** To study the potential intake of dioxins in Belgian teenagers under the assumption that dietary guidelines for n-3 fatty acids (FA) are met solely through fish consumption.
Methods: An existing database with 7 day food record data from 341 Flemish teenagers was used as the basis for this scenario research. Guidelines on n-3 intake – expressed as energy percentage – were applied to caloric needs on individual level and were translated to necessary individual daily intakes of fat from different types of fish. These data were then linked to fish contamination data for dioxins and dioxin-like PCB’s on the basis of probabilistic techniques (Monte Carlo simulations).

Results: Under conditions of observed fish intake, less than 20% of the adolescents had dioxin intakes from fish above 1 pg TEQ/kgBW/d and less than 25% had overall intakes above 4 pg TEQ/kgBW/d (WHO upper limit). Under simulated conditions, taking into account recommended fish intake for n-3 FA needs, over 90% of the population had intakes above 1 pg TEQ/kgBW/d from fish leading to an overall intake above 4 pg in 55% of the population. These figures increased further to 100%, respectively 70% if fatty fish was entered as the main source of n-3 long chain PUFA’s.

Conclusions: It is concluded from these data that – in view of the current contamination data – intake of fish as a source of n-3 long chain PUFA’s can lead to intakes of dioxins above safety limits in a substantial part of the population.

PS.C12
Trends in Meal Patterns in Germany – Comparison of Surveys from 1995 till 2003
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Food and beverage intakes have spatio-temporal structures. Main events of eating are called meals. Their distribution over the time of the day has relations to culture and life-style, but also to physiology and health.

Objectives: The knowledge of meal patterns in Germany is scanty. There is no current national dietary survey in Germany on this topic. Food marketing studies report on disintegration of traditional meals. Our study tries to verify if.

Method: The same questions on meals were part of three omnibus-surveys in Germany. The first one was carried out in September 1995 (N = 1,250), the second one in November 1997 (N = 2,000) and the third one in November 2002 (N = 2,002) in representative samples for German population.

Results: Despite of observable tendency towards disaggregation of meal patterns most of the Germans still have at least three main meals per day: first breakfast, lunch and dinner. As a fourth meal, afternoon tea or coffee is the most common occasion, especially on weekends. During working days for the working population a second breakfast on the working place is common. Snacking is not regular in average, but in certain segments of the population. The evening meal (supper/dinner) is the most regularly meal. But asking people what is for them the main meal, the answer is: Lunch is the main meal for the average German, especially on weekends.

PS.C13
Explaining the Discrepancy Between Nutritional Recommendations and Food Practices: A Contribution of Risk Sociology
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The persistence of malnutrition problems in developing countries and the outbreak of food-related diseases in the world attest the limited impact of the political measures. The gap between experts’ recommendations in nutrition and food practices does not seem to be due to a lack of knowledge, in most cases. Therefore, other hypotheses have to be found. Our article explores two paths of potential explanation.

Our first explanatory hypotheses are to be found in the analysis of the relationships between risk and behaviour. For instance, some individuals would not perceive risk caused by inadequate diet or would be overly optimistic about their risk control potential; this overconfidence could block the risk awareness process. Conversely, some consumers would be conscious of the risk but would accept it because of socio-cultural or hedonic factors; they also might have to because of economic constraints. Consequently, attitudes to nutrition would not lead to changes in behaviour. Furthermore, it would appear that the subjects may build a mental protection against risk; this means that they associate the risk to another group than theirs, considering themselves not exposed to the risk. It is a form of risk deny.

The second explanatory path we explore concerns the study of risk perception divergences between risk management experts and the profanes. Scientists generally qualify the public perception of risk as ‘irrational’, as it differs from their own probabilistic and ‘objective’ perception. But the integration in risk perception evaluation of individual perceptions, which are social, heavily influenced by beliefs and subjectivity, would seem to offer a means of improving risk food management.

On the basis of these analyses, new paths as regards to nutritional politics can be put forward.

PS.C14
Vegetable Consumption and Number of Main Meals at Findiet 2002 Study
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Aim: We studied meal patterns and food selection in main meals and snacking in Finnish adults. The aim was to probe connections between consumption of vegetables and pattern of main meals per day.

Material and Methods: A dietary survey was introduced to 2002 Finnish adults in the national dietary survey. Dietary data was collected with a computer-assisted 48-h recall interview. Data collection for every meal started with definition of meal, time and place of the meal and continued with details of food descriptions and amounts consumed. Meal pattern was determined with count of main meals per day, and energy content of meals.
**Results:** The average number of meal events was about 6 for adults. Mostly one main meal (lunch or dinner) was eaten daily. The total daily energy intake was higher with two main meals compared to subjects with one main meal. The average energy intake per one main meal was 39% from total energy intake in men (n = 374) and 36% in women (n = 450), and per two main meals 62% in men (n = 250) and 57% in women (n = 310). The food selection in main meals emphasised traditional dishes like potatoes and meat, but a newer tradition of vegetable salads was common. Vegetable salads were mainly consumed in main meals (92% of total consumption in men, 90% in women). A higher proportion of rye bread was consumed in main meals than that of wheat bread. Fruit consumption was mainly connected with other eating events, only 20% of total fruit consumption appeared in main meals.

**Conclusions:** The Finnish main meals seem to have lost dessert traditions with fruit or berry desserts. Dietary recommendations for portions of vegetables and fruit can be achieved only by increasing traditions with fruit or berry desserts. Dietary recommendations for 5 portions of vegetables and fruit can be achieved only by increasing consumption in other eating events than main meals.

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**PS.C15**

**Food Consumption Patterns in the Polish Households**

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Consumer behaviour, consumption patterns and socioeconomic factors influencing them are the basic elements of consumer science. In market economies consumer is in the central point. Food consumption levels and their trends become very important for the country. During transition period in Poland since 1989 the food consumption patterns underwent significant changes. At present, the structure of food consumption is highly diversified in different groups of society. It is reflected in the differences of the average monthly per capita consumption of basic foodstuffs. Households with the highest income level consume more meat, fruit and vegetables than the poorest households’ group. Individual food consumption depends on age, place of living, structure of households, income, previous and current level of savings. In 1999 the share of food in households’ budget was 33%. It was very high compared with European developed countries. In Poland food still accounted for the largest share of consumption. Own empirical research was carried out in 2000 on 500 households sample from selected cities and rural areas. Interviews were conducted using a questionnaire asking about the changes in food consumption during the last 3 years. The results of the research brought new data. More than 50% of population concluded that in Polish households the food expenditures increased. Households consisting of 5 to 6 persons and households with lower level of income declared higher food expenditures. At the end of the XX century about 60% of respondents noticed improvement of the food quality. The respondents bought food products in various places. The majority of them (64%) did their food shopping in the neighbouring small stores, 26% in supermarkets and about 10% at the local market. Richer, better educated and younger respondents preferred shopping in the bigger centers.

In the perspective of Poland’s accession to the European Union the respondents expected improvement of the fulfillment of food needs and further changes in consumption patterns.

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**PS.C16**

**7-year Trends in Food Intake in the EPIC-Potsdam Study**

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**Objective:** Most likely repeated dietary assessments show changes in food intake over time. However, the interpretation of detected changes is difficult as it remains unclear if these are due to aging of populations or reflect overall trends. In this context we analysed repeated dietary assessments in the EPIC-Potsdam Study.

**Methods:** Longitudinal and cross-sectional data were used to differentiate age and period effects in the EPIC-Potsdam cohort. 512 study participants (230 men, 282 women, ages 30 to 66) with baseline examinations in 1994/95 repeated the food frequency questionnaire in 2002. Mean differences in intake were calculated and tested with the paired difference t-test to investigate age effects. A random sample out of the baseline cohort was matched to the age distribution of the 512 as it was in 2002 to analyse period effects. Food intake data were compared usinganova and tested for differences in intake adjusted for age, occupation, education and smoking status.

**Results:** The longitudinal comparison showed increased consumption of water, juices (women), herbal/fruit tea, fish and whole grain bread on the expense of other bread. Consumption of coffee and black tea, fat spreads, meat (women) and processed meat (women) decreased. The comparison of cross-sectional data of the age and sex matched samples in 1994/95 and 2002 confirmed most of these changes not to be due to age only.

**Conclusions:** The changes in food intake in the population based EPIC-Potsdam cohort seem to reflect an overall trend independent of participants’ ages. Repeated dietary assessments are useful and important to monitor such trends in cohort studies.

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**PS.C17**

**Drinking and Some Nutritional Habits of High School Students**

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In a prospective clinical research the drinking and some nutritional habits of high school students were studied. The research that included 94 high school students (61 female, 33 male) with the average age of 17.8 ± 0.8 years was carried out in two parts. In the first part the basic data on the students according their nutrition, family background, habits and general health condition were acquired with a questionnaire. In the second part of the research the exact data on the drinking habits in the school time (forenoon) were collected, and on the same day additional tests of the morning and noon urine were performed.
On average, high school students drank 14.5 dL of fluid per day; male students drank insignificantly more fluid (15.8 dL) than female (13.8 dL). The students drank mostly tap water, followed by clear fruit juice, milk with 1.6% fat, ice tea, milk with 3.2% fat, natural mineral water, bottled spring water, orange juice, … Male high school students drank more milk and tap water than female, while females drank more bottled spring water, clear fruit juice and coffee. From fruits students mostly consumed bananas, apples, oranges, strawberries, mandarins, peaches, apricots, grapes, … From vegetables most common were potatoes, green salad, tomatoes, cucumbers, paprika, … Based on the acquired results it can be concluded that the investigated high school students drank too low quantities of fluids and they were mildly to moderately chronically dehydrated. It would be necessary to increase the input of total fluids, especially of milk, water and sugarfree fluids.

PS.C18
Determinants of Salt Consumption Habits among Young Finnish Adults
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For decades, health professionals have put great emphasis on reducing salt consumption in Finland. Strategies have included i.a. nutrition education and informative food labeling. The aim of this study was to investigate salt consumption behaviour and its determinants and associates in different socio-demographic groups among young Finnish adults.

The study was carried out as a part of The Cardiovascular Risk of Young Finns, a longitudinal project on coronary heart disease risk factors and their determinants among children, adolescents and young adults in Finland. At the latest follow-up in 2001, in total 2,540 men and women (24 to 39 year old) filled in questionnaires about their food habits, including several questions about salt consumption habits, other health behaviour, and socio-demographic factors.

We found no differences between men and women in salt consumption habits. Well educated subjects reported significantly lower salt consumption than less educated. General health consciousness, non-smoking and infrequent alcohol consumption were associated with low-salt food choices and general tendency towards low salt consumption. Subjects reporting frequent use of meat dishes, cold cuts and French fries made less often conscious choices to keep salt consumption low than did the others.

Those who were unconcerned about salt consumption were often unconcerned also about other health habits. These results suggest that there is a small but noteworthy minority (an estimated 10–15%) that seems to have indifferent attitudes towards health promoting behaviour in general. Health education professionals may need to consider unconventional strategies to reach these people who have a greatly increased risk of developing CVD or other diseases.

PS.C19
The Position of Fruits and Vegetables in the Diet of German School Children – Results of Several Case Studies
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The dietary goals aim an increase in consumption of fruits and vegetables in industrialised countries. Only a minority of the German consumers eat ‘5aDay’, also in the young generation. Since food habits are formed in childhood, it is important to emphasise nutrition program for children. For implementation of such programs current knowledge of fruit and vegetable related food habits and attitudes is needed. Since there is insufficient and sparse information available on this topic, case studies were carried out in the township and region of Karlsruhe, Germany. In the surveys (2000–2003) several methods were applied. In 2nd grade children mainly qualitative methods were applied and there was a longitudinal design, the observation time was 2 years (N = 104, 7–9 y ). In 4–6th grade children (extended elementary and classical grammar schools; N = 66, 9–11; N = 97 10–12 y) were semi-quantitative methods applied, e.g. 3-day diary. The results confirm other observations in Germany that in contrast to the recommendations (Optimised Mixed Diet) the children had unsatisfactory consumption of fruit and especially vegetables (less than half of the recommendation), and consumed too many animal food products and foods with high fat and sugar content. The majority of the children consume fruit and vegetables only irregularly up to once a day, if at all. The food habit in girls and in classical grammar school was better. A higher exposure with fruits and vegetables in the family home correlate to higher preference and intake by the children.

PS.C20
Dietary Change in School Children as it Relates to Acculturation Occurring in East Oxford, England
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A pilot study was conducted to better understand the process of dietary change as it relates to the acculturation process occurring among primary school children residing in the multicultural community of East Oxford, England. The sample includes children from a variety of minority immigrant populations who have been exposed to a new dominant culture and diet, and children from the majority English population exposed to new minority cultures and diets. Food diaries ranging in length from 4 to 7 days were recorded by a total of
157 children between the ages of 9 and 11 years. Focus group sessions were conducted in the classroom to ask the children about their dietary habits. Follow-up interviews were conducted on the parents of a small purposive subsample of the children, focusing on parent’s perceptions of changes in their children’s diets compared with what the parents themselves and the children’s grandparents ate. An analysis of the variety of foods being eaten by the children will be presented. Ecological data analysis techniques (similarity coefficients) borrowed from the Biological Sciences have been used in examining the effect of acculturation on dietary changes, and will be presented. Factors perceived by both the children and parents to be influencing dietary change in this setting will be summarized. Interestingly, changes are occurring among all cultural groups participating in this research; including the majority English population. The process of acculturation not only affects the diets of the minority immigrant populations, but also directly influences the diet of the majority population; increasing the potential for added diversity in the diets of everyone residing in the multicultural community.

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**PS.C21**  
**The Swedish Nutrition Recommendations Translated into Food**  
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The Swedish National Food Administration has translated the Swedish Nutrition Recommendations (SNR) into foodstuffs. The objective was to test if the SNR may be achieved in practice, but also to prepare for future food based dietary guidelines. A selection of food items, mostly raw, was taken from the Swedish Food Database, representing all food groups, based on results of food habits from two previous national food and nutrition surveys. Portion size and frequency was determined for each food item and calculated per day for energy and nutrients. Two reference energy levels were chosen, 9.1 MJ and 11.5 MJ per day, representing a woman and a man, respectively, with a PAL value of 1.6 (low physical activity and sedentary work). The list of all food group items was summarised on a daily and a weekly basis. Finally the list was turned into a four weeks menu, for both the woman and the man. All nutrients, except protein and iron fulfilled the SNR. The high iron recommendation for fertile women, and a low energy level, made it easy to exceed the protein recommendation, as both are found in same food. Additionally, the recommendation for salt was exceeded, indicating products like bread, cheese and sausages contain too much. The biggest difference between these results and those from Riksmaten 1997–98, the second national food consumption survey, was found in the consumption of fruit and vegetables. The desirable consumption should be twice as high. Other large differences seen were in the consumption of bread, sweets and snacks and the quality of fats. This work showed that the choices are limited. The recommendations for hard fat, fibre, protein and iron restrain the alternatives. Least flexible are the proportions between food groups, but within each food group the choices are more.

**PS.C22**  
**Development of a Simple Dietary Questionnaire Based on Dietary Guidelines**  
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Dietary assessment methods, such as Food Frequency Questionnaires, are used to estimate intakes of macro- and micronutrients in the population. Also, the number of people meeting the dietary recommended nutrient levels can be calculated. Increasingly, nutrient recommendations set at a population level are translated into food-based dietary guidelines. The latter can be applied at an individual level and are more easily understood by consumers. At the same time, consumers want self-assessment of their lifestyle and health, choosing the intervention themselves with support from a trusted partner (e.g. general practitioner, friend, product website or careline). This creates a need for user-friendly questionnaires, i.e. short in length, easy to understand and fill in, and with an attractive layout, with outcomes linked to personalised dietary advice. Although many questionnaires are already available especially through the worldwide web, their quality is often questionable. We sought to develop a simple but reliable dietary questionnaire based on European dietary guidelines. This approach, including strengths, weaknesses, and implementation, will be presented as well as choice of dietary guidelines for which noticeable differences exist between European countries.

**PS.C23**  
**Effects of Somatostatin (SRIF) Administration on Amino Acid Imbalanced Diet Intake and Tongue Taste Buds in Rats**  
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It has been shown that SRIF injected in the anterior piriform cortex at low doses may increase the intake of the threonin imbalanced diet (THR-IMB), while larger doses of SRIF significantly decreased intake, and the effects of injections appear to be selective for the imbalanced diet. The literature reveals that injections of SRIF showed equivocal effects on feeding and that results may depend on doses, location and methods of administration. The discrepancies might be due to peripheral effects secondary to the leakage of centrally injected SRIF into the blood circulation. Thus, the dose-dependent role of SRIF in mediating the anorectic response to amino acids deficiency might depend on likely secondary peripheral effects. The present studies were designed to evaluate a potential dose-dependent effect of SRIF administered peripherally on a THR-IMB diet intake, on body weight gain (ΔBW), gut motility, and on taste buds in rats. Results demonstrated that the subcutaneous administration of SRIF had a dual effect related to its concentration, increasing intake of a
The combination of THR-IMB diet regimen and the SRIF treatment induced significant modifications on the density and morphology of taste buds of the tongue. The feeding responses to an amino acids imbalanced diet develops a learned aversion to the diet and seems that animals use taste cues in establishing learned aversions. The modifications of taste buds of rats treated by SRIF and eating THR-IMB diet might explain the increase on the imbalanced diet intake since treated rats might perceive this food less aversive than controls.

PS.C24
Dietary Habits and Serum Fatty Acids in Children
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The associations between dietary habits and the serum pattern of fatty acids (FA) have been investigated in a school-age population. In 105 healthy 8-years old children out of a population of 171 infants enrolled at birth the nutritional habits have been evaluated by means of a Food Frequency Questionnaire and a 24-hr recall. The following food items were considered for frequency of consumption: rice, bread, pasta, olive oil, seed oil, butter, whole cow's milk, skimmed cow's milk, yoghurt, cheese, eggs, meat, poultry, fish, green vegetables, legumes, cakes and snacks. The analysis of FA was performed with capillary gas-chromatography. Fatty acids are expressed as % values through the text. Statistics: non-parametric tests. The most favourable fatty acid patterns were associated with high consumption of pasta and low intake of red meats. A high (n = 16) vs medium (n = 71) or low (n = 18) consumption of pasta was associated with lower serum levels of C18:0 and higher levels of C20:5n-3, C22:6n-3 and total polyunsaturated FA. A low (n = 31) vs medium (n = 48) or high (n = 26) meat consumption was associated with lower serum levels of total saturated FA and higher levels of monounsaturated FA. The children with high pasta and low meat consumption (n = 9) compared with the others (n = 96) showed lower levels of total saturated (29, SD 4, vs 35, SD 2) and higher levels of total monounsaturated (31, SD 6, vs 24, SD 4) FA in serum (P = 0.001 and P = 0.04, respectively). A high consumption of pasta coupled with a low intake of meat may be marker of a more favourable pattern of circulating FA.

PS.C25
Lactovegetarian Lunch as an Alternative for Ordinary School Lunch
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The vegetarian option has become more popular among Finnish adolescents. In this study an eight-week lactovegetarian menu was developed as an alternative to the ordinary school menu. The purpose of the study was to ascertain pupils’ willingness to choose the vegetarian option, reasons for their meal choice and possible extra costs of the alternative menu. A two-week vegetarian intervention was conducted at Liperi Comprehensive School in North Karelia, Finland. Altogether 193 pupils (7- to 15 years old) filled in a questionnaire that included questions about their food choices and the reasons for these choices. Data were also collected from the work-diaries of the school-kitchen staff and by observations of the researcher. Qualitative data were analysed by content analysis. Pupils chose the vegetarian meal an average of twice a week. The most common reason for choosing the vegetarian menu was the good taste. The girls chose vegetarian meals more often than boys did (p < 0.001) and their interest in eating vegetarian food increased with age (p < 0.001). The girls were more satisfied with the taste (p < 0.01) and the variety (p < 0.05) of the vegetarian meals than the boys were. However, the total satisfaction (variety, flavour, appearance, temperature, choice of foodstuffs, deliciousness) with vegetarian meals did not differ between the sexes or between age groups. Of the respondents, 53% said that in future they would like to have vegetarian meal served daily. Despite the fact that the intervention increased costs and daily work in the kitchen, the results of the study show that serving an alternative vegetarian meal at school can be a very effective way to increase vegetarian food consumption among adolescents.

PS.C26
Dietary Guidelines and Nutrient Recommendations in Europe
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Many countries within Europe have established dietary guidelines with nutrient and food recommendations. National dietary guidelines on how diets can be chosen that promote good health as well as nutritional recommendations (RDAs) on intakes of nutrients show characteristic differences. In some countries there are detailed nutrient recommendations and dietary guidelines, whereas in other countries these are very general. This overview consists of (1) existing data of dietary guidelines and nutrient recommendations for the major European Union (EU) member states and organisations and of (2) areas of consensus and major differences between these European dietary guidelines and nutrient recommendations. Out of the 16 food based dietary guidelines, four guidelines are common for EU countries: (i) eat plenty of bread and cereals; (ii) eat fruit and plenty of vegetables; (iii) eat a variety of different foods; (iv) restrict the
consumption of fat. Other guidelines have been specified by only 1 or 2 countries. With regard to nutrient-based dietary guidelines, the main differences between the major EU countries, are for the fatty acids. The composition of the fatty acids has been discussed in all of the selected countries. However, in some countries more detailed than in other countries. For the micronutrients, most of the vitamins and minerals seem to be recommended within a desirable and comparable range. This overview of EU dietary guidelines and nutrient recommendations, clearly demonstrates the complexity of nutrition policies within the EU.

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**PS.C27**

**Dietary Compliance Strategies in a Saturated Fatty Acid Exchange Study**


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Compliance with dietary advice is a major challenge in studies of free-living individuals. In the present study 48 men (>40 years) and 53 women (post-menopausal) completed an intervention to assess the relationship between palmitic and stearic fatty acids and haemostasis and vascular cell function. Subjects were randomised to one of three diets: (a) general population intake, (b) high palmitic/low stearic or (c) high stearic/low palmitic for a 14-week period. Subjects initially completed a FFQ to ascertain habitual diet; those who avoided high fat products or claimed to be non-meat eaters were excluded. Following baseline assessment (7-day dietary record) subjects were verbally instructed and given written information on (a) a background diet of 25% of saturated fat intake, (b) daily consumption of 30 g of a test spread and (c) daily allowance of baked goods (made from test spread). It was stressed that the diet should be eaten in full. Strategies to encourage compliance were personalised eating plans to maintain energy balance, multiple contacts with the dietitian, utilising social support, and self-monitoring of biscuit consumption and saturated fatty acid exchanges. Initial assessment of compliance included collection of spread tubs, 4-day dietary records and measures of weight change. Subjects who failed to achieve dietary targets were contacted to resolve problems. When estimates of energy intakes (calculated from diary records) were low, subjects were considered to be non-compliant and further counselling was provided. For post-intervention analysis purposes, compliant subjects were identified from biochemical measures of fatty acids. Preliminary analysis suggests that 98% of subjects who completed the study complied with dietary measures. In conclusion, a range of strategies, which informed, encouraged and supported subjects, were successful in attaining compliance with diets.

Funded by the Food Standards Agency, spreads supplied by Unilever.

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**PS.C28**

**Dietary Assessment in Urban Population of Tehran: Tehran Lipid and Glucose Study**

P. Mirmiran, M. Mirboloki, M. Rahmani, F. Azizi

Endocrine Research Center, Shahed Beheshti University of Medical Sciences, Tehran, Iran

This study was conducted to clarify the status of dietary intake and its association with coronary artery disease (CAD) risk factors in Tehran urban population. The status of blood pressure, dyslipoproteinemia, diabetes mellitus, and obesity was determined in 15,005 subjects selected by cluster random sampling in Tehran urban district 13 in 2001. 1,476 persons including 830 women and 646 men aged 3 to 70 years old were selected randomly for dietary assessment. Intakes were assessed by means of two 24-hour dietary recalls. Underreporting was considered as energy intake divided by basal metabolic rate <1.27. Overweight and obesity were found in 40.0 and 23.1% of subjects. The prevalence of hypertension, diabetes, high cholesterol, high triglycerides, low HDL and high LDL-cholesterol levels among the adult population were 22.9, 10.6, 23.6, 3.9, 21.1 and 22.8%, respectively. The mean ± SD values of energy intake was 2,687 ± 669 kcal/day and Underreporting of energy intake was more prevalent in women than in men (29 vs. 13%, p < 0.001). The mean percentage values of energy intake derived from carbohydrate, protein, and fat were 57.8 ± 6.9, 11.1 ± 1.8, and 30.9 ± 7.2%, respectively. Body mass index and waist to hip ratio were correlated to total energy, bread and cereals and fat and sweet groups intake. A positive association was observed between servings of fat and sweet group and fasting blood glucose, total cholesterol, LDL-cholesterol and a negative association between servings of this group and HDL-cholesterol. Serum triglycerides had positive associations with servings of bread and cereal group and negative association with vitamin C and monounsaturated fatty acid intakes. Negative association was observed between calcium and vitamin C intakes and hypertension. The high intakes of energy, fats and sweets may contribute to the high prevalence of CAD risk factors in Tehranian population.

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**PS.C29**

**Relationship Between Physical Activity, Fitness and Body Composition in 9- to 11-year-old Children**

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The aim of this study was: a) to examine the relationship between physical activity (PA), aerobic fitness (AF) and body composition, and b) to investigate the differences in PA components between obese and lean children. Anthropometric characteristics, PA and AF were assessed in 26 obese and 28 lean children (28 boys, 26 girls) aged 10.0 ± 0.7 years (mean ± SD). Body mass index (BMI), % body fat (BF), body fat mass (FM), waist to hip (W/H) and trunk to extremity
Comparative Analysis of the Consumption Pattern of Healthy Volunteers and Young Polish Cystic Fibrosis Patients

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**Aim:** The evaluation of the energy from the chosen nutrients of the daily food rations (DFR) of healthy volunteers (HV) and cystic fibrosis patients (CF).

**Material and Methods:** The evaluation of the eating patterns was carried out among 31 cystic fibrosis patients and 45 healthy volunteers. On the whole 532 food questionnaires were collected. The results were presented as arithmetic mean and standard deviation (X ± SD). The hypothesis about significant differences between gender of DFR factors analysed was tested using U Manna-Whitney test.

**Results:** The amount of the energy taken from protein, fat and carbohydrates were similar in DFR from CF and HV. In the group of the healthy people the energy percentage from fatty acids respectively of male and female group was: saturated fatty acids – 14.6 ± 3.01%, monounsaturated fatty acids – 12.5 ± 1.27%, polyunsaturated fatty acids – 4.98 ± 2.10%, linoleic acid 3.99 ± 1.32%, alpha-linolenic acid – 0.64 ± 0.29% (DFR of men) and from saturated fatty acids – 11.3 ± 3.99%, monounsaturated – 12.6 ± 4.20%, polyunsaturated fatty acids – 6.12 ± 3.10%, linoleic acid 5.24 ± 2.86%, alpha-linolenic acid – 0.79 ± 0.43% (DFR of women). In the cystic fibrosis patients’ diet the energy percentage in DFR from saturated fatty acids was 13.9 ± 2.66%, monounsaturated 12.8 ± 3.72% and polyunsaturated 4.76 ± 2.04%. Linoleic acid was the source of 3.47 ± 1.70% energy and alpha-linolenic acid – 0.57% (boys) and 4.08 ± 1.92% and 0.56 ± 0.15 (girls).

**Conclusion:** The significant statistical differences concerned fats, and specially % of energy from saturated fatty acids, polyunsaturated fatty acids and their components – linoleic acid and alpha-linolenic acid.

**Acknowledgements:** Study was supported by the State Committee for Scientific Research, Grant No. 4PO5E 061 19.
PS.C32
Snacks are Important for Food and Nutrient Intake Among Women in Rural Malawi
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Introduction: Contribution of nutrients from non-staple foods and snacks needs more focus in order to make full use of this opportunity to improve the delivery of essential nutrients.

Methods: Energy, carbohydrate, protein, fat, vitamin A, vitamin C, iron and calcium intakes of 44 Malawian women (20 lactating) aged 15–45 years were estimated using 2 days’ observed weighed food record in the period March-May 1999.

Results: The diet was based on maize and cassava products. The largest proportions of fat (33% ± 4%), vitamin C (36% ± 4%) and a large proportion of vitamin A (30% ± 4%) intakes were from foods eaten between meals such as maize cobs, tangerines and groundnuts. Forty-two percent of energy intake was from cereals and grain products. GLVs were consumed by 93% of the women and contributed with high percentages of vitamin C (45%), vitamin A (41%), calcium (18%) and iron (12%) intakes. Fewer women (82%) consumed fruits, which were the second largest contributor of vitamin C (32%) and vitamin A (9%). Ten percent of protein and fat intakes was from nuts and beans. Starchy roots and tubers contributed with the largest percentage of iron (27%) and 21% of calcium intakes. Fish contributed with the largest percentage (22%) of calcium intake.

Conclusions: Foods eaten between meals are important for nutrient adequacy since they contribute with the majority of the essential nutrients, fat, vitamin A and vitamin C. Precise methods and data analysis which enable the estimation of nutrient intakes from snacks are needed.

PS.C33
Polish Consumers Choose More Vegetables than Fruit
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Statistical data indicate that the consumption of fruit and vegetables in Poland, despite yearly fluctuations, has shown an overall increasing trend and reached, accordingly, 46 and 124 kg/person/year in 2000. Despite this tendency Poland is ranked lower than all EU-15 countries in the case of fruit consumption. In comparison, vegetable consumption remains currently on an average European level, oscillating around 120 kg/person/year. The consumption of both groups of products is characterized by high seasonal fluctuations, especially in the case of fruit. Calculation of average relative deviations and relative amplitude of variations demonstrate, however, that seasonal fluctuations are diminishing. This trend can be linked to growing import, diversification of supply and changes of nutritional habits. Analysis of data based on household budget surveys and own research indicates that in the nineties big changes in consumer preferences took place regarding species of fruit chosen. Currently, 48% of consumed fruit in Poland are apples, 22% – fruit of foreign origin, while typical for Poland berry-fruit amounts to only 11%. This situation has led to oversupply of domestically-grown fruit and problems with sales for producers. Changes in vegetable consumption are less noticeable – cabbage, onions and carrots traditionally dominate. Complex activities aimed at stabilizing the market through education and promotion of fruit consumption, especially in the off-season months are necessary. Based on experience of other countries (i.e. Scandinavian, USA) the participation in such programs of companies functioning in the supply chain is an important element of success. Integration with the EU, in which food policy is more developed and supported by budget funds, is also a chance to accelerate the needed changes on an organizational and institutional level.

PS.C34
Evaluation of Methods Estimating Individual Food Consumption from Household Budget Survey Data
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Problem: Household budget surveys (HBS) provide valuable information on food consumption of private households, but the shares of the individual household members are unknown and need to be estimated for further epidemiological data analysis. Many such individualization methods (IMs) have been proposed, but their validity is hardly evaluated.

Methodology: The National Food Consumption Survey of Germany was designed in such a way that it provides individual food consumption data that can be added up to corresponding household data. From this aggregated household dataset 12 subsamples of varying sizes were drawn and 9 different IMs were applied to them. All the evaluated IMs are based on models regressing household food consumption on household composition. The covariation between estimated and actual values of the individual food consumption and derived nutrient intakes were analysed with special concern of relevant biases of the various IMs.

Results: Considering food consumption, the overall correlation between estimated and actual values varies from 0.64 to 0.92; considering energy intake, the corresponding values lie between 0.41 and 0.88. All the IMs show statistically significant age and gender related biases, which are, however, in most cases practically negligible (except for the per capita-approach). For some IMs, the deviation of the estimated from the actual values is negatively associated with the sample sizes.

Conclusions: Most of the IMs regarded are useful means to extract epidemiologically relevant dietary information from HBS data. Some IMs, however, especially the per capita-approach, provide substantially biased estimates and should therefore be avoided. Further improvements of IMs are to be expected if household food...
consumption is not just regarded as a function of household composition, but of factors determining the individual nutrition behaviour.

Acknowledgment: This study was conducted in the context of the DAFNE IV project, entitled ‘European food availability databank based on Household Budget Surveys’, of DG-SANCO of the European Union.

PS.C35
Dietary Factors of Cardiovascular Disease after 30-Years of Systematic Prevention Work

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The national strategy to lower the risk factors of cardiovascular disease was started in Finland in the 1970s, as the CD-mortality was the highest in the world at that time. The dietary aims were to change fat types, to lower sodium intake and to increase vegetable and fruit consumption. Concurrently, a monitoring system was developed including regular FINRISK/Findiet population surveys. The Findiet 2002 Survey was carried out in five areas in Finland. A random sample including 2,007 participants (25–64 y) was taken from the population register. For the dietary assessment, the participants were interviewed by a 48-h recall. The proportion of energy from fat was 34.9% in men and 32.4% in women. The proportion of saturated fatty acids was 14.4%, trans 0.5%, monounsaturated 11.8% and polyunsaturated 5.2% in men, and 13.6%, 0.3%, 10.6% and 4.9% in women, respectively. The youngest and oldest women had the lowest total fat intake. In men, no differences were found for the total fat intake by age groups. Salt intake was about double the recommendation (5 g/day or 0.5 g/MJ), being 9.9 g/day (1.1 g/MJ) in men and 6.8 g/day (1.0 g/MJ) in women. Salt intake increased by age in both gender. Women consumed more vegetables (104 g/day) and fresh fruit (108 g/day) than men (78 g/day and 78 g/day, respectively). In total, 25% of men and 12% of women consumed no vegetables, and 46% of men and 28% of women consumed no fresh fruit during the last two days. Fiber intake was 22 g (2.5 g/MJ) in men and 18 g/day (2.9 g/MJ) in women. Only women aged 55–64 reached the recommendation for fiber (3 g/MJ). Although the diet is much healthier nowadays and the mortality of cardiovascular disease has markedly decreased, the Finnish diet is still high in saturated fat and salt, and low in fiber.

Results and Conclusion: A survey of food inflow and outflow of households is feasible. However, the participating households need extensive support. To obtain valid tests for the assumptions mentioned a representative survey with a sufficient sample size (e.g. 500 households) is necessary. Preparations for such a survey are under way.

PS.C36
A Survey on Food Inflow and Food Outflow of Households

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Problem and Objective: Food purchase data from household budget surveys are often used for dietary assessment. Therefore, food purchase data are transformed into intake data using various assumptions referring to the food inflow and outflow of households. Inflow comprises (besides purchases) own production, food gifts and meal invitations received. Outflow includes (besides the intakes of the household members) food gifts, meal invitations to non-household members, wastes and food fed to pets. While transforming food purchase data into intake data it is assumed that certain corresponding types of food inflow and outflow are equal and therefore negligible, e.g. kind and quantity of giving and receiving food gifts or meal invitations. These assumptions have not yet been tested due to lack of suitable data. Therefore, a survey is carried out for such a test. In case of rejection of the assumptions, calibration functions can be estimated to properly transform purchase data into intake data.

Method: The survey lasts two weeks and refers to selected households. The members of a household report kind and quantity of the inflow and outflow of food. The inflow and outflow refer to the whole household except for the intake which refers to individual household members. In addition, the persons responsible for food related activities are interviewed about socio-economic characteristics of the households and their members as well as about food purchasing patterns. Since the survey is very demanding for its participants a pilot study limited to 20 households was carried out to gain information about its feasibility.

Results and Conclusion: A survey of food inflow and outflow of households is feasible. However, the participating households need extensive support. To obtain valid tests for the assumptions mentioned a representative survey with a sufficient sample size (e.g. 500 households) is necessary. Preparations for such a survey are under way.

PS.C37
Consumption of Vegetables, Fruit, Bread and Fish in the Nordic and the Baltic Countries (NORBAGREEN)

National Public Health Institute, Helsinki, Finland

The aim of the NORBAGREEN study was to examine consumption of vegetables, fruit, bread, and fish with a comparable method in the Nordic and the Baltic countries and to produce a food frequency questionnaire (FFQ) for this purpose. The FFQ was modified from the validated FFQ of the Nordgront project (1996–1998). Computer Assisted Telephone Interviews (CATI) in the Nordic countries and Paper Assisted Personal Interviews (PAPI) in the Baltic countries were used. The interviews were co-ordinated by the TOY Research (Finland). The number of completed interviews was 8,397 (approx. 1,000 persons/country, age 15–74 years). The samples were country representative by sex, age, and area. Validation studies were carried out in Lithuania and Finland. Vegetables were consumed most often in Sweden, Finland, Latvia and Lithuania. Fruit were consumed more often in the Nordic countries (excl. Iceland) than in the Baltic countries. Less than 15% of respondents consumed vegetables and fruit (in total) five a day or more. The proportion of respondents who consumed bread at least 5–6 slices a day varied from 10 to 60% between countries, most was consumed in Finland, Norway and the Baltic
countries. 25–65% of respondents consumed fish twice a week or more and the consumption was highest in Norway and Iceland. Women consumed vegetables and fruit more than men whereas consumption of bread was higher among men. Consumption of bread rich in fibre and consumption of fish did not differ by sex. Controlling challenges of comparability in the international study required attention throughout the study process. Consumption of vegetables, fruit, bread, and fish varied not only between the Nordic and the Baltic countries but also within the Nordic and within the Baltic countries.

**PS.C38**

**Dietary Habits in the Oslo Health Study: Higher Socio-Economic Status is Associated with a Diet Resembling the French Paradox**

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**Background:** Comparative studies have shown that the relative inequality in morbidity and mortality is large in Norway despite both egalitarian ideologies and strong social policies. The variations in total cholesterol and diastolic blood pressure with socio-economic status (SES) among Oslo citizens support the possible role of diet in explaining this gradient.

**Objective:** The objectives of this study were to describe socio-economic differences in food patterns in the general Oslo population for five age cohorts between 30 to 76 years, and to compare three different measures of SES: Residential area, length of education and for five age cohorts between 30 to 76 years, and to compare three different measures of SES: Residential area, length of education and occupational class.

**Design and Methods:** All Oslo citizens in five age cohorts, total 41,353 persons, were invited to a health screening (response rate 67%). The 14,591 Norwegian or Western born participants, 6,463 men and 8,128 women, who completed the main questionnaire with frequency questions about food habits were included in this analysis.

**Results:** Intake frequency of fruit/berries, cheeses, raw vegetables/salad, fatty fish and alcoholic beverages showed positive associations with SES irrespectively of the marker used. The difference in intake was particularly large for fruit/berries and cheeses. Education was the marker showing most variation in food habits in this population compared to occupational class or area markers. The pattern was similar for both sexes. Interpretations: High SES is associated with a food intake pattern resembling the French Paradox in the Oslo population, with length of education as the most influential variable.

**PS.C39**

**Research Study on the Alimentary Habits and Life-Style of a Group of University Students**

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Today it is well-known that style of life influences eating habits, in a more or less conclusive manner, in every one of us. On the basis of this consideration, research was carried out from the academic year of 1999/2000 to that of 2002/2003, in order to evaluate to what extent the influence of family, social life, religion and change of country and life-style for foreigners can influence eating habits.

The study group was taken from both Italian and foreign university students enrolled in their second year of the Medical Faculty at the University of Siena.

The 638 students, 253 male and 385 female, were given a questionnaire and a diary in which to record their food consumption.

The questionnaire was composed with the co-operation of a group of students, during the course of a pilot project concerning the same research, on a sample group of subjects enrolled for their second year of medicine at the same faculty.

In the questionnaire the type of diet was taken into consideration; the motivation for eventual choice of an alternative alimentary regime; the style of life, whether the subject was or wasn’t living in a family structure, the eventual changes of alimentary habits following separation from the family; the distribution of meals and where these were consumed (at home, in a canteen, bar etc.) was also investigated, along with whether the subject regularly ate breakfast or missed one or more meals a day and which ones, as well as the habit of consuming food brought from home or ‘home-cooked by Mum’.

Finally an investigation on the frequency and type of physical activity was carried out.

The food consumption diary related to 3 days which representative of the complete week. These 3 days included one non-working day and excessively long holiday periods which were not typical of university life were excluded.

The aim of the study, which will be continued for the next few years, was to accomplish the intervention of alimentary education aimed at the specific needs of the population group under exam conditions, beginning with the valuation of the quality and quantity of foods consumed daily.

Our interest was focused on university students for whom this period of their lives was considered crucial for the change of life-style.
PS.C40

Food Habits and Occupation: A Study Among Carpenters, Engineers and Transport Workers in Norway

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Background and Aim: Lifestyle diseases are important contributors to socio-economic inequalities in health. Thus, there is need for a special focus on social differences in health related lifestyles, including food habits. The aim of this qualitative study is to give insight into how men of different occupations form and talk about their food habits, how these relate to their work situation, and their wishes and possibilities for change.

Methods: Data were collected through semi-structured interviews in 2001–2003 with 20 carpenters (from 2 companies), 15 engineers (from 4 companies) and 13 transport workers (taxi, bus and lorry drivers). Data analysis included: coding; identification of topics, patterns, strategies; contrasting and comparison of the three groups.

Results: The data showed clear differences in the way men in the three types of work view food, meals, the body, physical activity and other health related habits. There were differences not only in food practices and favorite foods; the distribution of different types of meals throughout the day was also tied to the type of work. This was linked to notions of food as fuel for immediate body functioning, vis a vis notions of bodily shape and future health. Welfare activities at work were also different in the three types of work; those in higher positions (engineers) received most healthy offers, such as fruit baskets, healthy lunches, and participation in physical activities. This was in part a result of men’s own collective ideas and choices. These differences tend to reinforce the already large differences in health practices.

Conclusion: There is a large potential for efforts focusing on healthier food in the work place. However, they have to be tailored for each type of work.

PS.C41

Dietary Pattern and Mortality Rates for Cardiovascular Diseases in Croatia

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Aim: To analyse the relationship between food and dietary intake pattern and trends in mortality rates of CVD in Croatia.

Methods and Sample: Household Budget Surveys (HBS) according to the EUROSTAT methodology was conducted during 1998 to 2001. The stratified random sample of around 3,000 households was interviewed annually. COMCOP classification was applied and average daily dietary intake was calculated using national NCT. The obtained data were compared with previous HBS data from 1990. For mortality rates of CVD the source of information were routine mortality statistic and WHO data base HFA for period 1985–2001.

The obtained data were presented as standardized mortality rates/100,000 and percentage.

Results: Average daily cholesterol intake was 320 g. Total fat intake and fatty acids composition, as one of the risk factors for development CVD, are higher than recommended. Percent of daily energy intake derived from total fats is 38%, saturated 12%, monounsaturated 13% and polyunsaturated 13%. According to the statistical mortality data for the 2001 in total mortality of all causes – 53.6% of cases caused CVD. In total mortality of CVD the leading diagnoses are ischaemic heart disease (33.4%) and cerebrovascular diseases (31.4%). The standardized death rates of CVD for all ages are not showing decreasing trend and rates are between 586.5/100,000 (1985) and 572.7/100,000 (2000) with small oscillation. In 2001 the rate was lower and it decreased to 486.2/100,000.

Conclusion: In comparison to HBS data from 1990, there is present slightly decrease of saturated fats intake for 1% and increase of polyunsaturated fats intake for 2%. It can be explained by changes in food intake and dietary habits, especially the higher consumption of poultry and vegetable oil instead of lard. Mortality rates for CVD are still high and that demands further nutrition promotion activities.

PS.C42

Geographical Differences in Nutritional Intake in Portugal: The National Health Survey 1998–99

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Objective: To assess any differences regarding nutritional intake between geographical regions in Portugal.

Subjects and Methods: Data from 18,325 men and 20,761 women aged ≥18 years collected by the Portuguese National Health Survey 1998–99. For each gender, food intake from the previous 24 hours was assessed for five geographical regions (North; Center; Lisbon; Alentejo and Algarve) by univariate (chi-square) and multivariate logistic regression adjusting for age, BMI (continuous), marital status, educational level and smoking status (categorical).

Results: In both genders, significant differences were found between regions for all variables studied. Multivariate analysis using Algarve (South) as the reference showed the regions to be relatively homogeneous regarding food consumption. Results are OR for consumption relative to Algarve for men:

<table>
<thead>
<tr>
<th></th>
<th>Alg.</th>
<th>North</th>
<th>Center</th>
<th>Lisbon</th>
<th>Alentejo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soup</td>
<td>1</td>
<td>1.88*</td>
<td>2.92*</td>
<td>2.82*</td>
<td>2.67*</td>
</tr>
<tr>
<td>Fish</td>
<td>1</td>
<td>0.80*</td>
<td>0.85*</td>
<td>0.68*</td>
<td>0.60*</td>
</tr>
<tr>
<td>Meat</td>
<td>1</td>
<td>1.32*</td>
<td>2.04*</td>
<td>1.85*</td>
<td>1.57*</td>
</tr>
<tr>
<td>Potato</td>
<td>1</td>
<td>1.32*</td>
<td>2.11*</td>
<td>4.46*</td>
<td>0.84*</td>
</tr>
<tr>
<td>Rice</td>
<td>1</td>
<td>1.10*</td>
<td>2.14*</td>
<td>2.15*</td>
<td>1.71*</td>
</tr>
<tr>
<td>Fruit</td>
<td>1</td>
<td>0.76*</td>
<td>0.81*</td>
<td>0.49*</td>
<td>1.62*</td>
</tr>
<tr>
<td>Bread</td>
<td>1</td>
<td>0.60*</td>
<td>1.16*</td>
<td>0.72*</td>
<td>1.28*</td>
</tr>
<tr>
<td>Wine</td>
<td>1</td>
<td>0.89*</td>
<td>1.31*</td>
<td>1.37*</td>
<td>0.83*</td>
</tr>
<tr>
<td>Beer</td>
<td>1</td>
<td>0.78*</td>
<td>1.09*</td>
<td>0.80*</td>
<td>0.85*</td>
</tr>
</tbody>
</table>

Similar findings were obtained in women.

Ann Nutr Metab 2003;47:319–666
Conclusion: Nutritional intake differs markedly between geographical regions in Portugal, and those differences are not due to differences in age, obesity, educational, marital or smoking status.

**PS.C43**

**Eating Behaviour, Anxiety, Depression and Self-Image in a Sample of Portuguese Students**

P. Marques-Vidal

Centro de Nutrição e Metabolismo, Faculdade de Medicina da Universidade de Lisboa, Portugal

**Objective:** To assess the relationships between emotional, externally induced and restrained eating behaviour and depression, anxiety and self-image in a sample of young Portuguese students.

**Subjects and Methods:** Transverse survey conducted among 616 students (435 women, 181 men, mean age 21 ± 3 years) from a private university of Health Sciences. Eating behaviour was assessed by the Dutch Eating Behaviour Questionnaire; anxiety and depression were assessed by the Hospitalized Anxiety and Depression Scale; self-image was assessed by the Self-Image Inventory.

**Results:** 37% of women and 28% of men had clinical anxiety; in both genders, after adjusting for BMI, clinical anxiety was related to higher emotional and restrained eating scores, whereas no differences were found for subjects with clinical depression Women with a low self-image had lower restriction and higher emotional and externally-induced eating than women with normal or high self-image, whereas no differences were found in men.

<table>
<thead>
<tr>
<th></th>
<th>Women Anxiety</th>
<th>Normal</th>
<th>Men Anxiety</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrained</td>
<td>2.34 ± 0.11</td>
<td>2.18 ± 0.11*</td>
<td>2.18 ± 0.19</td>
<td>1.83 ± 0.20*</td>
</tr>
<tr>
<td>Emotional</td>
<td>2.46 ± 0.10</td>
<td>2.18 ± 0.11*</td>
<td>2.01 ± 0.19</td>
<td>1.70 ± 0.20*</td>
</tr>
<tr>
<td>Externally-ind.</td>
<td>2.60 ± 0.07</td>
<td>2.55 ± 0.07 NS</td>
<td>2.63 ± 0.14</td>
<td>2.60 ± 0.15 NS</td>
</tr>
<tr>
<td>Low self</td>
<td>2.09 ± 0.13</td>
<td>2.35 ± 0.09*</td>
<td>2.07 ± 0.21</td>
<td>1.93 ± 0.19 NS</td>
</tr>
<tr>
<td>Emotional</td>
<td>2.48 ± 0.12</td>
<td>2.23 ± 0.08*</td>
<td>1.91 ± 0.22</td>
<td>1.80 ± 0.20 NS</td>
</tr>
<tr>
<td>Externally-ind.</td>
<td>2.71 ± 0.08</td>
<td>2.58 ± 0.06*</td>
<td>2.58 ± 0.15</td>
<td>2.61 ± 0.14 NS</td>
</tr>
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</table>

Results expressed in adj. mean ± sem; NS not significant; *p < 0.05.

**Conclusions:** Anxiety, not depression, is related to changes in eating behaviour in young Portuguese students. The effect of self-image on eating behaviour appears to be gender-specific.

**PS.C44**

**Effect of Snack Consumption on Energy Intake and Satiety**

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**Background:** One of the most immediate method to evaluate the capacity of a food to help controlling energy intake and eating behavior is the ‘preloading paradigm’ procedure. The aim of the present study was to assess the effect of snack consumption on energy intake and satiety using the preloading paradigm and the related satiating efficiency index (SEI).

**Methods:** Ten male and ten female healthy subjects were enrolled for the study. Different snacks were tested to evaluate their effect on specific satiety (capacity of a food to limit its consumption) and general satiety (effect on a subsequent meal). The general satiety was studied using the Preloading Paradigm technique: the volunteers consumed two fixed energetic preloads of snacks two hours before eating an ad libitum Test Meal for lunch. Furthermore, the same subjects were randomly assigned to a trial were they had only the ad libitum Test Meal (control). Data obtained were analysed by comparing the energy intake from the Test Meal with or without the snack consumption, and by calculating the SEI calculated for each snack. SEI is a predictitive index obtained by the slope of the regression line relating Test Meal intake to preload size; it is a useful index of the effectiveness of a food in reducing food intake.

**Results:** The IES index of snacks resulted different between males and females but always ≤ 1 indicating foods with low satiating efficiency. Furthermore their consumption in the morning did not decrease the subsequently energy intake with lunch if compared with the control.

**Conclusions:** On the whole our results demonstrate that apart from SEI also the evaluation of a no load condition is necessary to better understand the real effectiveness of foods in controlling energy intake and satiety.

**PS.C45**

**Palatability and Sated-Hungry and Depressed-Related Ratings Relationships in Free-Living Brazilian Workers**

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Palatability is considered to have a major impact on food intake and the studies with French and North American populations showed that subjective state can influence the amount of food ingested. We aimed to evaluate ad lib eating behaviour influences on the meal palatability in free-living Brazilian workers. Twenty-two participants mean age 39 ± 9.5 years and presenting BMI of 24 ± 4.4 kg.m⁻²

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registered food intake in a pocket-sized diary for 7 days. They recorded their intake along with a global rating of the palatability of the entire meal and also rating of the sated-hungry, depressed-elated and calm-anxious on a seven-point scale. Self-ratings were obtained at the beginning and again at the end of the meal. Only the before meal palatability ratings were used in the current study. The duration of meals and the number of people present were also evaluated. It was found that 100% of meals that were self-selected were palatable. We found a negative correlation ($r = -0.431$, $p < 0.05$) with the palatability ratings and sated-hungry ratings after meals, while the correlations with palatability and depressed-elated ratings were positive both before ($r = 0.607$, $p < 0.01$) and after meals ($r = 0.632$, $p < 0.01$). We did not observe significant correlations with the rating scale of calm-anxious nor meal time or number of people present. These results were, at least in part, similar to those observed from the French and North Americans studies and suggests that palatability is related to subjective state of elation before and after meals and also satiety after meals. So, palatability appears to be influenced by subjective state and/or to be an influence on this subjective state by free-living humans in their natural environments, but we cannot yet confirm that palatability is related to intake across culture.

Financial support: FAPERJ.

**PS.C46**
**Monitoring of the Nutritional State and Alimentation Habits of 8-year-old Children in the Tivoli Health District**

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**Premise:** The Mother and Child Operative Unit of Tivoli health district, in the field of school medical care concerning the year 2002–03 has conducted a nutritional screening of children aged 8 recording the children’s weight and height: moreover their alimentation habits have been recorded in an alimentation diary.

**Materials and Methods:** 243 students have been tested (123 females and 115 males) every child has been submitted to the record of weight and height according to the standard procedures recommended by the world health organisation for the definition of overweight and obesity; from this data the body mass index has been calculated.

Moreover every child was asked to compile an alimentation diary which recorded the food and drink consumed during the day divided into breakfast, lunch, dinner, various snacks between meals for three consecutive days.

**Results:** The survey conducted reveals that the female population is 10% obese and 30% overweight; while 14% of males has been proved obese and 22% overweight. Concerning alimentation habits interesting data have emerged: 68% of child consume milk and biscuits in the morning. For the school snack at midmorning 32% of the children tested preferred ready prepared bought snacks, 25% consumed salted snacks (chips, crackers etc.), 23% ham and chocolate roll, 3% fruit and 22% nothing.

Our survey reveals that 66% of children eat no fruit for lunch and dinner, while 34% only rarely. The consumption of ham, salam and wurstel and of precooked food resulted high, as a matter of fact 26% usually consumes them several times a week. In regards to concerning between meal consumption 19% eats chips and salted snacks and 25% yogurt and fruit.

**Conclusion:** Our data reveals that the consumption of energy value foods is high such as sweets and fats at detriment of fruit and vegetables. It follows therefore indispensable to promote in both schools and in health centers for the prevention of eating problems alimentary educational interventions, addressed to children and their families to improve the way of life in order to prevent a wide diffusion of diseases such as hision, diabetes and cholesterolemia.

**PS.C47**
**Weights of Foods Consumed Influence Risk of Obesity in Irish Adults**

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The North-South Ireland Food Consumption Survey (NSIFCS; www.iuna.net) reported that 17% of adults aged 18–64 years were obese. The aim of the current study was to ascertain the extent to which weights of foods consumed (g/d) by NSIFCS participants were associated with the risk of being obese rather than normal weight.

Subjects’ heights and weights were measured, food intakes were assessed using 7-day diaries, and age, sex and educational attainment were determined by questionnaire. Every food was assigned to one of 28 food groups. Multivariate binary logistic regression was used to calculate the odds ratios (OR) for being obese rather than normal weight, that were associated with a 1 g/d increase in intake of each food group. The OR were then recalculated to describe the increase in risk of obesity associated with a median increase (g/d) in intake of each food group.

In increased consumption of 20 of the 28 food groups was significantly associated with an increased likelihood of being obese rather than normal weight. The greatest OR was observed for ‘all breads’, with a 14.4 times increased likelihood of obesity associated with every 127 g/d increase in consumption. Food groups with OR > 3.0 were ‘fresh meat’ (OR 5.9 for each 71.1 g/d increase), ‘biscuits and cakes’ (OR 3.7 for each 29.3 g/d increase), ‘chips and processed potatoes’ (OR 3.7 for each 62.9 g/d increase), ‘meat dishes’ (OR 3.4 for each 72.6 g/d increase) and ‘low fat milks’ (OR 3.1 for each 161.1 g/d increase). Food groups that were not significantly associated with increased risk of obesity were ‘plain rice and pasta’, ‘breakfast cereals’, ‘low fat spreads’, ‘vegetables’, ‘fruit, juices and nuts’, ‘all fish’, and ‘soups’.

Policies aimed at reducing the prevalence of obesity may be more effective if the emphasis is placed on reducing the amount of food eaten, rather than suggesting modifications in macronutrient intake.

Funded by the Food Safety Promotion Board.
PS.C48
Diet Quality Index and Lipid Profile in Postmenopausal Women
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Major traditional risk factors for cardiovascular diseases such as high blood pressure, high serum cholesterol and high triglycerides are positively affected by Mediterranean dietary habits. The Diet Quality Index has been developed to evaluate the adherence of the diet to the Mediterranean model. A study was carried out to calculate the Diet Quality Index in a group of postmenopausal women and to validate it against the serum lipid profile. Ninety-eight postmenopausal women were recruited in the framework of the EC funded project ISOHEART project in response to local mass media advertisements. A telephone screening led to the exclusion with subject with BMI < 20 and ≥ 32 kg/m², heavy smokers and women on HRT. A physical (height, weight, blood pressure) and biochemical evaluation (total cholesterol, HDL-cholesterol and TAG, glycaemia) were carried out. Dietary intake was evaluated using a 3-day weighed food record (Sunday and two weekdays) and with a Food Frequency Questionnaire. Food intake was converted into nutrient intake using a duly designed software (INRAN-DIARIO 2.1). The Diet Quality Index was calculated by comparing the observed intake with a set of recommendations and by assigning a score to each item according to its adherence to the recommendations. Median age of the subjects was 56 years (SD 5), median BMI was 26.8 kg/m² (SD 3.5). Median total serum cholesterol was 5.7 mmol/l (SD 1.6), HDL-cholesterol was 1.5 mmol/l (SD 0.5), serum TAG 1.2 mmol/l (SD 0.6) and blood glucose 5.5 mmol/l (SD 1.4).

PS.C49
Snack Preferences Depending on Sex and Body Mass
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The aim of this paper was to determine the preferred choices of snacks eaten between meals by residents of the Podkarpacie province, depending on their sex and body mass. The survey was done among a group of 200 people.

Between meals, women most willingly reach for chocolate (39.4%), while men often take cream cakes (28.6%) and chips (17.1%) for snacks. Crisps are equally popular with women and men (9.7% and 8.6% respectively). None of the male respondents chose hamburgers, and 1.8% women declared they would have hamburgers (9.7% and 8.6% respectively). Similarly popular are cream cakes. Other snacks of lower content of fats and carbohydrates are eaten by approx. 30% of the respondents.

PS.C50
Nutrition and Nutritional Status of Young Men
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Institute of Hygiene, Military Medical Academy, Belgrade, Serbia

Proper nutrition and optimal nutritional status are the most important factors for maintenance and improvement of health.

The aim of this study was to determine dietary intake and nutritional status of young men. The group consisted of 448 men aged 19–21 years. Food intake was quantified by 24-hour recall method during 3 days including one holiday. The following parameters were measured: body height, body weight, hemoglobin values, count of red blood cells and systolic and diastolic blood pressure.

The prevalence of underweight was (BMI < 18.5 kg/m²) in 12.5%, normal weight (BMI = 18.5–24.9 kg/m²) in 67.8%, overweight (BMI = 25–29.9 kg/m²) in 16.1% and obesity (BMI > 30.0 kg/m²) in 3.6%. The low values of hemoglobin were found in 23.2% subjects. Hypertension was found in 8.1%. Average daily energy intake was 12,521.2 kJ. In total energy intake proteins were participating with 14.1%, fats with 35.2% and carbohydrates with 50.7%. The diet was high in fat.

As almost one third of young men didn’t have optimal nutritional status, we recommended that was necessary to give more nutrition information to this population. On that manner we will be able to prevent nutritive disorders and improved health.

PS.C51
Nutrition and Processing Knowledge in a Sample of Italian Female Consumers
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¹Istituto di Scienza dell’Alimentazione, University ‘La Sapienza’ Rome, ²Istituto Scienze dell’Alimentazione – CNR, Avellino, Italy

Dietary behaviour is strongly associated with many environmental and intra-individual factors. The recent literature shows that dietary habits of consumers reflect, in part, the nutrition knowledge that can...
play a decisive role in the adoption of healthier food habits. The aim of this study is to investigate the knowledge of consumers regarding nutrients, modifications during the process of food cooking and storage in a sample of Italian population. Data were collected using a multiple choice questionnaire self-report formed of 24 questions ad hoc prepared. The random sample is comprised of 2,295 females (age $42.52 \pm 11.6$), subdivided for occupation in 49% housewives, 28% employees, 7% retired and 6% workwomen. The percentage of exact answers is 74% about nutrition knowledge, 76% about food cooking and 79% about food storage. The results show a less percentage of exact answers relating the role of vitamins and minerals (32%) and loss of nutrients in oven cooking (40%). The sample subdivided in housewives and not housewives put in evidence some statistically significant differences about nutrition knowledge relating carbohydrates, proteins, vitamins and mineral function ($p < 0.000$). Differences emerges from answers regarding the suitable cooking ($p < 0.002$) and nutrient loss in the boiling process ($p < 0.01$); and from that regarding the storage and ($p < 0.001$) and the use of the vacuum-package ($p < 0.001$). The greater percentage of exact answers is obtained for the group of the not housewives. Although the sample is not representative of the Italian female population underlines a good knowledge of the principles of a suitable feeding. Nevertheless a scarce knowledge is observed on the function of the micronutrients owed, probably, to the messages that the consumer always receives not from sources reliable. These results suggest to correct and to improve the knowledge through specific interventions of food education.

**PS.C52**
The Changes of Food Consumption and Food Consumption Patterns in the Czech Republic from the Beginning of 90’s

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The nutrition of the Czech population before year 1989 was characterized by excessive intake of energy, fats, especially fats of animal origin, animal proteins, cholesterol and on the other hand by insufficient intake of vitamins, namely vitamin C, and dietary fibre.

The nutrition significantly changed after the political changes in 1989. The main food consumption changes were: decreasing of consumption of beef (66.7%), pork (18.7%), butter (55.3%), milk and dairy products (17.2%), eggs (15.5%) and increasing of consumption of poultry (75.4%), subtropical fruits (66.3%), legumes (53.8%), vegetable fats and oils (28.8%) and vegetable (23.7%). The consumption changes influenced meeting requirements for Recommended Daily Intake of many nutrients. They were mostly positive and had favourable impact on the Czech population health, namely lowering of mortality rate caused by cardiovascular diseases and increasing of life expectancy. The only negative changes were decreased intake of calcium (on 89.4% of Czech RDI), vitamin A (on 91.1% of RDI) and vitamin B$_2$ (on 93.1% of RDI) influenced by lowered milk and dairy products consumption.

In spite of fruit, especially subtropical fruits, and vegetable consumption increasing, intake of vitamin C is low (65.6% of RDI). The low intake of vitamin C from food is partially compensated by intake of food supplements. The usage of various food supplements is increasing in the Czech population, especially by elderly people.

The main changes in consumption patterns are as follows: increased consumption of convenience foods, deep-fried food, snacks, vegetable salads, soft drinks, more frequent out-door meals, especially in fast food restaurants.

**PS.C53**
Dietary Behaviour as a Risk Factor for Health

M.T. Pavcic$^1$, L. Zaletel-Kragelj$^2$, J.M. Zakotnik$^1$

$^1$Ministry of Health, $^2$University of Ljubljana, Medical Faculty, Ljubljana, Slovenia

Dietary behaviour as risk factor for good health and particularly in obesity, diabetes, high cholesterol, hypertension and cardiovascular diseases (CVD) was studied in stratified, random sample of 9,064 adults (25 to 64 years) by the questionnaire concerning 14 questions about eating (Health Monitor Survey CINDI Slovenia 2001). All indicators for good dietary behaviour in general, determined as ≥3 meals per day, fruit, vegetables and low fat milk/milk products intake at least once per day, fish and cereals intake at least once per week, intake of red meat/meat products less than once per week and fried food ≤3 × per month were met only by 2.1% respondents. Dietary behaviour of 46.5% respondents was estimated as unhealthy. The greatest risks for good health, hypertension and CVD due to bad eating practices were observed in subgroup of 30 to 39 years old, less educated men of lower social classes, living in central and eastern parts of Slovenia. For obesity and diabetes the main risk represented <3 meals per day, intake of abundant meals, with a lot of hidden fat and sugar, and alcohol. The most endangered subgroup for obesity and diabetes was subgroup of 25 to 29 years old, less educated men of lower social classes, living in countryside of eastern parts of the country.

The results of this study indicate the importance and mode of nutritional prevention in different social groups of inhabitants.

**PS.C54**
Detecting Patterns in Household Consumption of Foods and Nutrients in Britain

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**Objective:** To detect variability in purchase patterns of foods and nutrients across British households, and investigate the feasibility of using commercially available data on household food purchases to carry out food and nutrient surveillance.

**Design:** Taylor Nelson Sofres (TNS) routinely collect information on foods purchased and brought home for consumption for market research purposes. Food purchase data collected from 33,177
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households and 105,667 individuals between 1991 and 2000 were used here to trace socio-demographic, geographical and temporal trends in the purchase patterns of the main macronutrients and eleven specific ‘marker’ products.

**Results:** The socio-demographic characteristics of the TNS Super Panel, when compared with GB-census population estimates, were found to be broadly representative. Estimated mean daily energy intake in the TNS data was 1667 ± 715 kcals, which is lower than other published estimates in GB; however percentage energy contributions were consistent with national trends. Significant differences were found for all nutrients (ANOVA test p < 0.0001) across (i) time (median percentage energy contributions from fat fell from 39.2% in 1991 to 37.5% in 2000), (ii) geographic region (highest fat intakes in Wales – 39.5%, lowest in East Midlands – 37.7%) and (iii) socio-economic group (gradual increase in median fat intakes from 37.7% in the most affluent to 39.1% in the most deprived Carstairs quintile groups). Intakes of the ‘marker’ products being traced were limited (less than 4% of households purchased these), however significant variations were detected in the proportion of households purchasing these across temporal, geographic and socio-economic strata.

**Conclusions:** Findings from this work suggest that variability in purchase patterns do exist across Britain. Prospective nutrient surveillance systems could trace these consumption patterns and inform nutritional surveillance. However, this work would be greatly strengthened by modification to existing food consumption and composition databases.

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**PS.C55**

**Effect of the Daily Intake of Yoghurt and Bread Enriched with Biological Active Substances on Blood Lipids and Various Parameters in Adolescents and Young Adults**

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**Background:** Food products enriched with various supplements (vitamins, minerals, special fats) are increasingly used to improve general nutrition and to achieve better health. These so-called functional foods should lead to important changes in the body, that are separate and distinct from those associated with their role as nutrients.

**Objective:** The aim of the present study was to investigate, whether the daily intake of yoghurts and white bread, enriched with a mixture of vitamins and mono- and polyunsaturated fatty acids from natural origin do have any effect on various blood parameters, especially on lipids and vitamins.

**Design/Methods:** In this double blind placebo-controlled clinical trial eighty adolescent healthy subjects, mainly medical students, mean age 26.3 years (min. 18.8, max. 35.8 years) were statistical assigned to two groups. One group (I), who had to eat for two months 2 special yoghurt- and 2 bread products a day, which contained 2.5 g monounsaturated fatty acids and 5.7 g polyunsaturated fatty acids \((\omega_6/\omega_3 = 7.1)\), 215 \(\mu\)g folie acid, 19.2 mg tocoferol and 346 mg bioflavonoids as well. The other probands represented the control group, who also ate 2 yoghurt- and 2 bread products a day, without any supplements. There was no possibility to identify the products for the subjects and for the supervisors. Plasma concentrations of vitamin C, cholesterol, HDL-c, LDL-c, VLDL-c, triglycerides were measured at the beginning and at the end of the study. Dietary intake has been calculated by means of 3 days dietary records before and 8 weeks after supplementation.

**Results:** In the supplemented-Group (I) cholesterol decreased from 190.7 to 179.4 mg/dl \((p < 0.01)\) which due to a drop of the LDL-cholesterol from 106.0 to 98.9 mg/dl \((p < 0.01)\). Triglycerides and HDL-cholesterol did not change. Iron levels and vitamin C levels increased also significantly (Table 1). Dietary habits showed distinct changes, especially an increased intake of Calcium, Magnesium, Manganese and Iron. With regard to the vitamin analysis an increase of vitamin C from 20.3 to 24.1 mg/L \((p < 0.01)\) in the Verum-Group has been observed. Unexpectedly the mean weight increased from 67.1 to 67.6 kg (mean BMI 22.3 to 22.4).

**Discussion:** The present data clearly shows that daily intake of food products, which are supplemented with monounsaturated and polyunsaturated fatty acids, tocoferol, bioflavonoids are able to achieve substantial changes in various blood parameters; although the mean total and LDL-cholesterol level were within the normal range at the beginning of the study, a significant decrease could be shown after the 2 months experiment. Interestingly an increase of vitamin C and iron level could be shown, although the supplement did not contain any of these nutrients. Due to the fact that the nutritional supplement was a mixture of natural bioactive substances it is very difficult to differentiate the entire effect of the ingredients on plasma parameters.

**Conclusion:** Regular intake of food fortified with a special natural supplement containing various different biological substances influences specific blood parameters, especially lipids and lipoproteins towards a low-risk profile. These results indicate that there might be a beneficial effect by means of daily intake of specially fortified foods in order to reduce the risk factors for coronary heart disease.

**References**


Table 1 for abstract no. PS.C55

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<th>HDL-C (mg/dl)</th>
<th>Iron (µg/dl)</th>
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The aim of the study was to compare breakfast consumption between two Croatian areas (Adriatic and continental). Subjects were children (both genders participated) from the capital (continental area) (n = 548) and two towns situated on the Adriatic coast (n = 364). Mean age was 10.3 years. The dietary method used was quantified Food Frequency Questionnaire (FFQ) which was completed by parents who received booklets with written instructions and pictures showing portion sizes. Records were converted to quantities using food composition tables and/or product labels.

Energy intake was significantly higher in the Adriatic than in the continental area (2,602.2 vs. 2,033.8 kJ; p < 0.001). Higher percent of children from the Adriatic area (41.5%) had breakfast providing >30% RDA for energy than children from the continental area (25.0%). More adequate energy fractions of macronutrients were observed in children from the Adriatic area. Significant difference (p < 0.001) was also observed for fat, carbohydrate, cholesterol and dietary fiber intake, and also for amount of food eaten by breakfast.

Calculated were intakes of vitamins D, E, C, B1, B2, B6, folate, niacin and minerals calcium, phosphorus, magnesium, iron and zinc. Intakes (%DRI) of all examined vitamins and minerals in average were higher in the Adriatic than in the continental area.

Milk is in average consumed more often in the Adriatic than in the continental area (4.5 vs. 3.7 times per week) and higher percent of children from the Adriatic area (44.0%) than from the continental area (32.2%) reported daily consumption of milk for breakfast. Fruit or fruit juice is consumed in higher percent of children from the continental (49.3%) than from the Adriatic area (29.9%). Breakfast cereals are not common breakfast food in both living areas (70.1 and 57.3% of children from the Adriatic and the continental area respectively reported that never consume breakfast cereals).

This study showed some significant differences in breakfast consumption between children from the Adriatic and the continental Croatian areas. Children from the Adriatic area had more adequate breakfast.
PS.C58
Effect of Long-Term Almond Supplementation on Food Intake and Eating Patterns
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Adding a new food to a habitual diet (HD) may alter eating patterns and intake of other foods. The impact on food intake and eating patterns of supplementing a self-selected diet (with little or no nuts) with almonds was examined in a 12-month study. The first 6 months constituted the control period where subjects followed their HD. During the intervention (second 6 months), subjects were asked to incorporate almonds (~52 g) into their HD without dietary advice by free feeding daily on the nuts (AD). 81 healthy males and females age 25–70 years completed the study. Subjects incorporated almonds into their HD by eating the nuts as a single portion. Regression results showed that age, sex, BMI, and displacement of grains, dairy products, fats, sweets, and vegetables in the overall diet were associated significantly with change in energy from almonds, F(5, 75) = 3.15, p < 0.01. Reduction in breakfast skipping was significant among males (p < 0.05) but not in females. The proportion of frequent and infrequent snackers in females according to BMI did not differ. By contrast, in lean males, 35% were frequent snackers, and 65% were infrequent snackers; in obese males (BMI > 84th percentile), 88% were frequent snackers, and 12% were infrequent snackers (Chi square = 6.4, p < 0.05). The observed changes in eating patterns, displacement of other foods in the overall diet, and prevention of breakfast skipping among males during almond supplementation may have contributed to improved energy intake regulation in this population.

PS.C59
Food Consumption in Russia: Geographical and Socio-Economic Differences
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Longitudinal research on over 11,000 Russians from 38 regions are used to examine territorial and related eating patterns. The data come from the nationally representative Russian Longitudinal Monitoring Survey (RLMS). Standardized twenty-four recalls along with food expenditures and anthropometric measurements are collected from all households and individuals in them. Additional in-depth socioeconomic and demographic data are collected.

Large regional differences in food consumption patterns exist. The structure of consumption also differs within these groups. For example, the average wheat and rye bread consumption is 174 g per day with about 35% from rye bread. In the Northern Caucasus the bread consumption level is one of the highest in the country – more than 200 g, but the rye bread is not consumed. Large economic differences exist in bread consumption, patterns not inversely linked to income as one might expect.

Nutrient differences are also studied. For example, vitamin C consumption levels are lowest (40–50 mg/day) in the Northern European part of Russia, in the Urals and the Far East. At the same time the major source of Vitamin C was potatoes. The average level of consumption of fruit and vegetables did not exceed 300 g/day and to a great extent depended on the income.

The geographical differences in overweight and obesity prevalence, depending on family income, are also examined.

PS.C60
Consumers’ Acceptance and Preference Towards New Generation Drinks
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The consumer is the key element which reshapes modern food marketing and markets. This can be observed in the beverage market, where the most successful products appeal strongly to particular consumers groups. Energy drinks, which respond to specific needs and desires, are a perfect example of new drink product.

The aim of this study was to investigate consumers’ acceptance and preference towards energy drinks, what can help in understanding consumer’s choices and latest trends which appear in the beverages market.

The study was carried out in 2002 in Warsaw (Poland). The target population consisted of 162 people, selected on 3 factors: age, gender and consumption of energy drinks. The respondents evaluate seven beverages on taste, flavour and overall acceptability. After sensory sessions, they filled in the U and A questionnaire, which consist of two parts. The first part includes questions relating to energy drink purchasing and consumption, second – statements concerning product image, consumers’ values and lifestyles. Statistical analysis was performed using Statistical Package for the Social Sciences and Sensory Analysis and Consumer Test Management Software.

Results from marketing U and A test were undertaken using factor analysis followed by cluster analysis. From that three respondents’ clusters were elicited. Later data analysis was focused on checking if consumer’s life style will influence on product’s evaluation and choice. For each cluster, the analysis of products attribute scores was conducted (two-way ANOVA).

The final results have proved that beside pleasant taste of drink, consumers are demanding products that fit in with their individual styles and habits. Consumers can (to some extend) tolerate a lack of appeal on some sensory attributes in exchange for functionality. However functionality is no compensation for poor sensory quality.
PS.C61
Socio-Economic Differences of Changes in Food Habits of Lithuanians over a Period of Eight Years
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Institute for Biomedical Research, Kaunas University of Medicine, Kaunas, Lithuania

The social and economic changes that have occurred in Lithuania after regaining of independence (1990) have had an impact on health and health behavior of Lithuanians.

Objective: To evaluate trends in food consumption of Lithuanian adult population in 1994–2002 in relation to social determinants.

Material and Methods: Since 1994 five health behaviour surveys have been carried out within the Finbalt Health Monitor project. For every survey random sample of 3,000 Lithuanians aged 20–64 was taken from the National Population Register. The study material was collected by mailed questionnaires. Multiple regression analysis was used for evaluation of relationship between social factors and nutrition habits.

Results: Over a period of eight years nutrition habits of Lithuanians changed substantially. The intake of animal fat decreased. Almost a half of population replaced butter on bread by low fat margarine. The decrease in consumption of whole milk was observed. The proportion of peoples using vegetable oil for cooking increased more than twice (from 40.7% to 88.4%). The positive trend in consumption of fresh vegetables and fruits was observed. Nutrition habits differed between various social groups of Lithuanian population: women, young people, persons with high education, inhabitants of cities had a healthier diet than men, older people, persons with low education and those living in rural areas. The increase in usage of vegetable oil for cooking and decrease in usage of butter on bread were larger among people with low education and inhabitants of rural areas. Persons with high education and urban population showed much larger changes in consumption of fresh vegetables and fruits.

Conclusion: Diet of Lithuanians tends to become closer to the recommendations of healthy nutrition. Social status affects the diet.

PS.C62
Validity of a Standardised Computerised 24-hour Diet Recall Program for Between European Population Comparisons of Dietary Consumption
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Introduction: There is an increasing interest in collecting dietary measurements in a standardized way across European countries. The 24-hour dietary recall (24-HDR) is a highly detailed method with an open-ended structure facilitating comparisons of dietary habits across populations. In addition, it provides a relatively high participation rate from study populations. Within the context of the European Prospective Investigation into Cancer and Nutrition (EPIC), the 24-HDR was adopted as a reference method for between-cohort calibration across the 10 participating countries. An ad hoc computerized program (EPIC-SOFT) was developed for collecting 24-HDRs in an international study context and report results on (relative) validity of the 24-HDRs as reference measurements for comparing mean dietary intakes across populations.

Methods: A single 24-HDR was collected from a stratified random sample of middle aged men and women (n = 37,000), using the EPIC-SOFT program. To estimate mis-reporting in EPIC-SOFT measurements, mean total energy intake (EI), mean EI/BMR ratio and the percentage of high over- and under-reporters were compared per gender across centres. In addition, mean urinary nitrogen was used as reference to validate mean nitrogen (protein) 24-HDR measurements at ecological level on a convenient sample (N = 1103).

Results: About 70% of the study centres reported a participation rate between 75% to 93% and shown to be reasonably representative of their entire cohorts, in most centres. Although under-reporting was generally heterogeneously distributed across centres, the differences in mean EI and EI/BMR was less than 10% in both genders, particularly after adjustment, and exclusion of one centre with outlier values and high-under reporters. Those represent on average 10.3% and 13.8% in men and women, respectively.

Conclusions: The 24-HDR is a promising reference dietary method for between population comparisons. The standardisation contributes to minimise measurement errors and make them applying with the same magnitude across populations. However, all errors cannot be prevented entirely and their structure and determinants need to be taken into account in the analyses.

PS.C63
The Effect of Nibbling and Gorging Dietary Regimens on Weight and Lipid Profiles in Rat
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Background and Objectives: Although laboratory animals have been used to overcome to the some limitations such as shortage of the period of study and the absence of a well-controlled intervention in food pattern human studies, the effects of meal frequency on lipid profiles has not investigated in laboratory animals. Therefore, the aim of this study is to investigate the effects of meal frequency on lipid profiles in rats.

Materials and Methods: Thirty female Wistar rats aged 11 weeks (210 ± 15 g), after 10 days acclimation period were weighed and randomly assigned into two equal groups. They were fed the same food as eight meals at 2-hours intervals starting from 6 pm (nibbling group) or as two meals at 9 pm and 6 am (gorging group) for 60 days. Before and at the end of intervention, the serum lipid levels were determined enzymatically. During the study period, the amount of daily food and water intake were recorded and the animals were weighed every 12 days. The results were compared with each other using student’s t-test.
Results: The body weight in two groups increased significantly ($P < 0.001$) but there was no significant ($P > 0.05$) difference between two groups before and after the intervention. The food and water intakes were non-significantly ($P > 0.05$) lower in gorging group than nibbling group. Nibbling regimen caused a reduction in the total cholesterol, triglyceride and LDL-cholesterol levels, whereas these parameters increased during gorging regimen. However, none of these changes were significant ($P > 0.05$). There was a significant increase ($P < 0.05$) in total cholesterol and LDL-cholesterol levels in gorging regimen compared to nibbling regimen.

Conclusion: According to the results obtained, there is no major difference between nibbling and gorging dietary regimens with respect to weight gain and lipid profiles.

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PS.C64

Contribution to the Overall Diet of an Habitual Mid-Afternoon Meal, the ‘Goûter’, in French Children and Adults

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The aim was to collect descriptive data on the mid-afternoon meal, the ‘goûter’, a typical French eating episode occurring mainly between 3 and 6 p.m., and to examine its nutritional impact in a representative sample of the French adult population (INCA survey, 1998–1999).

Methods: Data were obtained from 1,018 children (3–14 years) and 1,474 adults, using a 7-day dietary record. The mid-afternoon meal was self-defined by the participants. Subjects were classified as non-consumers (NC), occasional consumers (OC) and regular consumers (RC) if consuming 0, 1–3 and 4–7 mid-afternoon meals/week respectively.

Results: In children, eating a mid-afternoon meal was common, since 79% were RC and 16% OC. However, frequency of consumption decreased gradually during adolescence and more sharply in adulthood. In adults, 24% were RC and 31% were OC. Most of the mid-afternoon meals were consumed between 4–5 p.m., usually comprised 2 types of products (cereal products and drinks). Irrespective of its frequency of consumption, this meal was high in carbohydrate (CHO) (58% from CHO, 34% from fat and 8% from protein). In children, the mid-afternoon meal provided 313 kcal (16% of the total daily energy intake, TEI) in RC and 96 kcal (6% of TEI) in OC. In adults, it provided 216 kcal (10% of TEI) in RC and 79 kcal (4% of TEI) in OC. In all subjects, the mid-afternoon consumers presented a macronutrient profile closer to the recommended daily allowances favouring CHO rather than fat and protein. In addition, energy intakes at lunch and dinner were reduced when the frequency of consumption of the mid-afternoon meal increased.

Conclusions: The mid-afternoon meal is part of the eating patterns in the majority of French children and in some adults. It allows a better distribution of TEI and may be a good way to improve the quality of the diet via an healthy food choice.

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PS.C65

‘I eat and...’: A Project of Nutritional Surveillance


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Introduction: The Regional Health Plan for Tuscany defines nutritional surveillance as a coordinated group of activities aimed at collecting data on the food habits to prevent disease and to identify predictors of it.

Subjects and Methods: A randomization procedure was used to obtain a representative sample of 50% of the children attending the 3rd elementary class in Pistoia and its surroundings. The children underwent measurements of height, weight, skinfolds (triceps and subscapular) and circumferences (waist, arm). A specially devised food-frequency questionnaire was employed to assess the frequency of consumption of specific foods.

Results: 1,060 children, aged 7–12 years, were evaluated. We determined BMI [1] using national percentiles [2]:

<table>
<thead>
<tr>
<th>BMI Percentile</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>&lt;5th percentile (underweight)</td>
<td>5.0%</td>
</tr>
<tr>
<td>&gt;5th and &lt;85th percentile (normal-weight)</td>
<td>74.3%</td>
</tr>
<tr>
<td>&gt;85th and &lt;95th percentile (at risk of overweight)</td>
<td>13.2%</td>
</tr>
<tr>
<td>&gt;95th percentile (overweight)</td>
<td>7.4%</td>
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</tbody>
</table>

As food habits are concerned, 33% of the children does not eat breakfast every day, 16% never eats fish, 21% never legumes, 14% never vegetables and 10% never fruits. 32% are not engaged in any kind of physical activity.

Discussion: These preliminary data demonstrate the need of implementing strategies aimed at promoting more healthy eating habits in children.

References
**PS.C66**

*Effect of Dietary Habits and Life Style on Serum Lipids in Adults*

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The study was done in winter 2000/2001 in 152 participants aged 21–77 years (82 women, mean age 52.8 ± 16.1 and 70 men, mean age 48.6 ± 17.1) registered at Regional Health Centre in Warsaw. Fasting serum total cholesterol, triacylglycerols and HDL-cholesterol were measured by enzymatic methods. LDL-cholesterol was calculated with the use of Fiedewald index. Risk of coronary heart disease (CHD) was evaluated with the aid of total cholesterol/HDL-cholesterol index. Life style and nutritional habits were assessed by questionnaire method.

In 51% of men and 61% of women the serum total cholesterol level was above normal values. The highest levels of total cholesterol, LDL-cholesterol and risk of coronary disease were observed in men aged 36–50 years and among women over 66 years. Body mass index (BMI) was positively correlated with levels of total cholesterol, LDL-cholesterol, triacylglycerols and risk of coronary disease but negatively correlated with HDL-cholesterol in serum. Unproper life style, such as low physical activity level, coffee drinking, smoking habits and stress, could have attributed to the higher levels of lipids in participants serum. Restriction of fat intake and consumption high-fat products, especially saturated fats, caused positive changes in lipid serum profile and decrease risk heart disease.

**PS.C67**

*How Could Food Intake Affect Osteoporosis?*

*M.K. Mattar, M.A. Sami, S.A. Ibrahim, W.A. Moussa, H.A. Hassan*

National Nutrition Institute, Cairo, Egypt

Dietary factors such as calcium, phosphate and vitamin D in addition to micronutrients are essential for normal bone structure and function. This study is a part of a comprehensive cross-sectional survey on families to assess status of bone density among adolescents and adult population in Egypt. 2,500 families were randomly selected from 6 governorates. The surveyed population (fathers, mothers and two adolescents) from each family were subjected to anthropometric measurements. Bone mineral density measurements was done by using (DEXA) Dual Energy X-ray absorptiometry bone densitometer. Data on food consumption was collected using the 24 hours recall method. The study showed that low bone density was detected among (17.7% and 14%) of fathers and mothers respectively. The prevalence of low bone density was high among male adolescents (38.2%) as compared to (18%) among female ones. Regarding some nutrient intake which are important for bone formation and remodeling, it was found that (16%) of fathers and 12.2% of mothers had low calcium intake (less than 50% of their RDA), 37.8% and 21.5% of both male and female adolescents consume (less than 50% of their RDA) of calcium. The same results were observed in case of vitamin D intake. The percentage of fathers and adolescent males consume (less than 50%) of their RDA of vitamin A was more (23.9% and 17.1%) than mothers and female adolescents (7.5% and 9%) respectively. The results showed that the percentage of fathers and male adolescents who consume (more than 100%) of the RDA of protein was higher (19.9% and 56.4%) than mothers and female adolescents (11.5% and 24.1%) respectively. Therefore good nutrition in early life will reduce the risk of osteoporosis later and screening tests should be done for early detection of osteoporosis to prevent its occurrence.

**PS.C68**

*Frequency of Alcohol Consumption Among Adults in Republic of Srpska*

*M. Balaban, D. Stojisavljevic, D. Danovic, S. Petkovic*

1Institute of Public Health of Republic of Srpska, 2Medical Faculty Banja Luka, Bosnia-Herzegovina

Alcohol consumption among people depends on culture and lifestyle. It is harmful to individual health, family and community. The aim of this project is to define frequency of alcohol consumption among adults in RS.

**Methods:** For the survey was used translated ‘CINDI Health Monitor Questionnaire’ and population registry from Statistical Institute. The sample size was 2,200 respondents.

**Results:** During last 12 months total number of consumers was 76.0% (male 89.0% and female 63.1%). According to age of respondents, most of them were in age 25–34 (78.7%). The biggest number of male consumers was in age group 25–34 (91%) but female consumers in 45–54 (68.9%). Average number of beer bottles is 6.27, free mixed high balls 3.45 bottles, strong alcohol 5.38 portions and wine 3.01 glasses.

Number of respondents who never used strong spirit is 37.5%, but daily drinker are 10% (male 17.5% and female 2.5%; p < 0.001). Wine never drink 59% and daily 0.5%. Male respondents drink daily 1% (p < 0.001). Beer never drinks 36% and daily drinkers are 14.3%. Male drinks more than female (p < 0.001). Only 1.6% of respondents were advised by doctor to drink less. Average age of first drinking alcohol is 19.4 years. (p < 0.001). Place where first drink happen was in family 51.2%, with friends 45.9% and in restaurant 2.9%. Most of people drank first alcohol after 18 years (38.9%). The largest quantity during one day: beer 5.2 bottles wine 3.9 portions and strong spirit 5.9 portions.

**Discussion and Conclusion:** Alcohol products are responsible for 9% of ill burden in European Region. On the basis of obtained data male drinks more than female and it is linked with mortality statistics and years of life expectancy. The most famous alcohol drink is beer. It must be implemented action plan for limit of alcohol consumers.
Submitted Posters

PS.C69
The Structure of Romanian Diet and Food Quality Related to Prices During the Transition Period of Romania
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During the transition period of Romania, the food consumption and the structure of diet significantly varied. There were meaningful alterations of Romanians’ nutrition after 1998, both from qualitative and quantitative points of view. Moreover, the poverty status of Romanian population allowed the promotion on the internal market of food goods with lower or moderate quality at prices apparently accessible.

Especially after 1995, the structure of yearly average consumption by main food products, expressed in physical units per inhabitant, was modified, in favour of vegetal products. Main consumed foodstuffs were bread and mealy products. Since 1998 the consumption of meat and milk products decreased gradually. The ratio related to the consumption between vegetal and animal products within the transition period of Romania was registered. The daily average food consumption, expressed in calories and nutrients, per inhabitant, for the same period was also analysed. The average food consumption was below 3,050 thousand calories/inhabitant/day and the structure of diet significantly varied. There were meaningful alterations in the countries from Africa, Asia and South America, where carbohydrates consumption, expressed in nutrients, became close to the model of the United States of America.

The consumer price indices (CPI), which measure the evolution per total of prices for purchased food goods used by Romanian population during the transition period (1990 reference period) significantly increased. The evolution of food prices was related to inflation for the mentioned period. CPI for food products was different to evolution of average net earnings. The evolution of average prices by main agro-food products sold on the internal market within the Romania’s transition period were estimated, too. The prices of basic food products were correlated to their quality, expressed in nutrients (carbohydrates, lipids and proteins).

PS.C70
Assessment of Emotional, Externally Induced and Restrained Eating Behaviour Among Portuguese Students
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Objective: To assess the emotional, externally induced and restrained eating behaviour among Portuguese students.

Subjects and Methods: Transverse survey conducted among 612 students (432 women, 180 men, mean age 21 ± 3 years) from a private university of Health Sciences. Eating behaviour was assessed by the Dutch Eating Behaviour Questionnaire; height and weight by analogical scales. Overweight/obesity was defined as BMI ≥ 25 kg.m⁻².

Results: Overall, women had higher emotional and restrained eating scores and lower externally induced eating scores than men (see table, results are mean ± SD). Subjects who reported being on diet had higher restrained and externally-induced eating scores in both genders, and lower emotional eating scores in women. Among dieters, women had higher emotional eating scores than men (2.50 ± 0.61 vs. 1.87 ± 0.76, p < 0.01). Overweight/obese subjects had higher restrained scores in both genders, lower externally-induced eating scores in men and higher emotional eating scores in women; all scores were higher in women than in men.

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrainted</td>
<td>2.32 ± 0.77</td>
<td>1.88 ± 0.71</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Emotional</td>
<td>2.24 ± 0.68</td>
<td>1.82 ± 0.64</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Externally-induced</td>
<td>2.59 ± 0.45</td>
<td>2.67 ± 0.51</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Finally, on multivariate analysis, being on diet, overweight/obese or women were independently related to a higher restrained eating; being on diet or women were related to emotional eating, and being on diet was related to a higher externally-induced eating score.

Conclusions: Eating behaviour is largely dependent on gender, overweight/obesity or dieting. Women are more prone to eat due to emotional stress, whereas men are more sensitive to external factors.

PS.C71
Consumption of Vegetables in Lithuanian Population
M. Olechnovic1, A. Barzda1, A. Abaravicius2, R. Bartkeviciute1
1National Nutrition Centre, 2Medical Faculty of Vilnius University, Vilnius, Lithuania

Aim: The aim of the survey was to provide detailed information on the food consumption patterns, especially in the group of vegetal products and fruits, and health behaviours of the population in Lithuania.

Materials and Methods: 300 respondents representing summer – autumn season were interviewed at the first step of the investigations (2001). 765 persons were interviewed (autumn – winter season) at the second investigation (2002). The current work presents common results of I and II period of investigations (in total – 1,065 of respondents). Interviews, including a 24-hour recall of dietary intake, and standardized questionnaire (covering demographic characteristics, eating habits and health behaviors), as well as height and weight measurements.

Results: Relatively small part of the examined people only 7.1% stated their preference on the ‘healthier alternatives’ and 54.8% selected food according to the price. 40.5% of males ate fresh vegetables only once or twice a week, 34% of females – three or five times per week. 21.2% of females and 15.8% of males ate boiled vegetables more often – five or seven times per week. 47.7% of urban population and 89.2% of rural population ate only domestically produced vegetables and fruits. So, 28.5% of rural population and 22.7%
of urban population ate fresh vegetables every day, in the case of boiled vegetables it was even 21.4% of rural population and 16.5% of urban population.

Conclusions: In conclusion, the price of foods was the most important criterion for choosing the meals. Great part of respondents used domestically produced vegetables and fruits, so during the autumn season fresh vegetable were more often used, however the insufficient of using fruit and vegetables in the diet of the population in Lithuanian were observed.

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**PS.C72**

**Obesity Among Italian Children (SCARPS Study): What Is it Associated With?**


Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Rome, Italy

**Introduction:** Childhood obesity has been increasing in Western countries and that is really worrying. Epidemiological studies have shown that the increase in obesity is correlated with behavioural and environmental changes, besides eating pattern ones.

**Aim:** The aim of this study was to examine how strong the correlation is between certain socio-environmental and nutritional variables and obesity among Italian children.

**Methods:** The analysis was done applying a model of logistic regression, in a sample of 1,036 Italian children, in which the dependent variable was the probability for a child aged six to 14 to become obese (dicotomic variable). Preliminarily, we selected those relevant social-environmental variables (significant \( \chi^2 \) test \( P < 0.005 \)) that, afterwards, were used in the model as independent variables together with the food consumption data, associated in homogeneous groups: geographical area, sex, life style, professional status and education of parents and number of people in the family. Once estimated the parameters, the relative risk for a child, with certain characteristics, to become obese was calculated for each modality.

**Results:** The results did not show a correlation between obesity and type of food eaten but a significant one between obesity and geographical area, sex and life style. In fact, the probability for a child living in the centre of Italy vs. one living in the South to become obese is lower than 20% (RR 0.80 IC 0.6–1.3) and it is almost halved when considering a child living in the North (RR 0.50 IC 0.3–0.8). Moreover, it came out that the probability for a male child vs. a female one to become obese is 1.7 times higher. An active or very active child is less likely to increase seriously his/her weight (RR 0.40 and 0.30 respectively).

**Conclusion:** Alltogether, this study seems to show a higher incidence of the socio-environmental factors rather than the type of food eaten.

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**PS.C73**

**Food Consumption Patterns in the Republic of Serbia**

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**Objective:** Aim of the paper was to evaluate food consumption patterns and trends in the Republic of Serbia in order to obtain reliable information on food intake so that improvements in diet can be made and consequently decrease the occurrence of chronic diseases.

**Material and Methods:** Data on the national consumption of the main food groups between 1989 and 2000 were obtained from the National Institute of Statistics. Data included average intake per capita of cereals, fruit, vegetables, pulses, meat and meat products, fish, milk and milk products, eggs, fats and oils, soft and alcoholic drinks, coffee and sugar. Average daily intake per capita of macronutrients, i.e. energy, protein, carbohydrates and fat was derived together with data on specific micronutrients such as iron, calcium, phosphorus, fiber, vitamin E and D, saturated and unsaturated fatty acids, cholesterol.

**Results:** Average daily energy intake in Serbia was 2,810 KCal/d per capita. The share of dietary energy supplied from proteins was 81 KCal/d per capita, from fats 94 KCal/d, from carbohydrates 362.5 KCal/d. The percentage of dietary energy supplied from cereals was 45.8%, vegetables 2.62%, meat and meat products 11.41%, fish 0.45%, animal fat 6.14%, vegetable fats and oils 8.47%, eggs 1.18%, fruit 2.34% milk and milk products 7.16%, sugar 6.53%.

**Conclusions:** Dietary changes over the past decade include shifts in the structure of diet towards a higher energy density diet with a greater role for fat and added sugar in foods, greater saturated fat intake mostly from animal sources, reduced intakes of complex carbohydrates and fibre and reduced fruit and vegetable intakes. There is need to monitor actual food consumption patterns and changing trends based on representative consumption survey in order to verify effectiveness of national nutritional programmes aimed at reduction of nutritional risk factors of chronic diseases.

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**PS.C74**

**Polish Experience in Changing Food Consumption Trends During Market Transformation**

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Faculty of Human Nutrition and Consumer Science, Warsaw Agricultural University, Warsaw, Poland

Based on institutional economics authors analysed holistic approach in food sector covering production, processing and supply incl. consumer’s behavior towards changing consumption pattern(s) during the beginning of the XXI century. The main conclusions from these investigations are as follows:

- Many positive changes in consumption occurred (e.g. increase in fruit, fish, more vegetable fats and less sugar), but the most negative effect was observed in milk products despite theirs significant diversifications.
In solving contemporary and future food problems intersectoral approach is necessary taking into account general economic situation and specifically institutional economies oriented towards achieving compromises between producers, processors, traders and consumers.

Changes in food patterns, being a consequence of family budget and other aspects of consumer behavior adaptation to new market conditions, indicate the necessity of systematic monitoring of food consumption in Poland.

However an ultimate goal for the food sector is to maintain security, safety, sustainability and along with food services offered to the modern consumer.

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**PS.C75**

**Evaluation of the Reliability of Estimating Food Quantities from the Household’s Food Expenses: Case Study Using Data from Bolivia**

A. Pérez-Cuets Eulert1,3, A. Naska2, P. Kolsteren1,3, A. Trichopoulou2

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**Introduction:** For more than 15 years, the European Data Food Networking (DAFNE) initiative has been exploiting the use of Household Budget Survey (HBS) data for estimating food availability at household level and for monitoring food disparities within and between countries. Because of the periodicity in data collection, the HBS have a wide scope of application in developing countries, where demanding dietary surveys are rarely carried out. In some developing countries, however, the recorded data refer only to the households’ food expenses and food quantities need to be calculated.

Bolivian HBS data collected in 1990 were integrated in the DAFNE database. Since both food expenses and quantities were recorded during the survey period, the Bolivian dataset was used to evaluate the reliability of estimating food quantities from expenses incurred, in the setting of a developing country.

**Methodology:** Twenty-two food items were selected from the Bolivian 1990 HBS, on the basis of availability of official average yearly prices per their unit weight. Food quantities were calculated by dividing the recorded expenses with the respective average prices. Comparisons were performed using the household raw data. Pearson’s correlation coefficients and regression coefficients were calculated.

**Results:** Calculated means were lower than the recorded ones, except for carrots; however, the Pearson’s correlation coefficients between recorded and calculated food quantities were high (r between 0.50 and 0.99; p < 0.001) for the 22 food items. Regression analysis showed that the increments in calculated quantities changed in the same direction to the recorded ones.

**Conclusion:** Preliminary findings based on the Bolivian data suggest that estimating food quantities from food expenses might lead towards underestimation of actual values, particularly for food items with seasonal consumption. However, the calculated food quantities may reflect availability at population level and can be used to safely identify high versus low food consumption.

**Acknowledgements:** The HBS was provided by the Bolivian National Institute of Statistics. This study is partially sponsored by Nutrition Tiers Monde (Belgian non-profit organization), and the Department of Hygiene and Epidemiology of the University of Athens.

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**PS.C76**

**Changes in the Food Consumption Pattern and Cardiovascular Mortality in Poland**

W. Sekula, W.B. Szostak, K. Figurska

National Food and Nutrition Institute, Warsaw, Poland

Trend over time in standardised mortality rate in Poland was analysed together with the trends in food and nutrient consumption. Data derived from the national food balance sheets showing the quantities of major foodstuffs available per capita per year and original calculations on the daily amounts of energy and nutrients derived from food were used.

Cardiovascular mortality rate in Poland followed for several decades increasing trend until 1991. In this year it amounted to 625.4 per 100 thousands of population. Since 1992, however, a decline in the death rate due to cardiovascular diseases has been noted and in 2001 it was by 30% lower in comparison to 1991.

It was shown that the consumption of butter, other animal fats, milk and beef followed a declining trend initiated in 1990 and was in consequence considerably lower in 2001 in comparison to 1989. At the same time, there was a dramatic increase in the consumption of the vegetable fats and oils. Very significant consumption increase was noted for fruits and for poultry meat.

Total energy amount derived from food insignificantly declined between 1989 and 2001. There were at the same time shifts in the proportions of energy derived from food of animal and vegetable origin resulting from the decline in the amount of the animal energy. Total fatty acids content in the daily diet per capita decreased insignificantly. It reflected significant reduction in the amount of saturated fatty acids, insignificant increase in the monounsaturated fatty acids content and significant increase in polyunsaturated fatty acids amount.

It could be concluded that the improvement in the food consumption pattern over the last decade was an important cause of cardiovascular mortality decline in Poland.
Between September 2000 and November 2000 the ‘Household Food Consumption and Anthropometric Survey’ was carried out in Poland covering 1,362 households. Households recorded data routinely collected in the Polish HBS on the amount and cost of food purchased by the household or obtained by other means. In addition, food consumption for each household member was examined by 24 h recall. All members of 1,215 households provided 24 h recall data. Results from the two methods of assessment regarding food quantities and the estimated energy and nutrient amounts were then compared. To allow for direct comparison between the methods, food consumption data collected by the 24 h recall (expressed in ‘as eaten’ category) were converted into the ‘as purchased’ equivalents.

The energy value of an average daily per person food quantities in 1,215 households measured through the household budget surveys carried out between September and November exceeded by almost 20% the value resulting from individual dietary survey. The protein and fat contents were by 12% and 9% higher, respectively, while the carbohydrate content was by 32% higher. Smaller differences between means were found when the results of the 24 h recall were compared with the results of the HBS data collected in the whole sample over the entire year. Higher differences for the September–November period reflected predominantly the ‘bulk’ potato buying during the harvest season, a tradition that is still very popular in Poland.

### PS.C79

**Assessment and Comparison of Eating Behavior, SFA Intake and GERD Problem in Dormitory and Non-Dormitory Living University Students, Tehran, Iran**

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International Pars Research and Development Institute, Gastrointestinal and Liver Research Center, Shaheed Beheshti, University of Medical Sciences, Iran

**Introduction:** Within this rapidly changing world, in order to have good progressions, we need healthy youths as a large group of university students. One of the most important factors that affects their personal and working lives is having good nutritional behavior to be healthy and get technical skills for future.

**Material and Methods:** A case-control study was conducted on 60 Tehran university students (18–25 years of age), 30 dormitory and 30 non-dormitory living control subjects matched with regard to age and sex. A questionnaire covering demographic data, possible disease and 24-hour dietary recall was filled out for each individual.

**Results:** 53.33% of dormitory and 56.66% of non-dormitory living students had three main foods. 46.66% and 43.33% had less than three main food per day respectively in dormitory and non-dormitory living students, without significant difference. 43.33% and 16.66% of the students didn’t receive any mid-day snack, 20% and 30% received two mid-day snacks per day in dormitory and non-dormitory living students, respectively. 60% of the students had 3 hours and more between their food intakes per day, in both dormitory and non-dormitory living students with no significant difference. Junk food containing Saturated Fatty Acid consumption pattern (more than 2 time a day) was 86.66% and 66.66% in dormitory and non-dormitory living students. There was a positive correlation between their mid-day snack and Saturated Fatty Acid. The work concerns eating habits, growth and the way of socialization of tamil children (first generation) born in France from immigrant parents (south India and Sri Lanka). The aim is to prevent obesity and deficiencies for the health of these children.

**Conclusions:** The results showed that in both dormitory and non-dormitory living students, there wasn’t a good habit of dietary time and Saturated Fatty Acid intakes. It was also shown that there was a positive correlation between their eating behaviors and GERD.

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**PS.C77**

**A Comparison Between Household and Individual Food and Nutrient Consumption Data**

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Between September 2000 and November 2000 the ‘Household Food Consumption and Anthropometric Survey’ was carried out in Poland covering 1,362 households. Households recorded data routinely collected in the Polish HBS on the amount and cost of food purchased by the household or obtained by other means. In addition, food consumption for each household member was examined by 24 h recall. All members of 1,215 households provided 24 h recall data. Results from the two methods of assessment regarding food quantities and the estimated energy and nutrient amounts were then compared. To allow for direct comparison between the methods, food consumption data collected by the 24 h recall (expressed in ‘as eaten’ category) were converted into the ‘as purchased’ equivalents.

The energy value of an average daily per person food quantities in 1,215 households measured through the household budget surveys carried out between September and November exceeded by almost 20% the value resulting from individual dietary survey. The protein and fat contents were by 12% and 9% higher, respectively, while the carbohydrate content was by 32% higher. Smaller differences between means were found when the results of the 24 h recall were compared with the results of the HBS data collected in the whole sample over the entire year. Higher differences for the September–November period reflected predominantly the ‘bulk’ potato buying during the harvest season, a tradition that is still very popular in Poland.

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**PS.C78**

**Tamil Children – Born in France between 1992 and 1998 – Growth, Eating Habits and Prevention**

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The work concerns eating habits, growth and the way of socialization of tamil children (first generation) born in France from immigrant parents (south India and Sri Lanka). The aim is to prevent obesity and deficiencies for the health of these children.

Longitudinal data on height and weight have been collected from the Centres of ‘Protection Maternelle Infantile’ in the north area of PARIS for 36 girls and 47 boys from birth to six years old. Eating habits have been observed through interviews.

There is a discrepancy in results between girls and boys from 0 to 4 years old. For girls, 6 are obese (17%), between 2 and 3 years (Body Mass Index is above the 97e percentile). One third (36%) show overweight (above the 50e percentile) between 2 and 3 years. Those who are overweight between 1 or 2 years old are going to be in the same state to 4 years old, which could probably be a risk of obesity later in life. For boys prevalence of obesity is less important than for girls, 11% (5); this appears either about 6 months or 3 years. 15% are overweight at one or three years old. But 35% are UNDERWEIGHT under the 3rd percentile between 1 to 4 years old.

These differences can partly be explained through the culture of the tamils. Nutritious taboos are respected in France too during women’s pregnancy, just as during the post natal period. Tamil boys get a better regular medical following than girls, specifically when there is an obesity problem. Boys go on a diet and they lose weight; but some of the girls abandon the medical center. On the other hand, boys do some physical activities in the sense of moving. Girls are not authorized to play outside in the streets.

Seventy percent of the families keep their eating habits. They shop in Indian grocery stores. Nevertheless through ‘fast food eating’ consumption of sodas is more and more important.

Are tamils’ eating habits becoming westernised? It is too early for answering this question.
problem, especially in dormitory living students. It is suggested to provide university students with the correct information about healthy eating as high-risk subjects.

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**PS.C80**

**Family and Individual Factors Related to the Finnish Adolescents’ Fruit and Vegetable Consumption**

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Adolescents’ eating habits often change when they gain more independence and are more able to choose what, when, and with whom they eat. A critical change in this period of life is the decline in fruit and vegetable consumption. The aim of this study was to explore which factors positively relate to adolescents’ fruit and vegetable consumption.

The data used in this study was drawn from the WHO co-ordinated survey of Health Behaviour in School-Aged Children (HBSC Study). We collected nationally representative data from self-completion questionnaires administered in the classroom by the teacher. The survey included food frequency and meal pattern questions, and a wide range of questions on background factors, individual and social resources, and health behaviours. The sample consisted of 13- and 15-year-old Finnish students (N = 3,564) in 2002. SPSS Windows and MLwiN were used in statistical analyses.

The regular meal pattern as well as eating together with family was associated with more frequent fruit and vegetable consumption. Approximately one third of the adolescents ate regular meals (i.e. breakfast, lunch, and dinner) every school day and together with their family every day. In addition, being female, physically active, non-smoker, from high affluence and socio-economic status families, and having plans for higher education also had a positive effect on fruit and vegetable consumption.

Adolescents’ fruit and vegetable consumption was related to both family and individual factors. Promoting eating together with family is of vital importance. Whole meals eaten with the family contain more fruit and vegetables than adolescents would otherwise choose. It’s also an aspect of the family’s supportive behaviour, which reduces negative consequences of overweight. We tested the hypothesis that a daily moderate consumption of beer (106 and 211 Kcal for women and men, respectively) would not change body weight.

**Methods:** Twenty-seven women and 30 men aged 25 to 50 years were included in this study. After a 30 day-alcohol abstemious period, all of them were submitted to a daily consumption of a moderate amount of beer (330 ml for women and 660 ml for men) during the following 30 days. Dietary assessment and anthropometric parameters were evaluated three times: at the beginning of the study (a), after abstention (b) and after moderate beer consumption (c). The volunteers were instructed to go on with their normal lifestyles including dietary habits during the course of the study. Dietary intake was calculated using a 7-day food record. Body weight was measured with a scale Seca (with a precision of ±100 g), height with incorporated stadiometer to the scale. Body composition was established by body mass index (BMI) (weight/height^2) in kg/m^2.

**Results:** Data are presented for points (b) and (c). Throughout the study, energy intake, body weight and BMI did not change significantly in both men (2250.6 ± 762.5 vs 2306.7 ± 496.2, 73.1 ± 8.7 vs 73.5 ± 8.4, 24.47 ± 2.6 vs 24.62 ± 2.6) and women (1777 ± 10.4 vs 1888 ± 476.6, 60.9 ± 4 vs 62 ± 2.8, 24.03 ± 2.5 vs 24.05 ± 2.5), respectively.

**Conclusion:** According to the results of this study, we suggest that a daily moderate beer consumption during one month does not change body weight of healthy adults.

Study supported by Centro de Información Cerveza y Salud, Spain.

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**PS.C82**

**Quality of Breakfast in Children**


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Several epidemiological studies showed that a regular consumption of breakfast plays a key role in nutrition quality and adequacy of diet. This is true at any age and particularly in school-aged children [1]. A good quality of this meal contributes to a more balanced daily intake of macronutrients and higher intakes of micronutrients amongst children [2], besides, it is associated with a lower Body Mass Index (BMI) [3].

The aim of this study was to verify the relationship between quality of breakfast in school children and their nutritional status. For this purpose, we investigated 7,790 children, aged 8.9 ± 0.3 years, living in the Lazio region.

Data about breakfast of only one day were collected, by asking each child about type and quantity of foods eaten. Nutritional status was assessed by weight and stature measurements collected by standardized method [4] and evaluated by the International Obesity Task Force method [5].

A first analysis indicates that 16% of the sample did not eat anything before going to school. Moreover, those who skipped breakfast with respect to those who had breakfast presented a significantly higher percentage of children (χ² = 6.24, d.f. = 2, p = 0.044) obese (15.5% vs. 10.8%) and overweight (28.7% vs. 25.6%).
However, further variables will be studied, in order to define the correlations among breakfast quality, nutritional status and geographic area.

References


PS.C83

Fast Food and Snacks in Austria

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Objectives: Childhood obesity is a dramatically growing problem. With regard to 40–50% of morbid obese adolescents who consume fast food daily, the aim was to describe the possible role of fast food as high potential energy and fat source.

Methods: Nutrient compositions of three fast food outlets in Austria were analysed for energy and fat content and especially proportion of energy from fat. In addition, data were compared with traditional Austrian snacks and meals as well as other gladly consumed snacks.

Results: Most of the products have a content of energy from fat of 40–50%, some even more (up to 60–65%). Even salads are high in fat, mostly because of fat-rich dressings (up to 20 g fat). Compared to traditional ‘Austrian’ fast food, there is no big difference, as it also shows fat contents of 50–60%.

With one meal, easily up to 1,000 kcal can be consumed (more than half of the upper limit of fat intake). However, the informed consumer has the chance to select more acceptable food item. So-called ‘low-fat’ products are rare, but are characterized by better nutrient relations.

Conclusions: Fast food and snacks are contributing to a high extent to the fat and energy intake of more and more snacking children. Recommending the avoidance of fast food is not successful, because it is part of nutritional behavior of today and the future. Efforts to provide healthier, low-fat fast food are very important and have to be forced. This might possibly contribute to a better nutrition of children and adolescents and to avoid overnutrition.

PS.D1

Dietary Proteins, Immune Function, and Induced Colon Carcinogenesis in Mice

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The objective of the present work was to compare the ability of four dietary protein sources regarding immunostimulation and retardation of the azoxymethane induced cancer in mice. The protein sources were a commercial casein (CC) 84.3% protein, a commercial soy protein isolate (SPI) 92% protein, Immunocal (IM) 91.5% protein, and a whey protein concentrate (WPC) 83.4% protein, produced in our laboratory by rennin coagulation of defatted and pasteurized (72°C, 15 sec) bovine milk, by ultrafiltration (MW cut off 10 kDa) followed by diafiltration (CF = 12, DC = 25). Isogenic A/J female mice, 6–7 weeks of age, were maintained in isolator, 5 in each cage. Prior to injection of carcinogen (AOM) the mice were maintained five weeks on the experimental diets. Subcutaneous injection of AOM started in the 4th week on the diet and continued for six weeks (5 mg/kg bw) weekly making a total dosage of 30 mg/kg bw. All four protein sources had similar composition and showed no difference in promoting growth. Whey protein sources significantly inhibited colon preneoplasic lesions and tumors, compared to CC and SPI. IM and WPC were superior to CC and SPI regarding stimulation of spleen cell production of immunoglobulin (IgG), after challenging with 10 million saline washed sheep erythrocytes, as detected by plaque forming cells (PFC) technique. The efficacy of the dietary proteins to stimulate spleen cells and glutathione synthesis decreased along the experiment, although the stimulation capacity of the whey protein sources remained superior. A very strong correlation (r = 0.998) was established between PFC number and liver glutathione concentration, both at the beginning and at the end of the experimental period.

PS.D2

Anti-Inflammatory Effects of Resveratrol in an in vivo Acute Inflammation Model and on COX-2 Inhibition

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Resveratrol (trans-3,4,5-trihydroxystilbene) is a polyphenol found in various plants, most notably in grapes but also in a variety of medicinal plants. Resveratrol has been suggested to have potent antitumorogenic and anti-inflammatory activities. The aim of this study was 1) to investigate the potency of resveratrol in vitro at inhibiting cyclooxygenase (COX)-2, an inducible enzyme in the proinflammatory

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prostanoid pathway and 2) to investigate the anti-inflammatory activity of resveratrol in vivo in carrageenan-induced paw edema in the rat. It was also assessed for inhibition of COX-1. Resveratrol was tested, in the range of 0.1–125 μM, for the inhibition of ovine COX-1 and COX-2 activities in vitro using radiochemical enzyme assays. The compound demonstrated a concentration-dependent inhibition of COX-1 and COX-2 activities with mean IC50 of 19 μM and 67 μM respectively. These data suggest that resveratrol is a more potent COX-2 inhibitor than aspirin, but less powerful than NS398, a selective COX-2 inhibitor. The anti-inflammatory activity of resveratrol (0.03 to 30 mg/kg, p.o.), was evaluated in the carrageenan-induced rat paw edema model using indomethacin (5 mg/kg, p.o.), as a positive control. A sub plantar administration of carrageenan (0.5%) in to the right hind paws of rat produce a significant edema formation by 3 h after irritant administration. Resveratrol reduced paw edema in a dose-dependent manner with an ED 30% of 0.16 mg/kg. At the highest dose tested (30 mg/kg, p.o.), the drug significantly decreased total edema formation by 47%. Thus, resveratrol potently inhibited the carrageenan-induced paw edema in the rat. The edema-suppressing activity of resveratrol was much higher than expected from the IC50 values obtained in the COX-2 enzyme assay suggesting that in addition to COX-2 inhibition resveratrol probably has anti-inflammatory activity via other mechanisms.

PS.D3
Alcohol Dehydrogenase 3 Genotypes Influence the Beneficial Effect of Alcohol Consumption on Inflammation

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Moderate alcohol consumption was associated with a reduced risk of cardiovascular disease (CVD). A polymorphism of ADH3 gene alters the rate of alcohol metabolism and modulates its effect on CVD risk and HDL levels. Modulation of inflammation mediates the protective effect of alcohol. We investigated the effect of alcohol on hs-CRP, IL-6, P-selectin, and lipids in relation to ADH3 polymorphism. 154 healthy subjects (77 males and 77 females, 30–60 years) were randomly selected from the population. Information on alcohol consumption was obtained by a standardized FFQ. Hs-CRP was measured by immunoturbimetric assay (HemosIL, IL, Spa, Milan, Italy). A statistically significant negative correlation was found between alcohol intake and hs-CRP levels (r = −0.06, P = 0.049). ADH3 genotype significantly modified the association between alcohol and hs-CRP (P = 0.01 for interaction after adjustment for age and sex): indeed it was present only in γ2 allele carriers (r = −0.37, P = 0.001) but not in γ1 homozygotes (r = 0.03, P = 0.76). A similar trend was observed for P-selectin and alcohol (r = −0.20, P = 0.094 for γ2 carriers; r = 0.06, P = 0.62 for γ1 homozygotes; P for interaction = 0.07). We also found an association between high level of IL-6 and the high level of alcohol consumption, but only in homozygous for γ1 (P for interaction = 0.035). Alcohol intake was positively associated with TC (r = 0.21, P = 0.009), and TG (r = 0.21, P = 0.010), the latter being only present in γ1 homozygotes (r = 0.30, P = 0.006 vs r = 0.08, P = 0.48 in γ2 carriers; P for interaction = 0.096). ADH3 genotype influences the effect of alcohol consumption on both inflammation and triglycerides level. In particular, in carriers of the γ2 allele (associated with a slow rate of ethanol oxidation) alcohol intake decreases inflammatory markers, without any effect on TG.

PS.D4
Effects of Immature Durum Wheat on Immune Response and Serum Lipids in Rats

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Studies in experimental animals indicate that isolated oligofructans may modulate the response of the immune system and the concentration of serum lipids. Experiments on the effect of real foods naturally rich in fructans without extraction and isolation from the natural sources have not been carried-out. On this information we have examined the effects of immature wheat utilised in the experimental diet for rat on serum lipids and immune response. The concentration of fructans in immature wheat is higher than the concentration found in mature wheat (5.0 vs. 1.9%). Three groups of growing rats have been fed for six weeks with the experimental diets (control diet, diets containing 53% of mature wheat and immature wheat). At the end of the experimental period lymphocytes were isolated from the spleen and serum prepared from the blood. Lymphocytes proliferation was determined by 3H-thymidine incorporation after stimulation with mitogenes and the plasma triglycerides and total cholesterol, lipoprotein-cholesterol level, was measured by colorimetric assay. The results showed that the diet rich in immature durum wheat was able to reduce triglycerides, total cholesterol and lipoprotein plasmatic levels, without affecting lymphocytes proliferation grade. Moreover there was no a significant no differences in lymphocyte proliferation compared with control diet. The dietary factor and mechanisms involved are discussed.

PS.D5
Intestinal Morphology and Characteristics of GALT in Rodents Fed Diets Supplemented with Plasma Proteins

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We studied body and organ growth, intestinal IgA secretion and several cell populations of the Gut Associated Lymphoid Tissue (GALT) in young rodents fed diets supplemented with either 4% or
8% spray-dried animal plasma (SDAP). Weaned BALBc mice (19–20 days-old) and Wistar rats (21–22 days-old) were fed the experimental diets for 14 days. SDAP supplementation had no effect on mouse growth; however, 8% SDAP significantly increased final body weight in rats. Both mice and rats, showed a significant reduction in the small intestine/body weight ratio, which was shown to be due to a reduction in intestinal water content. No change in spleen or thymus final weight was observed in either species. The B-lymphocyte IgA plasma cell population of the intestinal mucosa was not affected by SDAP although luminal IgA secretion in rats fed 8% SDAP was higher than in the 4% SDAP supplemented animals. Analysis of epithelial GALT cell population of the intestinal mucosa was not affected by SDAP but dietary supplements did not modify these variables.

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PS.D6
Effects of Plasma Protein Supplementation on Intestinal Functions in an Experimental Model of Intestinal Inflammation
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We studied the effects of dietary supplementation with plasma proteins on intestinal secretion and lymphocyte populations of the Gut Associated Lymphoid Tissue (GALT) in rats challenged with the enterotoxin B of Staphylococcus aureus (SEB). Wistar-Lewis rats were fed diets supplemented with 8% spray-dried animal plasma (SDAP diet) or with 4.7% of immunoglobulin concentrate (IC diet) from day 21 (weaning) to day 35 after birth. On days 30 and 33, animals were given SEB (0.5 mg/g, i.p.). Water content in faeces was measured 24 h and 48 h after the second SEB administration. On day 35, samples of intestinal mucosa, Peyers’ patches (PP) and mesenteric lymph nodes (MLN) were taken. 24 h after the second SEB administration the water content of faeces increased, which was prevented by both SDAP and IC diets. After 48 h, only SDAP was still effective. Rats treated with SEB showed increased mucosal myeloperoxidase activity that was not modified by the diets assayed. SEB also increased the T lymphocyte population in Peyers’ patches. In the SEB treated rats there was an increase in the number of activated cells of the T-helper population which was not observed in rats fed with the plasma supplemented diets. However, no significant effects of SEB or diets were observed in the activated suppressor cytotoxic lymphocyte population. The percentage of T-gd lymphocytes and natural killer cells were increased by SEB administration and both effects were prevented by the SDAP supplemented diet. In MLN, SEB increased total and CD4+ activated T lymphocytes, but dietary supplements did not modify these variables.

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PS.D7
Immunomodulatory Effects of Lactococci in Murine Model
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There have been few studies on the probiotic activity of lactococci although they are commonly used as starter bacteria in manufacturing many kinds of fermented dairy products. Fifteen strains of the genus Lactococcus were examined for their probiotic activities such as immunomodulatory effect. Six strains induced the production of cytokines (IL-12, IL-6 and TNF-alpha) in macrophage line J774.1 cells and the highest induction was observed with Lactococcus lactis subsp. lactis G50. The cytokine induction in the J774.1 cell line was almost sustained after heat-killing of the strain. Spleen cells from BALB/c mice fed G50 culture produced more IL-12, IFN-gamma and slightly less IL-6 production than control (i.e. without strain G50), indicating that strain G50 can enhance Th1-type immune response in vivo. The effect of oral administration of strain G50 on antibody response in mice was also investigated. Mice were immunized with ovolucoid (OVM), a potent egg allergen, and then the level of antibody in serum was determined. Total IgE in the group treated with strain G50 was significantly lower than that of control. The response of OVM-specific IgG1 and IgE tend to be low in the group that was administered with strain G50, compared with response of the control group. These results suggest that strain G50 has an ability to suppress Th2 response by enhancing Th1 response. Strain G50 is a new candidate for probiotic strain because of its effective immunomodulatory properties such as suppressing allergy.

PS.D8
Resveratrol Enhances the Effects of Anti-Inflammatory Prostaglandins
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Prostaglandins (PGs) and nitric oxide (NO) are crucial metabolites of macrophages in different phases of inflammatory reactions. COX-2 dependent PGE2 provokes inflammation, whereas PGD2 appears to be involved in the resorption of inflammation. Its metabolic derivatives, cyclopentenone PGJ2 and 15deoxy-PGJ2, have profound effects on macrophage functions; e.g. 15deoxy-PGJ2 abolishes nitric oxide production. We have analyzed the impact of PGs on lipopolysaccharide (LPS)-stimulated RAW 264.7 macrophages. COX-2 dependent PGD2 production was impaired by all metabolites in a dose-dependent manner; 15deoxy-PGJ2 was the most potent and abrogated PGE2 secretion. NO production was significantly reduced by 15deoxy-PGJ2 and not by PGE2. The cyclopentenone PGs also down-regulated the expression of various pro-inflammatory cytokine genes as determined by quantitative RT-PCR (15deoxy-PGJ2 > PGJ2 > PGD2). Resveratrol, a phytoalexin, is also a potent anti-inflammatory metabolite that also enhances the effects of anti-inflammatory PGs.
inhibitor of NO or PGE2 produced by LPS-stimulated macrophages. It down-regulates mRNA levels of COX-2 and iNOS via the NF-κB signaling pathway, but also affects protein expression and COX-2 enzyme activity. We also tested resveratrol in combination with cyclopentenone prostaglandin PGJ2 or 15deoxy-PGJ2, and found a mutual influence of these compounds on PGE2 and NO production. Likewise, the expression level of pro-inflammatory genes was impaired in cells treated with resveratrol and cyclopentenone PGs. These observations let us infer that the combinations had effects on both PGE2 secretion and NO production. Presumably, the metabolites and the compound regulate independent but convergent cellular pathways. An intervention strategy aiming at increasing cellular cyclopentenone prostaglandin levels combined with resveratrol-mediated inhibition of PGE2 and iNOS activity is therefore considered a valuable approach to alleviate chronic inflammation processes.

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**PS.D9**

**The Role of Colonic Microbiota in Lactose Intolerance**

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In persons with lactase non-persistence, milk consumption can lead to lactose intolerance with a heterogeneous spectrum of symptoms. Knowledge of factors that cause this different response could improve prevention strategies of lactose intolerance. In a previous study we found no difference in the small intestinal lactose digestive capacity between groups with mild (n = 16) and diarrhea-predominant (n = 11) lactose intolerance symptoms. We suggested that the different response is caused by different processing of lactose in the colon, which – to a great extent – is determined by the composition of the faecal microbiota. Therefore, in this study the microbial composition of the two lactose intolerant groups was compared using the fluorescent in situ hybridization technique. Large inter-individual differences were found in the numbers of total bacteria and the bacterial numbers of main groups of bacteria (CV: 0.65 and 0.64–0.82 respectively). The bacterial numbers were not significantly different between the two groups. A significant negative correlation, however, was found between the individual symptom scores of the intolerant persons and the numbers of total bacteria (rs = −0.42, p = 0.03). The results suggest that an increased number of bacteria might contribute – by means of a higher fermentative capacity – to the reduction of lactose intolerance symptoms.

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**PS.D10**

**Study of the Effect of Epicatechin Derivatives on the Cytokine Production**

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New bio-based antioxidant compounds epicatechin derivates with putative application as food preservatives and dietary supplements have been described recently [1, 2]. They have potent antioxidant activity. Some antioxidants were found to be potent inhibitors of the production of tumor necrosis factor-alpha (TNF), IL-1 beta and IL-6 by human peripheral blood mononuclear cells stimulated by lipopolysaccharide (LPS) [3]. The aim of the present work was to evaluate the capacity of the epicatechin and epicatechin derivates of modulating three different cytokines: TNF, IL-1 beta and IL-6, which are currently considered to be the major cytokines influencing the acute phase of the inflammatory response. 2001 of human whole blood was incubated for 18 hours at 37°C in the presence of 1000 of sterol solution containing 10 g/ml of LPS from E. coli to induce the release of cytokines. In other experiments the epicatechin and epicatechin derivates were added to the blood in order to determine the potential inhibition on the cytokine production. The compounds studied were very active as inhibitors of the IL-1 and IL-6 production, inducing a 60–80% of inhibition. On the other hand, epicatechin was the only compound active inducing an inhibition of the TNF production of about 40%. The inhibition of inflammatory cytokines could provide a strategy for therapy of diseases with inflammatory pathogenesis and may provide enhanced health benefits.

**References**


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**PS.D11**

**A Diet Supplemented with Biscuits Enriched in Antioxidants for 15 weeks Improves Immune Functions in old Mice**

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With ageing there is a deterioration of the immune system which contributes to morbidity and mortality. These age-related alterations of the immune functions seem to result from oxidative stress, since ageing is linked to an increased rate of free radical generation and decline in antioxidant competence. Therefore, diet supplementation with antioxidants could prevent or delay the age-related immune impairment. In the present work we have studied the effect of a diet...
supplemented with biscuits enriched in antioxidants on several important functions of peritoneal leukocytes from old mice.

**Methods:** OF1 Swiss mice (20 months old) received a diet supplemented with 20% (w/w) of biscuits enriched with antioxidants (vitamin C, vitamin E, β-carotene, zinc and selenium) for 15 weeks or standard diet (controls). After this time the peritoneal suspensions (containing the main immune system cells, i.e.: macrophages, lymphocytes and natural killer (NK) cells) were obtained and the following functions were studied. In macrophages the different steps of the phagocytic process (adherence, chemotaxis and index and efficiency of phagocytosis (PI and PE respectively) and the digestion capacity determined by the measurement of intracellular production of free radicals and reactive oxygen species (ROS) such as superoxide anion and hydrogen peroxide) were assessed. In lymphocytes, the proliferative response to mitogens namely ConA and LPS and the release of interleukine 2 (IL-2) were determined. The NK activity against cells from a murine lymphoma was also analyzed.

**Results:** The results show that the ingestion of the above diet increased a number of functions that decrease with ageing, i.e. the chemotaxis of macrophages and lymphocytes, the PI and PE of macrophages, the intracellular production of superoxide anion and of hydrogen peroxide, the percentage of stimulation in the proliferative response of lymphocytes to ConA and LPS, the release of IL-2 and the NK activity. The adherence to tissues, a function that is very increased with age, was found to decrease in macrophages and lymphocytes from the antioxidants-administered animals.

**Conclusion:** Since it has been suggested that the functions of these leukocytes may be a good marker of health and longevity, the use of this antioxidant diet supplementation could be useful for the maintenance of subject health with the resulting improvement of longevity.

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**PS.D12**

**The Long-Term Effects of Perinatal Malnutrition on Immunity: Lymphocyte Subset Distribution and Kinetics in Young Gambian Men**

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Individuals born during periods of nutritional deprivation in a rural Gambian setting have been shown to be more susceptible to mortality from infectious disease in adult life. This may be due to failure to generate normal lymphocyte precursor pools. Such a defect would be expected to be reflected in the phenotype and kinetics of lymphocytes in affected adults.

This study aims to describe the distribution and lifespan of lymphocytes in a setting where malnutrition is common and investigate the effect of perinatal undernutrition on such parameters.

Healthy adult subjects of known nutritional background (n = 8) were recruited from three Gambian villages. Lymphocyte kinetics (proliferation and death rates) were measured in vivo by stable isotope labelling with deuterated glucose as measured by gas chromatography mass spectrometry. Blood samples were also analysed by 3-colour flow cytometry to determine lymphocyte subset distributions according to CD3, CD4, CD8, CD45RA and CD45R0 expression.

Preliminary analysis of cell kinetics shows mean proliferation rates of 1.9 and 3.8%/day for CD4+CD45R0+ and CD8+CD45R0+ lymphocytes had slower proliferation rates, 1.2 and 0.6%/day (doubling times: 5 and 8 months).

Mean white blood cell (WBC) counts were found to be 5.6 × 10⁶ cells/litre, with lymphocyte proportions equivalent to 51.2% of total WBC. Average CD4/CD8 T-cell ratio was 2.3 with the following naïve and memory cell distributions as a proportion of CD3+ cells: 36.5% CD4CD45R0+, 32.2%CD4CD45RA+, 7.7% CD8CD45R0+ and 23.6% CD8CD45RA+.

Thus we have demonstrated the ability to measure lymphocyte phenotype and kinetics in a tropical setting where malnutrition is common and will relate such observations to current and perinatal nutritional status.

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**Influence of Meal Frequency on Human Immunoglobulins**

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Although the effect of meal frequency on some biochemical parameters such as serum levels of lipids, insulin and glucose has been investigated, there is no report on the influence of nibbling and gorging dietary regimens on human immune system. In the present study, for the first time, the effect of meal frequency on human immunoglobulins is investigated.

The subjects of this study were fifteen healthy nonsmoker males aged 27.2 ± 6.4 (ranging from 19 to 38) years. All subjects were placed on two identical diets in which they consumed the same food either as three meals at 7-hours intervals (gorging dietary regimen) or as nine snakes at 2-hours intervals (nibbling dietary regimen). Each diet was of two week’s duration and was separated from each other by a period of three weeks during which the volunteers followed their usual diets. At the end of both diets, the blood sample was obtained from each subject under fasting condition and the serum levels of IgM, IgA, IgG and IgE were determined. IgM level decreased significantly (p < 0.001) following nibbling diet, however, gorging diet resulted in a non-significant (p > 0.1) increase in IgM level. Both dietary regimens caused a significant (p < 0.01) decrease in IgA and IgE levels compared with the base line values, although the levels of these two immunoglobulins following both diets were almost the same. On the other hand, the base line level of IgG significantly increased by two regimens (p < 0.05). Therefore, human immune system is influenced by the number of meals eaten and gorging diet has relatively a better effect on serum immunoglobulins compared with nibbling diet.
Breast-Fed Infants with Gross Blood in Stools: Evaluation of the Breast Milk

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The etiology of gross blood in infant stools has yet to be elucidated, but in the clinical setting it is generally considered to be caused by allergic or unexplained colitis. The present study investigated whether immunomodulatory factors in breast milk might characterize the appearance of gross blood in the stools of breast-fed infants.

Methods: Breast milk samples were collected from mothers of infants with gross blood in stools (n = 23) and from mothers of healthy age-matched infants (n = 71). The breast milk samples were analyzed for concentrations of transforming growth factor-β2, tumor necrosis factor-α, interleukin (IL)-4, IL-10, prostaglandin (PG)E2, and cysteinyl leukotrienes (Cys-LTs). Logistic regression models were formed to identify potential intervention targets to reduce the likelihood of the condition.

Results: The clinical problem studied was distinct from the effectors mechanisms associated with allergic disease. The likelihood of gross blood in stools in the breast-fed infant was reduced by mother’s allergic disease together with breast milk PGE2 and Cys-LTs as well as the proportion of eicosapentaenoic acid of total fatty acids.

Conclusions: No single factor in breast milk, but a combination of immunomodulatory factors contributes to gross blood in the stools of breast-fed infants. The challenge for the future lies in discovering a combination of active compounds for dietary supplementation of infants at risk to reduce the likelihood of intestinal disorders and to replace the commonly used elimination diets inappropriate for the condition.

Malnutrition during Lactation is Associated with Leptin Resistance to the Anorectic Effects and Higher Expression of Leptin Receptor in Pituitary of the Adult Offspring

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Previously, we demonstrate that energy restriction during lactation programs the offspring to a higher body weight, while protein restriction programs to a lower body weight, without changes on food intake or in serum leptin concentration in adult life (Passos et al. Nutr Res 2000;20:1603; Teixeira et al. J Nutr Biochem 2002;13:493). Our aim was evaluate the resistance to the anorectic effects of leptin in animals whose mothers received protein or energy restricted-diet during lactation. Lactating Wistar rats were assigned to one of the following groups: C – control diet with 23% protein; PR – protein restricted diet with 8% protein; ER – energy-restricted, receiving the control diet in restricted quantities, which were calculated according to the mean ingestion of the PR group. After weaning all pups had free access to the control diet until 150 days of age, when they were tested for its response to either leptin or saline on food intake. The pituitaries were dissected and used for immunohistochemistry analysis. Serum TSH and thyroid hormones were determined by radioimmunoassay. Control group reduced food intake in 2 h (36%), 4 h (41%) and 6 h (25%) after leptin treatment. In contrast, no response was observed to leptin in the PR and ER groups, demonstrating the development of resistance to the anorectic effect of leptin. Analysis of immunostaining showed that animals from PR and ER mothers had a higher expression of leptin receptor in pituitary tissue with higher serum T3 and lower TSH (p < 0.01), while the T4 was higher only in the PR group (p < 0.05). This higher expression of leptin receptor in pituitary together with the lower serum TSH suggest leptin resistance in pituitary. These data suggest that maternal malnutrition during lactation programs the leptin resistance to the anorectic effects and the leptin resistance in pituitary.

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Serum Levels of Th2-Type Immunoglobulins are Increased in Two Known Metabolically-Depressed Animal Models

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Abstract withdrawn.
Dendritic Cells Generated in vitro from Murine Bone Marrow in the Presence of Eicosapentaenoic Acid or Arachidonic Acid have Altered Cytokine Producing Capacity

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Dietary (n-3) polyunsaturated fatty acids have been shown to modulate immunity. Ex vivo studies have shown that n-3 fatty acids in the diet are able to reduce in vitro proliferation of spleen cells and modulate cytokine production. Eicosanoids, produced from arachidonic acid (AA) and eicosapentaenoic acid (EPA) released from the cell membrane phospholipid pool, are able to modulate the maturation, cytokine producing capacity, and Th-cell-polarizing activity of dendritic cells. Moreover, n-3 fatty acids in the diet have previously been shown to modulate APC function by reducing MHC class II expression. In this study we addressed the influence of culturing dendritic cells (DC) in the presence of AA and EPA on incorporation of AA and EPA in the cell membrane phospholipids and on the subsequent cytokine producing capacity of these cells.

DCs were generated from murine bone marrow cells. EPA and AA were added in different concentrations during generation and differentiation of DCs. At day 8 of culture nonadherent cells were collected, washed twice, and were either seeded in 48-well plates with or without LPS, or cells were analysed for fatty acid composition of total phospholipids by TLC and GC. The content of IL-10, IL-12, IL-6 and TNF-α in supernatants were measured by ELISA.

Addition of 20:5(n-3) to the culture medium during generation of murine bone marrow-derived DC leads to selective incorporation of EPA into the membrane phospholipids as compared to undetectable levels of EPA in DC generated without EPA. In line with these findings, the addition of AA to DC cultures gave enhanced levels of AA in the fatty acid composition of phospholipids. Both AA and, in particular EPA, decreased the viable cell yield in a dose dependent manner. Addition of AA and EPA during differentiation of DC impaired their subsequent maturation induced by LPS as revealed by an altered cytokine profile.

Nutritional Characterization of Milk Protein Hydrolysates with Low Allergenic Properties

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Cow’s milk allergy is one of the more prevailing food allergy in infants. Allergens in foods are almost always naturally occurring proteins: among proteins in bovine milk, β-lactoglobulin and casein have been recognized to be a major cause of intolerance and/or allergic response in humans, probably because of resistance to proteolysis. Indeed, although enzymatic hydrolysis of proteins is usually employed for increasing food tolerance, several studies have reported residual antigens in hydrolysed milk formulae.

In the frame of a three-year MiPAF project ‘Innovative technologies to produce dairy products characterized by an increased tolerability and improved functional properties (TOLLELAT)’, in vitro proteolysis was carried out to achieve selective elimination of regions of casein and whey proteins that are responsible for allergenic reactions. These are likely to be buried in the native protein, thus proteases were used during thermal treatment of proteins to obtain limited in vitro hydrolysis of their transient conformers formed under non-denaturing conditions [1, 2].

Low-immunoreactivity protein hydrolysates were then characterized for their nutritional properties. Total N and total ash content, together with concentration in specific minerals (Na, K, P, Ca, Cu, Fe, Zn) were determined in hydrolysates of casein and whey proteins obtained under different conditions. Binding properties towards minerals and trace elements of hydrolysates and their in vitro protein digestibilities were also assayed. The results indicated a high protein and mineral contents in all samples. Hydrolysates presented a reduced protein digestibility, but had improved mineral binding properties when compared to the untreated proteins. In particular, in both casein and whey protein hydrolysates, a strong chelating power was observed for some trace elements, such as copper, that may be related to exposure of specific amino acid sequences.

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References

Milk contains gangliosides, which upon fractionation can be found in the whey fraction. The two abundant gangliosides in human milk and, to a lesser degree in bovine milk, are GD₃ and GM₃. Recently, it has been proposed that it could be beneficial for formulated infants to receive formulas enriched in gangliosides from bovine milk, since current formulas have lower contents of gangliosides than human milk. Regarding the effect of gangliosides on cellular events, gangliosides in milk might act on the mucosal or systemic immune system by changing the antigen capacity of the cells, especially the dendritic cells (DCs). We therefore used murine DCs to characterise the effects of gangliosides on antigen presentation and polarisation capacity of the immune system.

Immature DCs were generated in vitro from murine bone marrow and LPS was added to effect maturation. 3 hours prior to LPS addition, GD₃ or GM₃ was added and cytokine (IL-6, IL-10, IL-12, and LPS was added to effect maturation. 3 hours prior to LPS addition, GD₃ or GM₃ was added and cytokine (IL-6, IL-10, IL-12, and TNF-α) production as well as maturation markers (MHC II and CD 86) were measured. Moreover, the effect of the two gangliosides on the antigenic and allogenic stimulatory capacity of DC on T-cells was tested by mixed lymphocyte reaction. Especially exposure of GD₃ to DCs resulted in a reduced allostimulatory capacity and cytokine production in immature cells. Feeding experiment with gangliosides isolated from bovine milk are currently being performed to confirm the results from the in vitro studies.

**Effects of Polyphenols and Isoflavones on Gastrointestinal Epithelial Cells**

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Resveratrol, a phytoalexin abundant in wine grapes, and other polyphenols and isoflavones have anti-inflammatory and anti-tumorigenic effects that were observed in macrophages and tumor cell lines. We initiated this study to find natural substances that interfere in gastrointestinal inflammation. We analyzed the effect of various substances on inflammatory pathways in the human colon adenocarcinoma cell lines HT29 and T84. Treatment of HT29 cells with tumor necrosis factor α (TNF-α) in the absence or presence of polyphenols or isoflavones up-regulated mRNA of IL-8, IL-1β, COX-2, TNF-α and MIP-2, within 6 hours, as determined by quantitative RT-PCR. Similar to curcumin, resveratrol reduced the expression level of different genes such IL-8, TNF-α, IL-1β, COX-2, and iNOS. We observed that genistein down-regulated COX-2 gene expression but had no effect on others genes. TNF-α-stimulated HT29 cells strongly up-regulated MIP-2 mRNA. The treatment of T84 with TNF-α induced the up-regulation of various genes like COX-2, IL-8, IL-1β, IL-6 and iNOS. Resveratrol down-regulated the mRNA of these genes. The data indicate specific responses of HT29 and T84 to inflammatory stimuli, since the expression of some pro-inflammatory genes (e.g. IL-6) differs between the two cell lines. Further effects of polyphenols and isoflavones at other levels are under evaluation. The results suggest that polyphenols have a significant influence on the gene expression in gastrointestinal epithelium. Polyphenols and presumably isoflavones could be valuable candidates to attenuate exacerbated responses of human gastrointestinal epithelium to inflammatory insults.

**Study of Allergenic Cross-Reactivity of Latex and Foods**

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Introduction: The latex sensitive individuals are at a greater risk of developing and anaphylactic food reaction than the general population. This study is determine prevalence of allergic cross-reactivity of latex and foods among persons who exposed with latex in Isfahan.

Material and Methods: In this study, 59 volunteers (45 women and 14 men, 21–47 year) which used latex gloves were investigated. General information including age, sex, duration of time of using latex gloves, food and latex sensitivity and symptoms of sensitivity were collected by face to face interview and by using a questionnaire.

Results: 1) 36.8% and 52.6% of participants had food allergy and latex allergy respectively. 2) Food sensitivity in people with latex allergy was more than in people without latex allergy (43% vs 29.6%), however it wasn’t significant. 3) Among the people with latex allergy 10% had been more sensitive to foods after use of latex gloves and symptoms of food allergy occurs severely.

Some of food allergens in this group were: pomegranate, tomato sauce, fish, shrimp, spice, pepper and kiwi fruit.

Conclusion: While the details of the clinical association of latex and food allergies needs further studies, documentation of food allergies known to coexist with latex sensitivities may be useful for identifying the risks of latex exposure in this group.