A qualitative exploration of obese patients’ experiences with efforts to lose weight

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Background: Obesity is one of the most important public health problems in Western countries today, but the treatment of it is not easy. To be able to offer proper treatment more knowledge about this group of people is needed. The aim of this study was to focus on how people with a high level of obesity feel about their own health, lifestyle and experiences with efforts to lose weight.

Material and Methods: In this study nine obese patients (6 female and 3 men) awaiting testing and treatment were interviewed. They had a BMI ranging from 35 to 62, and several of them were hoping for surgical treatment. Semi-structured interviews were carried out by one of the authors (E.H.). All interviews were audio-recorded and transcribed. A thematic analysis was performed.

Results: All of the patients in the study were well aware of their own inadequate behaviour with irregular meals, overeating and physical inactivity. A lack of motivation to change their lifestyle was generally present within the group. They also presented low self-efficacy after repeated failed trials to lose weight and had few strategies to prevent relapse after a slip. In addition, some experienced lack of support, understanding, follow-up from family and health professionals.

Conclusion: Repeated but failed attempts to lose weight may lead to feelings of hopelessness and irrational coping strategies. Therefore, besides attempts to improve diet and physical activity, it is necessary to focus on the process of change itself when treating obese individuals. Treatment should include counselling with a focus on motivation, decision-making and self-efficacy in maintaining changes.
**P3** Behaviour, Psychology and Nutrition

**Comparative study of nutritional health behavior in nursing student and non nursing student in governmental university in Tehran 2006**

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**Introduction:** This research is comparative study was carried out to compare nutritional health behavior in nursing student and non nursing student in governmentuniversity in Tehran.

**Methodology:** The sample consisted 261 nursing student and 139 nonnursing student. Variable such as sex, place of living, and marital status were matched in two groups.

Data collection was a questioner divided in two parts. The first part include demographic characteristic and second part consisted nutritional behavioral question.

**Results:** The result showed average of number in nutritional behaviors for first years nursing students was 65/37 ± 6/739 and average of number in nutritional behavior for first year non nursing student was 61/69 ± 6/86. T test showed is not significant relationship between two groups p = 0/16.

Result also showed average of number in health behavior for last year nursing student was 64/05 ± 8/074 and average of number in health behavior for last year non nursing student was 59/54 ± 5/74.T test showed significant statistical relationship between two groups = 0/034.

**Conclusion:** Nursing students health behavior is a guider and model for people in the community, they are as a consultant for client. So expected they have good number from health behavior specially nutritional behavior.

**P4** Behaviour, Psychology and Nutrition

**Consumer understanding of health claims**

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Consumer confidence in nutrition and health claims is a critical issue from the consumer, government and industry points of view. The new European legislation on nutrition and health claims made on foods entered into force on 19th January 2007. The law sets out conditions for their use, establishes a system for scientific evaluation of the claims and creates European Community lists of authorised claims. Claims of foods will only be permitted if the average consumer can be expected to understand the beneficial effects expressed in the claim, and all consumers must be protected from misleading claims. On behalf of the ILSI Europe Consumer Science Task Force, this paper examines consumer understanding of claims and focuses on the type of data and information that could be needed to provide the necessary evidence.

**P5** Behaviour, Psychology and Nutrition

**Determinism of voluntary feed intake, what can we lean from rainbow trout clones**

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Voluntary feed intake (VFI) is markedly affected by environmental factors; this renders difficult the discrimination of its genetic components. In addition individual variability of VFI can be indirectly driven by other features such as growth target or social interactions. Fish are pertinent models to analyse the relative contribution of genetic variation to VFI: i) social interactions can be studied in natural conditions because fish are reared in groups, ii) the group structure is linked to growth performance variability and iii) pertinent models can be produced, such as clonal lines. Recently haplo-diploid rainbow trout breeders were obtained by the way of gynogenesis. The objective of the study is to dissect the drivers of VFI: discriminate genetic and environmental variations and analyse the correlations with individual growth rate and hierarchical position. We produced 10 families of heterozygous rainbow trout clones. At 6 month age (8 mg), fish were individually labelled and split into 6 tanks (7 fish/family, 70 fish/tank). The fish were fed ad libitum. At 4 occasions (3-week interval) we measured the VFI of each individual and the share of meal in each tank using the X-ray technique consisting in giving a radio-labelled meal and X-raying the fish 4 h 30 days after the meal. The between-individuals variability of VFI in one clonal family was of the same extent as VFI inter-day variability; this shows that a clone is the repetition of the same individual, and can be used to assess the extent of the environmental variability of the trait. VFI differed significantly between families, as the relationship between growth and VFI. The relative weight of growth rate, hierarchical position and group structure in driving VFI will be discussed.

**P6** Behaviour, Psychology and Nutrition

**Dietary patterns associated with vitamin/mineral supplement use and smoking in the E3N-EPIC cohort**

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**Introduction:** To understand relationships between supplement use or smoking and dietary habits is useful for etiological studies and surveillance purposes.

**Purpose:** Describe dietary patterns associated with vitamin/mineral supplement use and smoking habits in French women.

**Methods:** Scores for dietary patterns were obtained by factor analysis in 64,252 women from the French E3N-EPIC cohort. Their
association with supplement and tobacco use was investigated by logistic regression analysis.

**Results:** We identified three dietary patterns: Western (mainly fast foods, processed meat, rice/pasta and cakes, and low vegetables), healthy (mainly fruit, vegetables, sea products, vegetable oils, yoghurt), and drinker-meat eater (mainly alcohol, meat and meat products, coffee, and low fruit and soup). Supplement use was positively associated with the healthy pattern (multivariate OR for quartile 4 versus 1 (OR4) = 1.55, 95% confidence interval: 1.47–1.63) and inversely associated with the Western (OR4 = 0.84; 0.80–0.89) and drinker-meat eater (OR4 = 0.69; 0.66–0.73) patterns (p trend for all associations <0.0001). As compared with never smoking, current smoking was inversely associated with the healthy pattern (OR4 = 0.85; 0.78–0.92), while former smoking was positively associated with the healthy pattern (OR4 = 1.32; 1.25–1.40); both current and former smoking were inversely associated with the Western pattern (OR4 = 0.57; 0.53–0.62 and 0.64; 0.60–0.67 respectively); in the opposite, current and former smoking were both strongly positively associated with the drinker-meat eater pattern (OR4 = 5.78; 5.26–6.36 and 2.03; 1.91–2.15 respectively), p trend for all associations <0.001.

**Conclusion:** Supplement use and smoking are strongly associated with dietary patterns.

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**P7 Behaviour, Psychology and Nutrition**

**Eating attitudes: Distribution and relation of sociocultural factors, body dissatisfaction and body mass index in a sample of Mexican university student women**

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**Introduction:** Studies conducted in adolescents and young women have showed that Sociocultural Factors (SCF), Body Dissatisfaction (BDS) and Body Mass Index (BMI) are highly related with disordered eating attitudes.

**Purpose:** To investigate the distribution and relationship between SCF, BDS, BMI and eating attitudes in a sample of Mexican university student women.

**Method:** The CIMEC-26 (Cuestionario de Influencia del Modelo Estético Corporal) and EAT-26 (Eating Attitude Test) was applied on a convenience sample of 235 women of 16 to 20 years of age (X = 18.6; DE = 1.7) from Hidalgo, Mexico. BDS was measured with a nine body figure scale. The BMI was obtained from each subject.

**Results:** BMI distribution: emaciation 2%; low weight 9%; normal weight 60%; overweight 24% and obesity; 40% of the sample showed the higher percentage (9.5%). Pearson’s correlation indicated that all SCF of CIMEC-26 were significantly correlated with BDS and with dieting. BMI was significantly correlated with BDS, distress because of body image, influence of publicity, dieting, and in an inverted way with oral control (p < 0.01).

**Conclusions:** This data confirm that there is a relationship between SCF, BDS, BMI and eating attitudes in Mexican student women. Even though the data obtained do not demonstrate the diagnosis of eating disorders, it shows the presence of the characteristics symptoms in general population.

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**P8 Behaviour, Psychology and Nutrition**

**Effects of breakfast consumption on short term memory, attention span and psychological mood in adult male prisoners**

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**Introduction:** Many studies have evaluated the effects of breakfast on cognition in children focusing on potential educational and health implications. Few similar studies have been conducted on prisoners.

**Purpose:** To evaluate the differential effects of breakfast consumption on short term memory, attention span and psychological mood in adult male prisoners.

**Methods:** The study was approved by the Prisoner Based Research Ethics Committee of the Irish Prison Service approved the study. 28 participants with mean age 25 years (±4) and mean BMI of 25.1 (±3.1) were recruited by random sampling within Mountjoy Prison, Dublin. A randomised repeated measures design was adopted and data gathered following overnight fasting and after consumption of a standard breakfast on separate days. Blood glucose was measured by finger prick. The following cognitive tests were utilised: the digits forward span test (for short term memory), Stroop neuropsychological screening test (for attention span). Mood (anxiety) was assessed using the Hospital Anxiety and Depression Scale (HADS).

**Results:** Consumption of breakfast raised blood glucose levels (p = 0.0005) and led to significantly improved short term memory (p = 0.0005) and mood score (p = 0.004). There was no significant difference in attention span (p = 0.154) between the two breakfast conditions. HADS scores suggest a high degree of anxiety amongst prisoners.

**Conclusions:** Eating breakfast can significantly enhance aspects of mood (anxiety) and cognition. Thus, it is important to promote breakfast consumption given its potential implications in a prison environment.
**P9 Behaviour, Psychology and Nutrition**

**Food as a stress factor in the process of adaptation to a novel cultural environment**

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Despite growing globalization trends in nutrition certain food-habits persist as the expression of a given culture. Transition to a different environment might be a stress, in which food might play an important role. In the course of last years Prague has become often selected as the destination for students from various parts of Europe and the USA. The ‘cultural shock’ appears as the consequence of marked changes in their life. Problems with the offer, composition, frequency of meals and conditions associated with nutrition might negatively influence their physical and/or mental health and feeling of well being. We were interested in the role of food in the process of adaptation to the new environment in American students, coming to Prague and in difficulties that could appear as a results of the change in their nutrition and/or psychosocial life. They were given the questionnaire with items like the attitudes toward Czech foods, frequency of daily meals, food choice, physical and mental difficulties associated with food, their social contacts, etc. It appeared that more than 40% students had suffered from certain mental problems they had never experienced at home. Health problems accompanying change in food habits reported more than 25% of them. Number of daily meals decreased. Some negative symptoms might reflect the rigidity in their food habits, inability to replace the products they were used to consume at home with similar ones. The analysis of psychosocial factors showed, that their social life was not damaged. They found new friends here, they admired the city, they took part in meetings, parties, showed, that their social life was not damaged. They found new friends here, they admired the city, they took part in meetings, parties, trips organized by the International office. Evidently, food appeared to be the major stress in the process of their adaptation.

**P10 Behaviour, Psychology and Nutrition**

**Food behaviour of adolescents in constantine (Algeria, 2006)**

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**Introduction:** In Algeria, the signs of epidemiologic and nutritional transition are numerous. Socio-economic factors modify adolescents behaviours in particular the food behaviour. The aim of this study is the description of the food behaviour of school adolescents in Constantine in 2006.

**Methods:** The target group consisted of 302 pupils (10–19 years) from five secondary school. 51.3% of them are girls and 52.6% are school lunchers. We carried out a transverse survey by questionnaire with items like the attitudes toward Czech foods, frequency of meals and conditions associated with nutrition might negatively influence their physical and/or mental health and feeling of well being. We were interested in the role of food in the process of adaptation to the new environment in American students, coming to Prague and in difficulties that could appear as a results of the change in their nutrition and/or psychosocial life. They were given the questionnaire with items like the attitudes toward Czech foods, frequency of daily meals, food choice, physical and mental difficulties associated with food, their social contacts, etc. It appeared that more than 40% students had suffered from certain mental problems they had never experienced at home. Health problems accompanying change in food habits reported more than 25% of them. Number of daily meals decreased. Some negative symptoms might reflect the rigidity in their food habits, inability to replace the products they were used to consume at home with similar ones. The analysis of psychosocial factors showed, that their social life was not damaged. They found new friends here, they admired the city, they took part in meetings, parties, trips organized by the International office. Evidently, food appeared to be the major stress in the process of their adaptation.

**P11 Behaviour, Psychology and Nutrition**

**Gender, nutrition and health**

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Ageing is associated with reduced energy intake and loss of appetite. Physiological changes associated with age, include slower gastric emptying, altered hormonal responses, decrease basal metabolic rate and altered taste and smell also contribute to lower energy intake. Other factors such as marital status, income, education, socioeconomic status, diet related attitude and beliefs likely play a role as well. Many differences exist between the two gender i.e. biological, endocrinological, sociological, and also behavioral, which often depend on age.

**Objective:** The aim of this study was to find characteristic differences between nutritional habit of elderly men and women to promote the healthy ageing.

**Methods:** One hundred and twenty six elderly people (72 men and 54 women) of age more than 60 years were consequently selected from the district Bharatpur. A self managed questionnaire was filled in on life style and eating habits, including a food frequency questionnaire. Medical checkups, registration of anthropometrical parameters were also performed.

**Result:** The meal frequency was increased during the ageing in both the gender. The fluid intake was low, especially in females. Milk and dairy products, fresh fruits and vitamin supplement were consumed more frequently by men. The energy ratio of male and female is 9.75 vs 8.76 MJ. Alcoholic beverages were consumed more and frequently by men whereas tobacco chewing is found in both the genders. The increase of body weight from youth to elderly was greater in women (15.04 vs 11.02 kg).

**Conclusion:** High energy intake for decades lead to overweight in both genders (BMI > 29).
**P12 Behaviour, Psychology and Nutrition**

**Mid-afternoon cognitive employee performance after low or high GI lunch**

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**Introduction:** It has been suggested that mid-afternoon cognitive performance in a business setting is affected by the nature of the lunch meal. It is noted that poor cognitive could have (for some employees) a major impact on the business performance.

**Purpose:** To explore whether the nature of the lunch meal (as defined by its predicted glycaemic index (GI) value) is likely to have significant influence on the cognitive performance of office workers.

**Methods:** Twenty-one employees (all office workers) of a major financial institution based in central Dublin took part in the study. The study used a repeated measures cross-over design. All participants consumed: on one day, a low GI lunch; and on a second, non-consecutive, day a high GI meal. The order of meals was randomised. Each participant served as personal control. Mid afternoon on each study day (2 hours post lunch) three cognitive tests were administered. Tests used were: Trail making, Digit Span and Stroop test. Blood glucose levels were measured at post-lunch test.

**Results:** Cognitive performance improved when participants consumed the low GI meal compared with the high GI meal. Significant differences were shown in the Digit Span test (p = 0.005) and Stroop test (p = 0.007). There was no significant difference in blood glucose levels (2 hours post lunch) between the two groups.

**Conclusions:** This small scale study suggests that a low GI lunch-time meal can have effects on cognitive performance mid afternoon – therefore employers may see benefits if their employees were steered positively towards low GI options as lunch options.

**P13 Behaviour, Psychology and Nutrition**

**Moderate beer consumption has a similar immunoregulatory effect to that of common antidepressants**

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**Background/Aim:** While heavy drinkers show high rates of clinical depression, there are some evidence that low and moderate doses of alcohol increase overall affective expression and happiness, suggested to be related with an antidepressant effect. Major depressive disorders have been shown to be accompanied by an impaired immunoregulation, reflected in an increased Th1/Th2 ratio, while antidepressants decrease this ratio. We aimed to determine the effects of moderate beer consumption on Th1 (IFN-gamma) and Th2 (IL-10 and IL-6) cytokine production of healthy adults.

**Methods:** After a 30-day alcohol abstinence period, 57 healthy volunteers (27 women and 30 men) consumed a moderate intake of beer (330 mL for women and 660 mL for men) for 30 days. The capacity of IFN-gamma, IL-10 and IL-6 production by mitogen-stimulated peripheral blood mononuclear cells was assessed following the abstinence and alcohol consumption periods.

**Results:** After moderate beer consumption IL-10, and IFN-gamma cytokine production increased while the IFN-gamma/IL-10 ratio decreased in both men and women (P < 0.05). IL-6 production remained unchanged.

**Conclusion:** The decrease of the IFN-gamma/IL-10 ratio after moderate beer consumption is similar to the immunoregulatory pattern of common antidepressants. Although no causality can be drawn, this finding could support the common belief that moderate beer consumption is able to enhance mood and could have an antidepressant effect, but further study is necessary to know the mechanisms involved.

**P14 Behaviour, Psychology and Nutrition**

**Nutritional and psychological factors and risk of occurrence of gastroesophageal reflux disease (GERD)**

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**Introduction:** In the past 50 years one may observe a continuous increase in the incidence of gastroesophageal reflux disease (GERD) 20–30% of the population. Taking into account the changes in lifestyle and nutrition that took place in society over the last half century it may be assumed that they constitute one of the causes of the increase in GERD incidence. There is little research concerning nutritional risk factors associated with the disease in the world. In Poland there is a lack of similar research.

**Objective:** Determination of GERD psychological factors and risk factors connected with lifestyle, regular diet.

**Methodology:** Up to this moment 55 patients have been enrolled to the research. It includes clinical assessment, questionnaire regarding health condition, regular diet and lifestyle, and psychological questionnaire. Data regarding the average consumption by the examined group are collected based on a medical history and data on products and meals consumption are collected based on 2-day record.

**Results:** It has been stated that fat consumption in relation to the recommendation is exceeded and amounts to 35.9% of energy in total. The consumption of fiber lower than recommended has also been noted (on average 14 g/day). In the examined group the products that most often cause/intensify the disease symptoms are the following: fat and fried products/dishes, milk and milk products, fruit, chocolate and coffee. The disease symptoms are observed more frequently in active patients.

**Conclusions:** The research shows that GERD nutritional risk factors may be the following: increased food intake during meals, increased fat consumption, low fiber consumption. The psychological risk factors include such features as: impatience, haste, drive to success.
**P15** Behaviour, Psychology and Nutrition  
**Nutritional status and selected diet related diseases prevalence in patients**  
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**Introduction:** The Irritable Bowel Syndrome (IBS) concerns 10–15% of Western countries population. There are some scientific evidences that in 1/3 IBS patients, its symptoms may result from food allergy and from gluten intolerance.

**Aim:** The main aim of the work is to specify in patients with IBS: the nutritional status, prevalence of food allergy, coeliac disease and eating disorders.

**Methods:** The research will be carried out among ca. 2,000 patients with IBS treated in the Clinic of Gastroenterology and Metabolic Diseases of the Food and Nutrition Institute in Warsaw.

The presented work includes preliminary results of questionnaire survey in 92 patients with IBS, which included data on nutritional status, the occurrence of diseases coexisting with IBS, with particular attention paid to allergy and coeliac disease.

**Results:** IBS forms frequency was as following: diarrhoea-constipation (50%), constipation (25%), diarrhea (16%) and pain-only form (9%). Excessive body mass was diagnosed in over 57% patients, with higher frequency in men than in women (82% vs. 49%).

Various forms of allergy were observed in ca. 36% of patients. About a half of it’s cases was a food allergy. Two patients had coeliac disease diagnosed in the childhood. The binge eating occured in over 67% of the studied subjects, and night eating in almost 26%. The skin disorders were observed in 18% of patients.

**Conclusions:** The prevalence of overweight in men with IBS was higher than in representative studies of nutritional status in Polish population.

A high allergy prevalence in IBS patients may suggest that IBS symptoms might result, at least in some patients, from food allergy.

A frequent occurrence of eating disorders in IBS patients may indicate a common neuro-endocrinological basis of the both syndromes.

**P16** Behaviour, Psychology and Nutrition  
**Nutritive and energetic value of average daily meal in mothers and daughters**  
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Parent-child similarities in food preferences increase as children approach adulthood. Past research reveals the importance of mothers in family food consumption and ritual. The study examines similarities in nutritive and energetic content of average daily meal among mothers and daughters.

Data were obtained from 114 women, 57 mothers and 57 daughters. The dietary data from the Food Frequency Questionnaire were used to establish nutritional and energetic value of meals they consume. Additional questionnaire provided data about anthropometric parameters, dietary habits, and physical activity.

Average Body Mass Index (BMI) for daughters was 21.0 kg/m², and for mothers was 26.6 kg/m². For 86% of daughters and for only 42.1% of mothers BMI was between 18.5–24.9 kg/m². The most mothers were overweight (43.9%). Mother’s and daughter’s average daily meals differed significantly in energetic value, carbohydrate content, as well as content of calcium, thiamine, riboflavin, niacin, vitamin B6, folate and vitamin B12. Mother’s and daughter’s consumption of carbohydrates was below recommendations but intake of energy, proteins and fats was more than recommended. Average daily intake of micronutrients was above the recommendations (DRI) except for iron in daughters and folate and vitamin E in mothers and daughters. Average intake of the micronutrients was between 56.5%–96.6% DRI.

This study cannot confirm or deny similarities between average daily meals of mothers and daughters, presumably because the most of daughters and mothers are living separately (in different cities), what means that they make their own choice of food. Daughters were mostly students living in dormitory, so identified differences could be due to specific way of living and choosing convenience foods.

**P17** Behaviour, Psychology and Nutrition  
**Protein intake and stress levels in nurses and housewives of Pakistan**  
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**Objective:** The aim of the study was to investigate the influence of protein on stress in nurses and housewives.

**Methods:** The study was performed at the Institute of Biochemistry, University of Sindh, Jamshoro, Pakistan during the years 2003 to 2005. One hundred and sixty nurses and housewives aged between 25–45 years participated in this study. Environmental, psychological and physiological stress levels were measured with likert scale. RDA, recommended dietary allowance, formula was used for the calculation of energy giving nutrients in food of both the groups. API, actual protein intake, was calculated from the table of nutritive values of food. Total protein levels were measured by Biuret method and Albumin levels were measured by BCG method.

**Findings:** Environmental, psychological and physiological stresses were significantly higher in housewives as compared to nurses. Actual protein intake in both the groups was approximately half of their recommended values. In housewives, the protein intake was less as compared to the nurses.
Conclusions: Housewives are under more stress than nurses. The low level of serum protein in housewives has its correlation with stress.

P18 Behaviour, Psychology and Nutrition

Relation between risky eating behaviours and anthropometric and dietetic indicators in college students from Hidalgo, México

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Introduction: In the last few years it has been observed that in our country day by day there has been an important increase in risky eating behaviours, such as: preoccupation with about weight and food, binge eating, fasting and dieting, affecting directly the feeding pattern and the nutritional status of the person.

Purpose: To determine the distribution and relationship between risk eating behaviours and anthropometric and dietetic indicators in Mexican students.

Method: Transversal, descriptive and correlational field research, in a sample of 356 college students (53% males, 67% females) from 16 a 20 years old (X = 18.6; SD = 1.94). To collect the data, one area of the Questionnaire for Health and Feeding called Scale of Risk Factors Associated to Eating Disorders (EFRATA) and body image was used. The BMI was obtained from each subject. The dietetic indicators were obtained from a Frequency Food Questionnaire (FFQ).

Results: The findings of the study showed that binge eating is more common in subjects with overweight (1.1%). Preoccupation about weight and food, eating for psychological compensation and dieting percentages were higher in obese subjects (10.5%, 5.3%, and 5.3%) respectively. According to FFQ, subjects with weight and food preoccupation frequently eliminate cereals, meats, lipids and sugar from their diet. No significant correlations between dietetic indicators and risky eating behaviours were found.

Conclusions: The findings of the study showed that women displayed more risky eating behaviours, except for preoccupation about weight and food (males 14.3%; females 8.2%). An important contribution of this research was the use of a reliable and valid multidimensional questionnaire developed in Mexico.

P19 Behaviour, Psychology and Nutrition

Risky eating behaviors, body mass index, body dissatisfaction and the internalization of the thin ideal and its relationship to marginalization in Mexican adolescents

Claudia Unikel; Magdalena Vazquez; Fatima Garcia; Michelle Breton; Ietza Bojorquez

The main purpose of this research was to achieve knowledge on the frequency of risky eating behaviors (REB) and its association to body mass index (BMI), body dissatisfaction (BD) and the thin ideal internalization (TI) in high-school students from communities with high, medium and low marginalization in Mexico. It’s a transversal study for three independent samples: students from high marginalized communities (HM) in the state of Mexico (N = 328), students from medium marginalized (MM) communities (N = 229) and students from low marginalized (LM) communities (N = 254). Students mean age was 15.8 years (SD = 1.0) in a range of 14 a 19 years. No differences were found on students BMI (XHM = 22.4, XMM = 22.9, XLM = 22.8). BMI was classified in three categories: low weight (<15th percentile), normal weight (>15th and <85th percentile), high weight (>85th percentile). Students with high weight from all samples scored higher on almost all risky eating behaviours. Students from LM and HM samples displayed statistical differences on preoccupation with gaining weight, dieting and excessive exercising, while students from MM sample displayed differences on preoccupation, fasting and exercising. With the exception of LM high weight students, heavier students scored above the cut point on the risky eating behaviour scale (LM = 8.3%, MM = 14.9%, HM = 7.1%) compared to normal weight students (LM = 11.5%, MM = 8%, HM = 3.5%). Non low weight students scored above the cut point. A positive relationship was found between BMI, BD and TI, with statistical differences shown among LM students on both variables and only on BD among MM and HM students. The data obtained show that BMI, REB and BD are positively related no matter the level of marginalization, while the TI is only related to a LM environment.

P20 Behaviour, Psychology and Nutrition

Taurine supplementation improves the utilization of sulfur-containing amino acids in consecutive alcohol administration rats

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The proposed study is to evaluate the effectiveness of taurine supplementation on the utilization of sulfur-containing amino acid
(SCAA) in consecutive alcohol administration rats. Ninety Sprague Dawley rats (male and female 45 each) were consecutively treated with 20% alcohol water solution and taurine-fortified diets (2 g/kg BW taurine) for 4 weeks. Food and water were available ad libitum. In the beginning, ten animals (M 5, F 5) were sacrificed and the biological lesions (blood and brain, and liver) for basal level of SCAAs and other biochemical parameters. The other rats were then sacrificed every week for following four weeks. In results, there is no difference on alcohol-water solution consumption. During the experiment, the plasma alcohol concentration increased during the study, however, taurine-treated animals showed the lower plasma ethanol level in week 2 and 3 significantly. In SCAA concentration, cystein and taurine were both lower after a week of alcohol ingestion in brain and plasma as well as in liver showed in week 2. Furthermore, homocysteine level of plasma and liver significant declined in week 2. The plasma SAM/SAH ratio also increased in week 2. On the other hand, the key cofactor of transsulfuration, vitamin B6, significantly declined in plasma after a week of ethanol intervention whereas an increase was observed in brain tissue. Under the taurine supplementation, some recoveries of SCAA were shown significantly by delaying taurine depletion, increasing SAM/SAH ratio, and elevating plasma and brain level of vitamin B6 in week 2. No biochemical differences between genders were found. In conclusion, taurine supplementation could recover the brain and blood abnormal utilization of SCAA under consecutive alcohol administration in rat.

**P21 Behaviour, Psychology and Nutrition**

**The evaluation of the effectiveness of Pyridoxine (vitamin B6) for the treatment of premenstrual syndrome: A double blind randomized clinical trial**

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**Objective:** A comparison between Pyridoxine (vitamin B6) and a placebo for the treatment of premenstrual syndrome (PMS).

**Material and Methods:** A double blind randomized clinical trial was performed on 160 university students who were suffering from PMS (according to the retrospective diagnostic criteria which had been recorded during the last 3 menstrual cycles). Then the patients were randomly assigned into two groups, and finally 94 patients who had finished the study were statistically analyzed.

In the Pyridoxine group (46 patients) vitamin B6 was prescribed at a dose of 40 mg twice daily (total 80 mg), and in the placebo group (48 patients) a tablet similar to vitamin B6 tablets in size, smell, shape and taste was prescribed 1 tablet twice daily. In both groups the tablets were started from the first day of the fourth menstrual cycle and continued for the next two cycles, and during these two cycles the symptoms were recorded.

**Results:** The severity of PMS in the second cycle of the treatment (in both groups) showed a statistically significant decrease (p < 0.05, Pair T test) and the comparison between the two groups showed that the severity of PMS in the Pyridoxine group decreased more than the placebo group, which was statistically significant (p < 0.05, Student T Test) and this was because of the reduction in the psychiatric rather than somatic symptoms of PMS.

**Conclusion:** Regarding the effect of Pyridoxine in reducing the severity of PMS, it can be suggested as a treatment for PMS, at least for the psychiatric symptoms.
Brazilian mothers’ beliefs, attitudes, and practices related to child weight status, and early feeding within the context of nutrition transition

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With the rapid pace of the nutrition transition faced by many developing countries like Brazil, assessing child feeding practices within the context of the nutrition transition and co-existence of over and under-nutrition within the same population becomes increasingly important. This qualitative study describes Brazilian mothers’ child feeding practices and perceptions of how these factors might be associated with child weight status including underweight and the development of childhood overweight and obesity. The role of socioeconomic, cultural, and organizational factors on these relationships. We conducted four focus groups with low-income mothers enrolled in a Family Health/Community Health Workers program in Ceara, Northeast Brazil. Study results showed that mothers’ child feeding practices are influenced by socio-cultural beliefs, economic resources, mothers’ immediate social support networks (e.g. family members, especially grandmothers), and participation in nutrition assistance programs. Food practices in this population appeared heavily tied to socio-economic status. Mothers spoke of economic factors as barriers to providing healthy diets for children, with food insecurity and hunger emerging as significant problems. Moreover, a socio-economic differential emerged between mothers from urban vs. rural areas, with rural mothers reporting feeling stressed and embarrassed about their children being ‘skinny’, a reflection in their opinion of not being able to adequately provide. Child malnutrition was the most common nutritional problem reported, nevertheless, mothers were aware of the negative health consequences of obesity, and in several cases, had themselves battled with overweight and obesity.
used for collecting data and was analyzed using SPSS (version 12.0).

Results: The most commonly mentioned reason to attempt to lose weight was to avoid health problems followed by improving personal appearance. The weight loss perceptions of fifty percent samples were within the accepted range (2–5 kg/month). The characteristics of weight loss attempters were that, more than 60% made previous attempts, 45.8% followed the advice of doctors and dietitians but number of attempts varied. Females and those who were married lost more weight and they followed the diet for longer duration. The major reasons for stopping the previous dietary regime were inability to resist sweets and traditional foods (31%) followed by dissatisfied with the weight loss outcome (24.8%). Forty one percent of dieters have chosen this clinic as advised by friends and relatives and 37% have done so because of their past experience.

Conclusion: The study confirms awareness, health consciousness, social support but lack of self-control among the dieters.

P26 Behaviour, Psychology and Nutrition

Body mass index and compensation practices in response to the food excesses in a group of adults from the Community of Madrid. Differences according to the sex

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Background: At the present exits a great preoccupation about prevention/control of the obesity, for this reason to know the preoccupations and the habits of the population is very interesting.

Objective: To determine the compensation practices in response to the food excesses in a group of adults from the Community of Madrid according to sex and body mass index (BMI).

Methods: A cross-sectional study was applied, interviewing to 429 subjects, of which only 203 had followed or were following practices of weight control diets. Paying attention to this group, we have tried to know which were the main modifications that they introduced in their feeding habits when they tried to compensate a food excess. Also we collected personal, dietetic and anthropometric data.

Results: The interviewed subjects (32.7 ± 11.2 years) were in their majority students (37%), 25% worked as administrative, 18% was sanitary staff, 13% were housewives and 7% worked in other different employments. Differing according to the sex, men had a BMI significantly superior than the women (26.1 ± 3.6 versus 23.1 ± 3.4 kg/m², p < 0.001). 47.5% of the total sample compensate the food excesses (35% men and 52% women). The most frequent practices of compensation were: to eat less (49%), to do exercise (16%), to eat more fruit (11%) and more vegetables (7%). The interviewed women declared to compensate the excesses eating healthier (8%) or omitting some food (7%) compared with the males (p < 0.05).

Conclusions: Though the women have minor BMI they practice more varied strategies to compensate the food excesses than the men. This strategies are not the most suitable or justified practices, so much to maintain the reduction of the body weight obtained as to support the health and nutritional situation.

P27 Behaviour, Psychology and Nutrition

Effect of preferences for niboshi soup stock and instant soup stock on their sensory evaluation

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Most popular and traditional soup stock in Yamaguchi prefecture in Japan is those with extracted from dried sardines, niboshi. However, many people use instant soup stock for miso soup nowadays. The purpose of the present study is to evaluate interrelationship between preferences for niboshi and instant soup stocks and a sensory evaluation in parents/children pairs in elementary schools. The subjects were 96 pairs of parents and children (10–11 years old), who lives in Nagato-city located at the northern part of Yamaguchi prefecture. The subjects tasted niboshi and instant soup stocks and completed the questionnaire about the flavor, umami, fishy odor and bitterness in both of niboshi and instant soup stock. They also answered preference for both soup stocks. We analyzed levels of free amino acids and nucleic acid-related compounds in both soup stocks by using amino acid analyzer. The flavor of their favorite soup stock was better than that of not favorite one (p < 0.05 by Tukey multiple comparison). The umami taste of instant soup stock was stronger than niboshi soup stock, and the fishy odor of niboshi soup stock was stronger than instant soup stock in the subjects who prefer instant soup stock (p < 0.05 by Tukey multiple comparison). The content of glutamic acid in total amino acids in instant soup stock was 99% (g/g). Niboshi soup stock included various amino acids and was abundant in histidine and taurine. The content of inosinic acid was higher in niboshi than in instant soup stock.

P28 Behaviour, Psychology and Nutrition

Modifications in the sensation of well-being, before and after meals, as consequence of the participation in two types of hypocaloric interventions, in overweight/obese women

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The aim of this study was to analyze the changes in the sensation of well-being of young overweight/obese women following two slightly hypocaloric diets based on the increased relative consumption of foods whose intakes were those most removed from their ideal: cereals (diet C) and vegetables (diet V).
Methods: The study subjects were 57 women (aged 20 to 35 years) with a body mass index (BMI) of 24–35 kg/m² who completed the 6-week dietary intervention period. Dietetic and anthropometric data, were collected at the start of the study and again at six weeks. Subjective sensation of well-being were measured using a visual analogue scale before and after each meal, both at the start of the study and six weeks later. The Well-being Quotient (WQ) of each meal (the difference between the sensation of well-being before an after a meal/100 kcal) was calculated.

Results: Reductions in body weight and BMI were achieved with both diets, but significantly greater losses were achieved with diet C. Subjective sensation of well-being after breakfast, mid-morning snack, lunch as well as the average sensation of well-being after all meals were higher with diet C after six weeks when comparing with diet V.

Improvement of the WQ at the end of the study were achieved only with diet C in breakfast, lunch, and dinner. At the end of the study, greater WQ were achieved with diet C in mid-morning snack and lunch. More women in diet C completed the study (93.5% compared to 77.8% in diet V).

Conclusion: The better well-being results obtained with diet C could lead to a higher adherence to dietary rules. This could contribute to the greater body weight losses and lower withdrawal of this diet.

P29 Behaviour, Psychology and Nutrition
Physical efficiency of people addicted to psycho-active substances
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Drug addiction is a serious social problem, it concerns nearly 70,000 young people in Poland. There are various treatments in use, such as pharmacology, psychology and dietetics. The drugs influence and changing the nutrition customs. The drug addicted people eat usually one meal daily, what leads to malnutrition increase. The check-up sample consisted of patients, age in between 19–26 years, of the 10th Detox Unit, Lodz public hospital. The comparable control sample was the peers group, mostly students, presenting medium physical trainings level. The methodology involved in the assessment, considered the performance of the hospital diets, morphology, biochemical and anthropometrical check-ups. The hospital estimated daily calories requirement is 2,450 kcal, and relates to men group, in range between 19–26 years, average body mass of 70 kg and low physical activities level of 1.4. The 16 days menu program has been analyzed according with the computer program Diet 2.0. The average diet achievement level was 98%. The levels of selected parameters, such like iron and magnesium met with the recommended nutrition norms. Worrying deficiencies relate mainly to calcium, vitamin C and vitamins from group B. The drug addicted men test outcome was low pulse efficiency. The physical activities level have been determined according to the modified Harvard's test. The significant statistical differences have been proved between check-up and comparable control group. The example of significant statistical difference was pulse result, for check-up group it was 112 ± 8 hits/min, and for control group it was 167 ± 5 hits/min. Concluding, despite the proper nutrition in place, the drugs addicted patient proves significant physical inefficiency vs. comparable control group.

P30 Behaviour, Psychology and Nutrition
Breakfast and cognitive performance in Greek secondary school students
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Introduction: It is often stated that breakfast is the most important meal of the day; this may be especially so for young people during their key years of schooling.

Purpose: To explore the relationship between breakfast eating and cognitive performance in a group of Greek students aged 14–15 years.

Methods: 83 students (31 boys and 51 girls) from 2 secondary schools in Thessaloniki in Greece completed a breakfast questionnaire (to classify them into two groups) and then undertook a series of 6 validated cognitive tests (translated into Greek) which focused on: attention; memory, visual searching, concentration; thinking ability and accuracy. Tests included: trail making; cancellation; memory and search; sentence verification; and spatial memory. Parental approval was obtained for all participants.

Results: 34 students were classed as breakfast eaters (BE) and 49 as non-breakfast eaters (NBE). BE students performed significantly (p < 0.005) better in all tests than the NBE students. All tests the results were reviewed with respect to mode, median, highest and lowest scores. Evaluation of lowest scores showed particularly substantive differences with members of the NBE group displaying substantially lower scores on the particularly discriminating tests (such as the trail making test).

Conclusions: Breakfast is a very important meal which should not be omitted. The findings suggest that students who consume breakfast will enhance their cognitive abilities (as shown by significantly higher scores across all test protocols. It is suggested that NBE students could be at a significant scholastic disadvantage compared to their BE peers.
Cognitive predictors of weight loss among obese patients

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Purpose: To investigate whether cognitions about the costs and benefits of obesity and weight control (measured at baseline) predict weight loss (measured at 12 month follow-up).

Methods: In this prospective survey 104 obese patients were recruited from a weight management clinic. Data were collected at baseline (Oct–Dec 2004) on sociodemographic characteristics, height, weight, behavioural goals, knowledge about obesity’s health risks (ORK-10 scale) and beliefs about the consequences of avoiding obesity (BCOAS). At one-year follow-up (Oct–Dec 2005) data were collected on current weight and weight satisfaction.

Results: Participants displayed low levels of knowledge about obesity’s health risks at baseline and did not strongly endorse the health benefits of avoiding obesity. However, they strongly endorsed the social and aesthetic benefits of avoiding obesity and the costs of weight management. Useable data were obtained from 66 participants at follow-up. Just over half (n = 34, 51.5%) gained weight. Among those who did not gain weight (n = 32), greater weight loss was associated with endorsement of the social and aesthetic benefits (rs = .31; p < .05) and the health benefits of avoiding obesity (rs = .40; p < .05).

Conclusion: Cognitions predict weight loss in obese individuals who are successfully managing their weight and avoiding further weight gain. Health professionals might, therefore, find it productive to target discussions about the health and non-health consequences of obesity.

The measurement of diet-induced changes in cognition: methodological aspects

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Purpose: To assess nutrition effects, the experimentally oriented functional microanalysis of changes is complementary to the performance profile.

Methods: To assess nutrition effects, the experimentally oriented functional microanalysis of changes can be divided in subfunctions differentially affected with age. Theoretical conceptions of these functions, their changes during aging, related tests and methodological approaches were investigated. Changes due to selected nutritional variables were discussed (influence of caffeine, ginseng, glucose on attention and psychomotor performance; phosphatidylserine and vitamin E on memory). With age the episodic memory declines but memory is not a unitary phenomenon and should be monitored using a range of tests that reflect theoretical conceptions of the topic. Attention and psychomotor functions can be divided in subfunctions differentially affected with age. To assess nutrition effects, the experimentally oriented functional microanalysis of changes is complementary to the performance profile.

Conclusion: Behavioural assessments can be a sensitive and valid method to investigate the effects of nutrition on brain function, if applied appropriately. Control for potentially confounding factors is essential, as is the selection of a test and the condition under which they are administered. The study design should be tailored to meet the study aims, product characteristics and target population.
(3,000 mcg/day). In case of zinc the intake at the 97.5th percentile among men was 27 mg/day and this value was higher than UL (25 mg/day).

There was not observed exceeding of UL for other nutrients.

**Conclusion:** Supplementation of vitamin A in the group of men and women and zinc among men may potentially lead to intake which approach the upper levels. This results could be taken into account in the setting of safe levels of nutrients in food supplements.

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**P34 Control of Food Intake**

**Assessment of adolescents’ snack consumption pattern at schools in the east of Tehran, 2006**

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**Introduction:** Food patterns are mainly formed during early years of life especially in adolescence and stabilize afterwards. Therefore identification and assessing adolescents’ dietary habits formation is the path toward socio-economic development in future. The present study was aimed to assess the adolescents’ snack consumption pattern at schools in the east of Tehran, 2006.

**Materials & Method:** This cross-sectional study was conducted on 788 girls and boys aged 12–15 years in east of Tehran. Schools were selected based on geographical distribution and systematic random sampling was used. Data on students’ snack consumption patterns was collected by using a semi-quantitative food frequency questionnaire (FFQ) including 60 food items. Sources of providing each food item (school buffets, stores, home) were also determined. Data was analyzed by using MSACCESS software.

**Findings:** The most frequently consumed snacks were: cakes and biscuits (86%), sandwiches (82%), fresh fruits and vegetables (40%), potato chips (25%), nuts and dried fruits (25%), ice cream (21%), fruit drink and coke (20%), different kinds of sauces (20%) and milk (11%). Consumption of other food items such as puffs, chocolate and chewing gum was reported less than 20%. The most consumed sandwiches were bread & cheese (35%) and bologna and fried sausages (21%). Snacks were provided from home (43%), school buffet (41%) and stores (17%).

**Conclusion:** There is a huge gap between appropriate snack pattern and the intake pattern in adolescents. As the school buffets are one of the major sources to provide snacks, thus, planning to improve the quality and variety of available snacks will be one of the priorities regarding to nutritional health promotion in this age group and achieving sustainable development.
**P36 Control of Food Intake**

**Effect of the intracerebroventricular (ICV) glucose injection on the ingestion of a standard or a palatable diet**

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Evidence point to a role of nutrients in the regulation of food consumption, by a centrally-acting mechanism. Brain sites responsive to glucose may be concerned in both metabolic and motivational systems involved in the control of food intake. We have shown that an icv dose of 2.0 mg glucose inhibited food intake in female rats. Even though a powerful and complex physiological system exists to balance energy intake and expenditure, it has been argued that a palatable food may disturb appetite regulation.

**Objective:** To evaluate the effect of a single icv glucose injection on the ingestion of a standard or a palatable diet.

**Methods:** Female Wistar rats were stereotaxically implanted with a guide cannula at the lateral ventricle (LV). After a seven-day recovery period, animals were weighed and food-deprived at 12 am, and at the beginning of the dark period (6 pm), 2.0 mg of glucose in 5 μL of vehicle (artificial cerebrospinal liquid) were injected into the LV. Known amount of standard diet – SD (n = 6) or palatable diet – PL (n = 7) was offered and the consumption was measured after 2, 12, and 24 h. Palatable diet consisted of condensed milk and peanuts added to the standard diet. Food intake (g/100 g body weight) was expressed as mean ± SEM. Differences between means were analyzed by Student’s t test. The critical level for significance was set at p < 0.05.

**Results:** There was no significant difference in mean food intake between groups (SD 2 h: 1.72 ± 0.11; SD 12 h: 3.27 ± 0.51; SD 24 h: 2.29 ± 0.28; PL 2 h: 1.68 ± 0.28; PL 12 h: 2.31 ± 0.30; PL 24 h: 2.88 ± 0.24).

**Conclusion:** The acute intake of a palatable food couldn’t disrupt the anorexigenic effect of the icv glucose injection.

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**P37 Control of Food Intake**

**Fats, Omega-3 and Omega-6 fatty acids dietary intake in Polish population**

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**Introduction:** Nowadays there is observed in Poland too high dietary intake of fat which delivers more than 30% of total energy/person/day. In relation to the risk of non-communicable chronic diseases it is important to find out the structure of fat intake, because of the most important preventive role of ω3 and ω6 fatty acids.

**Purpose:** The aim of the study was an estimation of fats including ω3 and ω6 fatty acids intake in Poland.

**Material and Methods:** In 2000 National Food and Nutrition Institute carried out countrywide representative survey of dietary intake of fat and ω fatty acids in the group of 4,134 males and females in the range of age 1–96 years. The sample was divided into 18 group by age and sex. The 24 hour recall was used as the method to collect the dietary information.

**Results:** The total fat intake in all studied people was more than 140% in comparison to the Polish recommendations. The total fat energy in total sample was 35%.

In case of saturated and omega (ω) fatty acids this value was 12% and 5.4% of total energy. The total ω3 fatty acids intake in Polish population was 3.2 g per day and was smallest than ω6 intake which was almost 12 g per day. The ω6/ω3 rate was calculated as 4.4. The main source of ω fatty acids in Polish average diet were oils which share was 23%. However oils were mostly the source of ω6 fatty acids. Because of small dietary intake of fish products, the percent of ω3 fatty acids from these products was 5.4%. The total fat consumption, ω3 and ω6 fatty acids was differentiated among age and sex groups.

**Conclusion:** The presented study shows that in Poland the ω3 and ω6 fatty acids intake seems to be satisfy. High percentage of energy from SFA is unfortunately connected with high risk of coronary heart diseases.

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**P38 Control of Food Intake**

**Gender difference in the effect of intracerebroventricular (ICV) glucose injection on food intake**

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Feeding behaviour, which is related to the nutritional status, is at least partly controlled by the availability of glucose.

**Objective:** To evaluate the effect of a single icv glucose injection on food intake.

**Methods:** Female and male Wistar rats were implanted with a guide cannula aimed at the lateral ventricle (LV). After a seven-day recovery period, animals were weighed and food removed at 12 am. At 6 pm (onset of the dark period), 5 L/5 min. of either vehicle (artificial cerebrospinal liquid – CSF) or glucose (500 μg, 1.0 mg, or 2.0 mg) were injected. Immediately after the injection, a known amount of food was offered and the leftovers were measured after 2, 12, and 24 hours. Seven animals in each group were assigned to only one treatment. Food intake (g/100 g body weight) was expressed as mean SEM. Differences between means were analyzed by ANOVA followed by Bonferroni’s multiple comparison test. The critical level for significance was set at p < 0.05.

**Results:** Male rats decreased their food intake 12 h (p < 0.05) and 24 h (p < 0.01) after icv glucose injection (CSF: 1.40 ± 0.16, 6.06 ± 0.45, 7.77 ± 0.44 g, after 2, 12, and 24 hours, respectively; 500 μg glucose: 1.50 ± 0.34, 4.17 ± 0.58, 5.56 ± 0.62; 1.0 mg glucose: 0.87 ± 0.16; 4.03 ± 0.56; 5.66 ± 0.61). On the other hand, female rats only decreased their food intake 24 h after an icv dose of 2.0 mg glucose (p < 0.001) (CSF: 1.67 ± 0.29, 5.32 ± 0.63, 7.58 ± 0.81; 500 g glucose: 1.60 ± 0.29, 5.41 ± 0.59, 8.02 ± 1.50; 1 mg glucose: 1.75 ± 0.27, 5.45 ± 0.38, 7.95 ± 0.46; 2 mg glucose: 1.72 ± 0.11, 3.27 ± 0.51, 2.29 ± 0.28, after 2, 12, and 24 hours, respectively).
**Conclusion:** The present study provided evidence that the icv glucose injection reduced food intake in both male and female rats. Females were less sensitive than males to the anorexigenic effect elicited by glucose.

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**P39 Control of Food Intake**

**Genetically modified food in Poland in the years 2005–2006 – results from monitoring**

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**Introduction:** Genetically modified (GM) and in particular the proper labelling of such products, are very much the subject of consumer concerns. The control of the labelling of food that may contain, consist of or may be produced from genetically modified organisms can contribute to build up consumer confidence. The proper labelling of such food enables consumers to make an informed choice among food products placed on the market.

**Purpose:** Estimation of correctness of GM food labelling, that is providing information about genetic modification on the label of the food placed on the Polish market.

**Methods:** Products containing soya and maize as well as tomatoes and potatoes were taken from the Polish market. The food samples were examined by State Sanitary Inspection’s laboratories paying special attention to presence GM material in such food.

**Results:** In the years 2005–2006, 1131 samples of food potentially genetically modified were examined. 10 products (0.9% of food samples taken) were identified as containing GM material and not having information about modification on the label. Among such food occurred products with modification approved in European Union (EU), i.e. biscuits, soya flour, sausages with modification Soya Roundup Ready and GM potatoes which are not approved in UE.

**Conclusions:** Taking into consideration the building of the consumers trust to GM food and the fact that GM products without the information about genetic modification on the label appeared on the market, monitoring of such food should be continued, particularly paying special attention to presence GM material which is not approved in EU as food, that is such products like: potatoes, tomatoes, wheat, rice and papaya.

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**P40 Control of Food Intake**

**Phosphorus intake as food additives in Polish diets**

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**Introduction:** Phosphorus is found naturally in relatively large amount in many foodstuffs. Additional sources of this component in diets are food additives, commonly used in food industry e.g. as stabilizers, acidity regulators, improving texture and water absorbiveness of meat and poultry products.

**Purpose:** The aim of this study was to estimate the intake of phosphorus compounds (26 compounds) with diets by selected groups of Polish population and the assessment of risk for human health resulting from their intake.

**Methods:** Data was collected in 2000 under the FAO project ‘Household Food Consumption and Anthropometric Survey’. The source materials included 24-hour recalls of 1998 individuals (children aged 7–15 years, teenagers aged 16–18 years, adults aged over 50 years).

**Results:** Phosphorus compounds as food additives occurred in the majority of studied diets independently of age. The analysis of data showed that the diets of boys aged 13–15 years contained the highest amount of phosphorus coming from food additives – 146 mg/day, which stood as a factor causing of higher amount of phosphorus in diets originated from foodstuffs by 10%. The lowest intake of phosphorus as food additives was observed in the group of men aged over 65 years and amounted to 48 mg/day, increasing content of consumed phosphorus by 3.7%. The highest amount of added phosphorus was consumed from meat and poultry products and cakes, biscuits.

**Conclusions:** Taking into account that intake of phosphorus compounds as food additives increased its amount in comparison with phosphorus originated from naturally its containing products, therefore in the studies on estimation nutritional status of diets it should be taken into consideration phosphorus added as food additives.

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**P41 Control of Food Intake**

**Quantitative involvement of duodenal, portal and cerebral nutrient sensing towards food intake control**

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Control of food intake originates primarily from three different areas including the brain, the portal vein and the gut. Various nutrients have been shown to activate each of these areas that in turn provide signals to reduce ingestion. The aim of our study is to evaluate the quantitative role of these primary sensors towards eating behavior.

Six 30 kg pigs were surgically fitted with duodenal, carotid and portal catheters. Glucose (G, 20%), Intralipid (IL, 20%), or a mixture of amino-acids (N, Nutrilamine 95) were injected in either of these three sites in an isocaloric manner (240 calories.kg⁻¹.min⁻¹) during 10 minutes before the meal. 2200 g-test meal was presented for 30 minutes to evaluate the microstructure of the meal (total ingestion and ingestion speed).

The total amount of food ingested was significantly reduced for IL administration within the duodenum (53 ± 8.6 vs 65 ± 2.5 g. kg⁻¹BW) and for G administration in the portal vein (59 ± 3.0 vs 71 ± 0.2 g.kg⁻¹BW) and also in the duodenum (61 ± 4.0 vs 69 ± 2.7 g.kg⁻1BW). This was related to a significant decrease in ingestion speed during the first 10 minutes. For G infusions only, this reduction persisted during the entire meal period. Finally, no significant change
in food intake behavior was observed for N infusion irrespective of the administration route.

In conclusion, nutrient sensing for IL is probably located within the duodenum since intraduodenal but not carotid or portal infusions altered food intake. On the contrary, nutrient sensing for G is likely within the portal vein since intraduodenal and intraportal infusions were equally effective to reduce food intake. Finally, within the concentration limits used in our study, N did not participate significantly to short-term control of food intake.

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**P42 Control of Food Intake**

**Role of BDNF in the dorsal vagal complex of the Wistar rat and its implication in the swallowing reflex**

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Brain-Derived Neurotrophic Factor (BDNF), a neurotrophin expressed at the level of the brain stem, modulates feeding behavior by an anorexigenic action. Swallowing, a motor component of feeding behavior, is under the control of premotoneurons located in the medullary solitary tract nucleus, the so-called central pattern generator for swallowing. In anaesthetized rats swallowing can be induced by stimulation of sensitive fibers of the superior laryngeal nerve (NLS). The animals were fitted with electrodes placed in sublingual muscles to record the electromyographic activity. The effects of BDNF were tested on rhythmic swallowing induced by repeated stimulation (10–30 Hz) of the NLS.

**Results:** both ELISA mesurement and immunohistochemistry confirmed that BDNF protein is highly expressed in the dorsal vagal complex (DVC). Microinjections of GABA (10–9 to 10–3 M) or BDNF (1, 5, 10 μg/ml) into the swallowing centre induced similar dose-dependent inhibition of rhythmic swallowing as shown by the reduced number of electromyographic activities. This inhibitory effect had a brief latency (less than 30sec) with a duration of 30 sec to several minutes depending of the BDNF dose. The threshold of the BDNF-induced inhibition was near 1 μg/ml. Preliminary results indicate that: 1) the inhibition of swallowing occurred when GABA and BDNF were coinjected at subliminary doses, 2) after biceuculline, the inhibitory effect of BDNF was blocked suggesting a possible implication of GABA in the inhibitory effect. Moreover, repeated stimulation of NLS during 2 hours significantly reduced BDNF protein content within the DVC but not in the hypothalamus.

**Conclusion:** BDNF present in the CVD was shown to inhibit swallowing, an essential motor component of feeding.

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**P43 Control of Food Intake**

**Expression of intestinal neuromedin U is altered by zinc deficiency**

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An early symptom of dietary zinc deficiency is the depression of food intake, and peptide hormones secreted by intestine participate in appetite regulation. Zinc can modulate gene expression probably through transcription factors containing zinc fingers. Therefore, we investigated intestinal gene expression profile in zinc deficient rats and looked for novel GI peptide for food intake regulation. Male Wistar rats weighing about 180 g were fed an zinc-adequate AIN76 diet, a zinc-deficient diet or a pair-fed diet for 24 days and then intestinal gene expression were assayed with Agilent Rat V2 Oligo microarray. In zinc deficient rat intestine, 90 genes increased by one fold and 84 genes decreased to 50%; while in pair-fed rat, 47 genes increased by one fold and 29 genes decreased to 50%. Only 20 genes exhibited similar changes between zinc deficient and pair-fed rats, indicating that differential gene expression is specifically caused by zinc status. Expression of metallothionein and zinc transporter 1 was reduced by zinc deficiency to 28% and 41% of the control, respectively. In contrast, neuromedin U was increased by 176% in zinc deficient intestine. These expression changes were not observed in the pair-fed rats. The specific change in neuromedin U was associated with the feeding pattern of zinc deficiency and has been confirmed by real-time-QPCR. In conclusion, our study is the first to link dietary zinc nutrition with GI neuromedin U expression and provide a possible explanation of zinc control of food intake.

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**P44 Control of Food Intake**

**Increasing the protein content of a beverage reduces subsequent intake at the next meal**

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Protein is widely considered to be more satiating than carbohydrate. However, it is unclear whether this rule applies equally to drinks as solid foods. Discrepancies in the literature may indicate a critical level of protein (PRO) is required in drinks, to obtain differences in appetite between CHO and PRO. In this repeated measures, cross-over design study, 28 lean male volunteers (18–35 yrs) ate a standard breakfast in the laboratory and 210 minutes later consumed one of four preloads 30 minutes prior to an ad. libitum pasta meal. Three of the preloads were isocaloric (~278 kcal) mixed composition dairy fruit drinks (300g) of low (12.5% energy PRO/87% energy CHO), medium (25% energy PRO/75% energy CHO) and high (50% energy PRO/50% energy CHO) protein content. The control drink was a low energy (78 kcal) alternative (12.3% energy PRO/84.3% energy CHO). ANOVA linear contrasts indicated a dose response effect of preload protein level on intake (g) at the ad. libitum meal, (F(1,24) = 16.15, p < 0.001). Subsequent intake in each condition...
was: control (637.5 g ± 39.7), low (596.9 g ± 40.5), medium (546.9 g ± 34.7), and high protein (533.6 g ± 42.3). Participants did not compensate fully at lunch for the additional energy in the test drinks, however in the high PRO condition alone, total energy intake was not significantly different from the control condition. There were no differences in ratings of hunger and fullness across conditions. Our findings support the view that increasing the protein composition of beverages could be of interest to prevent short-term positive energy balance.

P45 Control of Food Intake

**Oral oleoylethanolamide (OEA) lowered food intake and body fat mass in C3H mice fed with a high fat diet**

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While oleoylethanolamide (OEA) regulates food intake and weight gain when injected intraperitoneally, less is known when given orally.

C3H mice received for 2 weeks a high fat diet (lipids: 50 energy %) which was then augmented either by 0, 10, or 100 mg/kgbw of OEA for an additional 4 wk (n = 7 per group). Food intake and weight gain were monitored. Gene expression related to food intake and energy expenditure were measured by Real-Time PCR.

Orally administrated OEA significantly lowered food intake over the 4 weeks, irrespective of the dose given, and decreased AT mass (−25%, P = 0.03 and P = 0.06 for 10 and 100 mg OEA, respectively). Multivariate statistical analysis of 23 genes expressed in various tissues revealed that, compared to controls, the gene transcripts mostly associated to a fat mass loss were linked to insulin signaling (adiponectine in AT, P = 0.02) and lipid metabolism (Fiaf: Fasting induced adipocytes factor in AT, P = 0.004) for the 10 mg group, and to food intake control through the activation of intestinal GPR119 (G Protein coupled Receptor, P = 0.0001), stomach ghrelin (P = 0.03) and AT leptin (P = 0.0003) for the 100 mg group.

OEA exerted a satietogenic effect and induced a lower weight gain under high fat diet. The 2 doses of OEA had similar effects on fat deposition, but the gene expression pattern controlling physiological functions was different: lipid storage and insulin signaling at the 10 mg dose, lipid oxidation, food intake control at the 100 mg dose. The most efficient dose has to be confirmed along with the relevant mechanisms at the gene expression level.

P46 Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions

**C677T methylene tetrahydrofolate reductase and plasma homocysteine levels among Thai vegans and omnivores**

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Hyperhomocysteinemia (>15 μM) is mostly caused by C677T mutation of methylene tetrahydrofolate reductase (MTHFR) and deficiencies of folic acid, vitamins B12 and B6 which affect remethylation and/or transsulfuration metabolic pathways of homocysteine (Hcy). We have determined plasma Hcy, serum and red blood cell (RBC) folate, serum vitamin B12 and MTHFR C677T mutation in 109 vegans and 86 omnivores, aged 30–50 years.

The results show that hyperhomocysteinemia was found in 57% of vegans (range, 15.1–82.6 μM) as compared to none in the omnivores (Hcy values, range, 5.3–14.0 μM). Allele frequencies, heterozygosity and homozygosity of this mutant were respectively, 19.7%, 32.1% and 3.7% in the vegans, and 20.9%, 34.9% and 3.5% in the omnivores. This mutant did not increase the plasma levels of Hcy in both the normohomocysteinemic and the hyperhomocysteinemic individuals. The C677T MTHFR is unstable and requires more-than-normal amount of folate to function normally. Both the vegans and the omnivores had adequate serum and RBC folate, denoting adequate folate nutrition, to overcome the defective function of this C677T genotype. Hyperhomocysteinemia among the vegans was solely a result of vitamin B12 deficiency.

In conclusion, hyperhomocysteinemia was prevalent among Thai vegans; it was due to vitamin B12 deficiency. The C677T mutation of the MTHFR did not appear to aggravate the hyperhomocysteinemia because folate nutrition was more than adequate. This implies that the vegans must be supplemented with vitamin B12.

P47 Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions

**Effect of dietary iron in people with and without genes for haemachromatosis**

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Introduction: Hereditary haemochromatosis is one of the commonest genetic disorders. There is considerable variability in the rate of end-organ disease in people with susceptible HFE genotypes for hereditary haemochromatosis, possibly due to variability in the rate of iron accumulation.

Purpose of Study: To estimate the association between dietary iron and other nutrients, and serum transferrin saturation and ferritin levels.

Methods: A community cross-sectional survey of 114 men and 119 women with different HFE gene genotypes conducted in...
Tasmania. Dietary macro- and micro-nutrient intake was assessed using a food-frequency questionnaire.

**Results:** 67% of men and 71% of women with C282Y homozygous genotype had elevated transferrin saturation. The median ferritin level in C282Y homozygous men was 151 microgm/dL under 35 years and 809 microgm/dL over 35 years. Only 33% of C282Y homozygous women had ferritin levels over 350 microgm/dL, all aged over 50 years. Serum transferrin saturation and ferritin levels were strongly associated with dietary fat intake in people with homozygous genotypes, but not in heterozygous and normal genotypes. Serum ferritin levels were strongly associated with dietary haem iron in people with homozygous genotypes whose ferritin level was above 350 ug/dL. When the two factors were analysed together in this group, 1 SD increase in haem iron increased serum ferritin by 470 ug/dL (CI95% 82 to 857; P = 0.03) and 1 SD total fat increased serum ferritin by 310 ug/dL (CI95% 31 to 589; P = 0.036). There was no association between dietary non-haem iron and measures of iron status.

**Conclusions:** The strong association between haem iron intake and ferritin in C282Y homozygotes with elevated ferritin could mean diet might delay the need for venesection.

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**P48** Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions

**Effect of ferritin on the immune response and susceptibility to White Spot Syndrome Virus (WSSV) in the white shrimp Litopenaeus vannamei**

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Ferritin plays an important role in the immune system of shrimp. In crustacean, ferritin is known as a globular protein that stores iron, and participates significantly in physiological and immune regulations, e.g., detoxification, inflammatory condition, developmentally regulated, and neuronal differentiation. White shrimp Litopenaeus vannamei is one of the most important cultured shrimp species in Taiwan. However, annual shrimp production has been notably declined in the last decades, due to environmental deterioration thereby outbreaks of infectious diseases, particularly caused by white spot syndrome virus (WSSV). In this study, immune responses (phenoxodisodise activity, respiratory burst and superoxide dismutase activity), physiological responses (glucose, lipid and lactate), susceptibility and ferritin gene expression to WSSV were measured when L. vannamei (9.4–1.3 g) were injected individually with ferritin at 0.1, 0.5 or 1 mg/g shrimp. L. vannamei injected with ferritin at 0.1, 0.5 and 1 mg/g shrimp maintained lower glucose and lactate contents after 12 hr, but lipid content of L. vannamei injected with ferritin at 0.1, 0.5 and 1 mg/g shrimp was significantly higher than that of control shrimp. The survival of shrimp that received ferritin at either dose was significantly higher than that of control shrimp at 72 hrs after the challenge. It is therefore concluded that L. vannamei injected with ferritin increased its immunity and resistance from WSSV infection.

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**P49** Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions

**Energy related genes involved in the prevention of body fat accumulation by vitamin C in a model of cafeteria rats**

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**Background:** Oxidative stress has been implicated in the pathogenesis of several metabolic diseases, including obesity. The supplementation with high doses of ascorbic acid has been reported to reduce fat deposition when conjointly administered with a high-fat diet in rodents.

**Methods:** A microarray study of subcutaneous adipose tissue from rats fed a control diet or a high-fat (cafeteria) diet, supplemented or not with 750 mg/Kg rat/day of ascorbic acid, has been performed. The analysis of the different metabolic pathways was carried out with GeneMapp 2.0.

**Results:** In cafeteria-fed obese rats, the microarray analysis showed the upregulation of some metabolic pathways related to energy utilization. Thus, genes belonging to the electron transport chain, tricarboxylic acid cycle, gluconeogenic and glycolyctic pathways are overexpressed.

The dietary treatment with ascorbic acid reduced the expression of relevant genes of these pathways. This is the case of pyruvate carboxylase, that catalyses the ATP-dependent carboxylation of pyruvate to form oxaloacetate; pyruvate dehydrogenase kinase, isozyme 1, one key inhibitory gene that regulates the homeostasis of carbohydrate fuels; and glucose-6-phosphate dehydrogenase, the key gene of the pentose phosphate pathway.

**Conclusion:** The current nutrigenomic approach allows to conclude that high doses of ascorbic acid are able to decrease the expression of key genes involved in energy utilization and carbohydrate oxidation. This could be linked to the preventive role of this vitamin on high fat diet-induced weight gain. Hence, this vitamin could act not only as a substrate for mitochondrial respiration or an antioxidant compound, but also as a regulatory molecule that can modulate the expression of genes involved in energy metabolism.
**P50 Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions**

**Folate status and polymorphisms of the methylenetetrahydrofolate (MTHFR) gene in infertile women**

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**Introduction:** Folate intake in Swedish young women has previously been shown to be low and not reaching the folate requirements. The effect of the polymorphism MTHFR 677 TT has shown undesirably high levels of homocysteine already in adolescence, especially in groups with low intakes of folate. In earlier studies of spontaneously aborted foetuses, an overrepresentation of MTHFR 677 TT has been seen. The representation of MTHFR 677 TT is according to previous studies around 10% in Sweden.

**Purpose of the Study:** The study presented here was a pilot to establish the frequency of the MTHFR 677 TT polymorphism in women with unexplained infertility, referred to an IVF-clinic, and to investigate the folate status in this sub-group.

**Methods Used:** The study sample consisted of 18 healthy nuliparous women with the diagnosis unexplained infertility, referred to the In-Vitro-Fertilization Unit at Karolinska University Hospital, Huddinge. The data were collected from October 2005 to February 2006 and included blood samples, two 24-hour recalls and a questionnaire in order to estimate supplement use, smoking, body size and frequency of intake of certain foods.

**Summary of Results and Conclusions:** The prevalence of the MTHFR 677 TT polymorphism (22.2%) was significantly higher than in previous Swedish studies. Folate status and folate intake levels was not significantly different between the MTHFR 677C>T genotypes. The folate intake levels from foods were low in the whole group (median 249.7 mcg/day). Women who used folate supplements (44.4%) had higher serum folate and lower plasma homocysteine levels. There is a need to study the frequency of the MTHFR 677 TT polymorphism and folate status in infertile women in more detail.

**P51 Diet Agene Variants and Response to Diets, Epigenetics and Genes Interactions**

**Genetic variations at the endocannabinoid type 1 receptor gene (CNR1) are associated with central obesity and metabolic syndrome in men**

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The endocannabinoid system modulates food intake and body weight in animal models. Treatment with the cannabinoid type 1 receptor (CB1) blocker, rimonabant, reduces body weight in obese individuals. We evaluated the association of single polymorphisms (SNPs) of the gene encoding CB1, CNR1, with body fat and metabolic syndrome (MS) in two independent samples of white European adult men. The 3813A/G and 4895A/G SNPs of CNR1 were genotyped in 930 participants to the Olivetti Prospective Heart Study (OPHS) in Italy and in 216 participants to the Wandsworth Heart & Stroke Study (WHSS) in England. Retrospective analysis was also performed on a OPHS sub-sample (n = 360) belonging to 1987 and 1994–1995 examinations. MS was diagnosed based on the International Diabetes Federation criteria. Anthropometric measures of body fat distribution and prevalence of MS were evaluated. In the OPHS study, the 3813G allele was associated with increased subscapular skinfold thickness (SS) (24.2 ± 9.1 mm vs 22.8 ± 7.7 mm, p = 0.031) and waist circumference (WC) (99.1 ± 8.8 cm vs 97.7 ± 8.8 cm, p = 0.05) and with higher risk of MS (O.R. 1.47, 95% C.I. 1.05 – 2.07; p = 0.024). No association was observed with 4895A/G variant. Haplotype analysis confirmed that the haplotype carrying the 3813G was associated with increased WC, SS and MS prevalence. Similar results were observed in the OPHS retrospective sub-sample and in the WHSS sample. In the latter, the 3813G was associated with increased WC (96.8 ± 11.3 vs 91.6 ± 10.4, p = 0.006) and with higher risk of MS (O.R. 2.39, 95% C.I. 1.14 – 4.99; p = 0.02). Genetic variants at CNR1 are associated with obesity-related phenotypes and susceptibility to MS in men, thus suggesting a candidacy for this gene in the process of fat accumulation.
The $-3826$ A > G polymorphism of the UCP1 gene is associated with higher serum fasting insulin levels and homa index in children

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Background: The $-3826$ A > G polymorphism of the UCP1 gene appears to be associated with obesity and metabolic syndrome in some studies. In this work we have analysed this polymorphism and its relationship with glucose and insulin fasting circulating levels in a study conducted with Spanish children and adolescents.

Method: 168 obese subjects and 227 with normal weight subjects (6 to 18 years-old) were recruited at hospital Pediatric departments and primary care centres in Navarra (North of Spain). Anthropometric measurements, glucose and insulin fasting serum levels were measured according to standard protocols and the HOMA index was calculated. The genotypes were determined by PCR and digestion with restriction enzymes (PCR-RFLP analysis).

Results: The frequency of the G allele for the $-3826$ A > G polymorphism was 0.23 and the genotypes distribution did not deviate from the Hardy-Weinberg predictions. The $-3826$ A > G polymorphism of the UCP1 gene appeared to be associated to insulin levels (regression coefficient $= +2.01, 95\% CI: +0.39$ to $+3.63; p = 0.015$) and with HOMA index (regression coefficient $= +0.51, 95\% CI: +0.12$ to $+0.91; p = 0.011$) after adjusting for age, gender, body mass index, obesity status and waist circumference.

Conclusion: Our results suggest that the $-3826$ A > G polymorphism of the UCP1 gene could be associated with a higher tendency to insulin resistance in our Spanish children and adolescents population.

Activity of PON1 is important determinant of these functions. The objectives of this study were to identify PON1 polymorphisms, and to determine both genetic and environmental factors association with PON1 activity. Paraoxonase and arylesterase activities were measured. Q192R and L55M PON1 polymorphisms were genotyped by PCR-RFLP in ninety Thai subjects. The results showed the increase of paraoxonase activity with drinking and decrease of this enzyme activity with age and smoking cigarette. There was linkage disequilibrium between Q192R and L55M PON 1 polymorphisms. Individuals with RR and LL genotypes exhibited significantly higher only paraoxonase activity (290.39 ± 8.89 and 230.91 ± 6.97 nmol/min/mL, respectively) than other genotypes (QQ = 81.37 ± 4.10 nmol/min/mL and LM = 131.78 ± 12.73 nmol/min/mL). Arylesterase activity did not affect by genetic variation. Multiple linear regression analysis showed significant predictors for paraoxonase activity (Q192R; $p = 0.001$, HDL-cholesterol; $p = 0.001$ and body weight; $p = 0.008$) for arylesterase activity (HDL-cholesterol; $p = 0.012$ and Apo-AI; $p = 0.045$). The data suggest the complexity of various factors that determine serum PON1 activity. Additional investigations of polymorphisms at promotor region, individual lifestyle, nutritional status and some drug treatment that influence PON1 activity as a risk factor for vascular disease or organophosphate toxicity are warranted.

Background: The Pro12Ala PPARG2 gene polymorphism has been associated with obesity and cardiovascular diseases, in which proinflammatory and prooxidative conditions may play a pivotal role. The aim of the current study was to investigate the effect of variants of this adipogenic transcription factor on anthropometrics and biomarkers of inflammation and oxidative stress in subjects with excessive body weight.

Methods: One hundred and sixty two middle age individuals (Body mass index: $33.2 \pm 5.3$ kg/m$^2$) were genotyped for the PPARG2 Pro12Ala polymorphism by PCR and digestion with restriction enzymes. Anthropometric measurements and circulating levels of interleukin-6 (IL-6), C-reactive protein (CRP) and malondialdehyde (MDA) were also analyzed.

Results: The genotype frequency distribution of the Pro12Ala gene polymorphism was consistent with Hardy-Weinberg expectations (ProPro: 80.2%, ProAla: 19.1%, AlaAla: 0.6%). No statistical differences were observed concerning anthropometric data according to the genetic variants ($p > 0.05$). However, markers related to the proinflammatory state, such as IL-6 (ProPro: $1.83 \pm 1.39$ pg/ml, Ala+: $1.24 \pm 0.39$ pg/ml; $p = 0.003$) and CRP (ProPro: $3.62 \pm 4.20$ ug/ml; Ala+: $1.83 \pm 1.05$ ug/ml; $p = 0.025$) were lower in 12Ala allele carriers as compared with homozygotes for the proline allele. Moreover,
carriers of the 12Ala allele presented lower plasma levels of MDA prooxidative marker (ProPro: 1.82 ± 0.71 uM; Ala+: 1.38 ± 0.33 uM; p = 0.001) than carriers of the ProPro genotype.

**Conclusion:** These results suggest that subjects with an excess in body weight presented different proinflammatory and prooxidative state depending on the PPARG2 Pro12Ala gene polymorphism, suggesting a higher risk of developing obesity-related cardiovascular disorders in those homozygotes for the proline allele.

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**P55 Early Nutrition and Programming**

**Child under nutrition in Sri Lanka – causal analysis**

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**Background:** Sri Lanka has a long history of impressive achievements in reducing maternal and child mortality rates. However, under nutrition has continued to persist as a major problem affecting children in Sri Lanka. The objective of this exercise was to determine possible risk factors of under nutrition based on the UNICEF conceptual model using secondary data.

**Methods:** Data collected through the Demographic and Health Survey (DHS) of 2000 which was nationally representative and the UNICEF survey on child welfare and health of 2003 conducted in 9 districts were used. The variables were categorized as immediate, underlying and basic causes of under nutrition to identify factors shown in the conceptual framework. Logistic regression analyses were performed using weight-for-age, height-for-age and weight-for-height as the dependent variables.

**Results:** In the DHS 2000, 30.5%, 15.1% and 15.5% of children under 5 were underweight, stunted and wasted, respectively. In the UNICEF 2003 survey, 36% of children were underweight, 18.2% stunted and 17.3% wasted. Low birth weight was the most significant predictor of underweight, stunting and wasting. Data of the UNICEF survey also showed that falling below the respective birth weight band was a significant predictor of underweight, stunting and wasting. Data of the UNICEF 2003 survey, 36% of children under 5 were underweight, stunted and wasted, respectively. In the UNICEF survey, 36% of children were underweight, 18.2% stunted and 17.3% wasted. Low birth weight was the most significant predictor of underweight, stunting and wasting. Data of the UNICEF survey also showed that falling below the respective birth weight band was a significant predictor of underweight, stunting and wasting.

**Recommendations:** Development of communication strategies to improve awareness on nutrition among mothers, and addressing the risk factors of under nutrition based on the UNICEF conceptual model using secondary data.

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**P56 Early Nutrition and Programming**

**Effect of sodium butyrate on growth, appetite and gastrointestinal tract development in piglet**

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Sodium butyrate had complex effects on bowel mucosa, but little is known on its effects on the small intestine (SI). The aim of this study was to measure the biological effects of an oral administration of Na-butyrate (3 g/kg dry matter intake) and to determine the period of feeding (before and/or after weaning) which was the most appropriated. Piglets (n = 32) were weaned at 28 d old and slaughtered 14 d later. Treatments were: 1- No Na-butyrate (Control) vs distribution: 2- after weaning 3- during sucking period (d4–d27) and 4- before and after weaning. Na-butyrate was administered orally during sucking period and then included in the diet. After slaughter, the entire gastrointestinal tract was removed for gross anatomy, morphometry and tissue sampling. Protein content and enzyme activities were measured in SI mucosa. Na-butyrate increased growth rate compared to control (240–270 vs 225 g/d) and stimulated appetite (336–360 vs 293 g/d) (P < 0.05), mainly due to administration before weaning (P < 0.01). The weight of the SI decreased (39 vs 47 g/kg body weight, P < 0.05) as well as protein content in SI mucosa. Intestinal enzyme activities were not modified or decreased. Crypt areas decreased in the jejunum but increased in the ileum. In conclusion, our results show that increase of performance is mainly due to oral administration of Na-butyrate during sucking period but cannot be explained by the more precocious development of the GIT. This effect seems to be similar to that of growth promotors (less consumption of nutrients by SI in favour of the other tissues of the whole body). Our results suggest application for butyrate as an alternative to antibiotics in animal nutrition and as a growth factor in human nutrition for the small birth weight baby.

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**P57 Early Nutrition and Programming**

**Influence of Intrauterine Undernutrition (IUGR) and catch-up growth on premature leptin surge and on cerebral response to leptin**

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The risk of developing chronic diseases in adulthood after an IUGR could be influenced by environmental factors acting during the pre and postnatal life. The brain represents one of the most responsive organ to stress. Changes in feeding behaviour and therefore susceptibility to develop a metabolic syndrome could result from disturbances in brain development during the early stages of life.

In order to study the effect of catch-up growth on brain development and food preference we studied IUGR rat pups at various post-
Nutrient restriction during early life induces permanent physiological adaptations in the new born that allow him to survive optimally in a poor nutrient environment but that are detrimental to health when nutrition is adequate or over-abundant. At the molecular level, these adaptations might be brought about by malnutrition-induced alterations on the epigenetic control of gene expression. As a first attempt to delineate the epigenetic changes induced by early malnutrition on the neuronal circuits regulating food intake, we analyzed the epigenetic status of Histone 3 (H3) and Histone 4 (H4) in several brain regions of 30 days old offspring from Spraguey-Dawley rats fed either a control (20%) or a low (8%) protein diet from the day of conception throughout gestation and lactation. At weaning, pups received a standard diet. At 30 days, their feeding behaviour was evaluated after the administration of D-fenfluramine (D-fen), an anorexigene compound that blocks the reuptake of 5-HT and stimulates its release. Male offspring from maternal protein restricted rats displayed significant decreased body weight that was already evident at birth and was accompanied by hyperphagia. The administration of D-fen (1.5–3.0 mg/kg) dose-dependently reduced 1 hour chow mash intake at the onset of the dark cycle in control rats but not in undernourished animals. At the highest dose tested (4.5 mg/Kg), D-fen produced a 78% inhibition of food intake in control animals and of 50% in undernourished rats. These observations indicate that the hyperphagia associated to perinatal undernutrition is at least partially related to a reduced regulatory function of serotonin on food intake.

**P60 Early Nutrition and Programming**

**Prevalence of obesity of school-age children in the Municipality of Vitia**

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**Introduction:** Obesity is a new global problem in the world. Obesity of children is one of a essential factor of their health. The aim of this paper is to evaluate the capability of Nutritional Assessment (NA) as anthropometric measurements to identify school-age children of Vitia who are obesity or high and very high nutrished.

**Methods:** In all the subjects NA is performed: weight and height. It has been examinate in 535 school-age children. Anthropometric methods based on the international biologic program have been employed.

**Results:** The research work has shown that the prevalence of obesity in the schoolchildren of the Vitia municipality is higher. 24% of them belong to the category of high and very high nutrition, which we see like a serious problem in the future. The difference of preva-
Obesity between country and town is not significant \( p > 0.05 \).

**Conclusion:** We are just in time to contribute in the preventive of obesity.

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**P61 Early Nutrition and Programming**

**The intestine: a new target for foetal programming**

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Foetal programming is now recognized as an important factor for adult health determinism. Protein restriction during pregnancy induces intrauterine growth retardation (IUGR) in animal models with deleterious impact on several organs in the offprings. We hypothesised that such a nutritional programming occurred in the intestine.

We induced IUGR in Sprague Dawley rats by isocaloric protein restriction (8% vs. 20% in the control diet) of pregnant dams. Lactating mothers and weaned rats were fed the control diet. Short Chain Fatty Acids (SCFA) concentrations in caecocolonic contents and mRNA expression of Mucin 2 (Muc2) and Trefoil Factor Family 3 (Tff3) in the proximal colon mucosa were determined during suckling period (Day 5, 12, 16) and after weaning (D22 and 40).

In both groups, luminal SCFA concentrations contents were affected by postnatal development with a significant \( p < 0.0001 \) increase after weaning. Considering the whole follow-up period, IUGR decreased significantly all SCFA (butyrate, propionate, minors) but not acetate concentration compared to normal intrauterine growth. These effects were particularly evident for propionate at D12 and D16 \( (p = 0.044 \) and \( p = 0.036 \)) and for butyrate at D40 \( (p = 0.032 \)). Muc2 and Tff3 expressions in colon significantly increased during postnatal development \( (p = 0.011 \text{ between D16 and D22} \text{ and } p = 0.002 \text{ between D22 and D40 respectively}) \) in the control group. But in IUGR rats these increases were impeded.

Despite normal feeding during postnatal development, protein restriction during pregnancy has a long term lasting impact on both microbiota metabolism and mucosal barrier function. These results suggest that intestine could be a foetal programming target, resulting from either epigenetic phenomena or lasting modulation of microbiota.

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**P62 Early Nutrition and Programming**

**Use of deuterium oxide dilution method to measure exclusive breast feeding in Africa**

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Measurement of breast-milk intake is fundamental for infant nutrition in developing countries because early introduction of weaning foods are among the main cause of child malnutrition. The conventional method for measuring breast-milk intake consists of weighing the baby before and after each feed and exclusive breastfeeding was usually estimated through a questionnaire to the mother. This is time-consuming, inaccurate and interferes with the mother’s normal activities. Breast milk and non-milk oral water intakes can be measured from the mother’s total body and infant water turnover rates after oral administration of 30 g deuterium oxide (a stable isotope) to the mother. One pre-dose and 6 post-doses saliva samples are collected from both the baby and the mother. Deuterium sample enrichments are then measured using a Fourier Transformed Infrared Spectrometer (FTIR). A two-compartment model is used to generate best-fit estimates for maternal and infant water fluxes. Flow is taken as unidirectional between mother and infant. The model predicts a mono-exponential decay curve of deuterium in the mother and a bi-exponential decay curve of deuterium in the baby. Calculations of breast milk output and non-milk water intakes are derived from baby water turnover. Paterns of breastfeeding is exclusive if non-milk water intakes is less than 50 ml/day. The deuterium dilution method using FTIR is a non-invasive, simple and safe method for measuring exclusive breastfeeding in free living subjects.

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**P63 Early Nutrition and Programming**

**Prevalence of low birth weight (LBW) in Senegal: relationships between LBW and animal food consumption in rural communities**

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The prevalence of low birth weight (<2.5 Kg) is high in Senegal. In 2000, 12% of the Senegalese newborns were of low birth weight, suggesting maternal malnutrition during gestation. Hence, we examined the relationship between low birth weight and maternal food consumption from animal sources (meat, poultry, fresh fish, dairy products and liver) during pregnancy in a cross-sectional study of 64 rural Senegalese women. Infant’s weights were measured at birth; their mother’s weight and height were measured 24 hours after delivery; and maternal dietary intakes were evaluated with a food frequency questionnaire.
Twenty two percent (22%) of babies had low birth weight (n = 14). Socio-economic status, weight and height were comparable between mothers with normal birth weight (n = 50) and those with low birth weight babies (n = 14). Frequency of animal food consumption was not different between the two groups but birth weight was associated with daily consumption of fresh fish (β = 167, p < 0.03) and consumption of poultry once a week (β = 188, p < 0.03) or more than once a week (β = 423, p < 0.02) when adjusted for mother’s height, parity, number of abortion, and socio-economic status. Moreover, birth weight was significantly increased with frequency consumption of fresh fish (p < 0.001) and poultry (p < 0.001).

The association between increased birth weight and higher consumption of fresh fish and poultry during pregnancy suggests that food consumption from animal sources may be an important factor for foetal growth in this rural community of Senegal.

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**P64 Elderly Nutrition**  
**A recommended food frequency, RFF, describing the overall diet quality is associated with dietary intake and socio-demographic characteristics in a sample of nonfrail older adults**

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**Introduction:** Indexes of overall diet quality are described in the literature as an alternative approach of using single nutrients to examine diet-disease relationships or to assess the diet of a population and population subgroups.

**Objectives:** To examine associations of dietary intake, and socio-demographic characteristics with an index of overall diet quality.

**Subjects:** A convenience sample of 444 nonfrail older adults in Vienna, Austria.

**Methods:** Diet was assessed by a 1-day estimated food record and a qualitative 28-item food-frequency questionnaire (FFQ). Data from FFQ was used to develop an index of overall diet quality, the Recommended Food Frequency (RFF).

**Results:** In linear multiple regression models, mean nutrient intakes of the sub-groups with higher scores of overall diet quality were closer to current nutrient-based dietary guidelines, e.g. lower intake of dietary fat (P for trend = 0.01), and higher intakes of dietary fibre (P for trend < 0.001), beta-carotene (P for trend < 0.05), and folate (P for trend < 0.01). The presented index of overall diet quality was further associated with several socio-demographic characteristics (e.g. age, gender, education).

**Conclusion:** Our findings show that the RFF as a measure of diet quality has the ability to discern subgroups of a population into low- or high-risk dietary behaviours. The method is relatively simple and inexpensive and could be used for monitoring dietary trends.

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**P66 Elderly Nutrition**  
**Changes over one year in body weight among community-dwelling older adults with and without Alzheimer dementia**

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**Introduction:** Unintentional weight loss is often associated with Alzheimer dementia (AD), and AD patients are at greater risk of weight loss and a worsening in their nutritional status as the disease progresses.

**Methods:** Thirty-six community-dwelling patients aged 65 + y, in early stages of AD, were recruited from memory clinics in Montréal.
with their caregivers, matched to cognitively-intact community-based controls (n = 58), and interviewed at four to five timepoints (T0–T4) over an 18 month period. We documented weight stability and other anthropometric measurements, appetite, dietary intakes, nutrition risk, and clinical, functional, biochemical and anthropometric parameters with nutritional relevance in patients and controls.

Results: At entry into the study, controls were heavier than patients (both sexes). Among males, mean body weight at T0 was 67.4 ± 14.1 kg and 76.5 ± 6.5 kg (patients and controls, respectively). In the female participants, mean weight was 59.4 ± 10.9 kg (patients) and 63.9 ± 9.3 kg (controls); over a one-year follow up period, body weight was significantly greater among female controls (p < 0.05). Weight loss among female AD patients was also greater than their control counterparts over the course of the study: they lost 2.6% of body weight compared to controls who added around 1% to their initial weight (p < 0.05). It is noteworthy that almost half of female AD patients lived alone.

Conclusions: Weight loss is a common predictor of morbidity and mortality in elderly adults. In a vulnerable population of older adults with AD, it is important to regularly monitor body weight and pay careful attention to dietary intakes in order to help these individuals maintain adequate nutrition status and remain in the community as long as possible.

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**P67 Elderly Nutrition**

**Characterize the nutritional profile (nutritional habits and status) and the impact of the nutritional intervention on the modification of cardiovascular risk factors in elderly members of a conviviality group**

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In the prevention and treatment of chronic degenerative diseases, among them being the cardiovascular ones, nutritional therapy is a procedure to be adopted in order to promote a change in alimentary habits and further life quality.

Method: This was characterized as a cross-sectional, experimental, comparative and inferential study. To characterize the profile and cardiovascular risk factors, all elderly members of the group were taken into account (100%, n = 37), and for the impact of individual nutritional intervention on cardiovascular risk factors, the results were compared between the control group (n = 15) and the intervention group (n = 22) in a 26-week period. The investigation was carried out using indicators concerning age, sex, socioeconomic, cultural, dietary, anthropometrical, and laboratory status and the results achieved with the Individual Nutritional Intervention (intervention group) and the Collective Educational Action for Successful Aging (control group).

Results: Qualitatively, alimentary intake was lower than the recommended one for the group of cereals, fruits, vegetables, milk and dairy products and higher for meats, eggs, oil, fats, sweets and sugars. Weight, abdominal circumference and BMI were above the references. Quantitatively, the intake of KCAL, CHO (%), protein per kg/weight, lipids (%) and cholesterol was shown to fit the recommendations and was above these for protein (%), Fe, P, vitamin A and B12. Calorie intake was below the recommended one. The markers of protein reserve fit the reference.

Conclusion: In the intervention group, better results were achieved for: increase in intake of fruits, vegetables, milk; reduction in intake of meats, eggs, oil, fats, sugars and sweets.

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**P68 Elderly Nutrition**

**Effect of bifidobacteria containing drink on infections and bowel function in the elderly**

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Constipation and infections are common factors influencing the quality of life in the elderly. The balance between beneficial and harmful bacteria in the gut plays an important role in the prevalence of many diseases, also other than those of the intestinal tract. The aim of this intervention was to study the effect of bifidobacteria containing drink on the infections and on the bowel function in the elderly.

Sixty-six elderly subjects from two hospitals participated in the study. Subjects were randomized into intervention (82.8 ± 10 years) and placebo groups (82.0 ± 9 years). The subjects drank either an oat drink containing bifidobacteria (intervention group) or a placebo oat drink (placebo group) twice a day for six months. The compliance of the product, the bowel function, the quality of the feces and the prevalence of the infections were assessed.

The compliance of the product was excellent: at the first part of the study (weeks 1–13) 97% of the subjects and at the second part of the study (weeks 14–26) 93% drank at least half of the amount of product given. Bowel function, prevalence of constipation and the quality of feces did not differ between the groups during the study. Both groups experienced more diarrhea during the first part of the study. The use of laxatives did not differ between the groups. Prevalence of infections and the number of subjects with infections did not differ between the groups. However, intervention group had more infections during the first part of the study compared with the second part of the study. There were no differences in the duration of the infections between the groups.

The bifidobacteria containing drink did not have a significant effect on the bowel function or on prevention of infections in the elderly subjects.
Few data are available regarding dietary habits of the elderly, in particular their fatty acid consumption whereas these are major risk or protective factors of several age-related diseases. The aim of this study was to characterize the dietary intake of a French elderly population in terms of macronutrients and fatty acids based on their socio-demographic characteristics. The study population consisted of 1786 subjects (range 67.7–94.9 years, 37% of men) from Bordeaux (France), included in the Three-City cohort. Dietary assessment was performed by a 24 h recall allowing the estimation of energy intake (EI), protein, carbohydrate, total fat, saturated, mono- (MUFA) and poly- (PUFA) unsaturated fatty acids intakes. Socio-demographic characteristics (age, sex, marital status, educational level and income), practice of sports and body mass index were registered. Total EI was significantly lower in women and decreased with increased age. Higher EI was associated with higher income. Total EI was not associated with educational level. Most of the population (73%) displayed an EI lower than 30 kcal/kg/d. Mean consumption of macronutrients in percent of EI was higher in women than in men, except for alcohol. Intake of proteins, mainly of animal origins, decreased as age increased. Compared to the French recommended allowances, excess saturated fat intake (43% of total fat), associated with a relative deficit in MUFA consumption (36% of total fat) was observed. The mean of n-6 PUFA intake and the mean linoleic acid/alpha-linolenic acid ratio decreased with higher educational level. Our results suggest that female gender, older age, low income and education are risk factors of poor nutritional status in older persons.

**P70 Elderly Nutrition**

**Impact on nutritional status of elderly by supplementation with a formulated dietetic product**

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A prospective case study was performed with 14 elderly individuals aged between 68 and 95, four males and ten females, characterized as malnourished or at risk of malnutrition. The 14 elderly subjects were selected from a total of 90 people applying the Mini Nutritional Assessment scale (MAN). The purpose of the study was to test the efficacy of the dietetic product on the nutritional status of the study group. The formulated product consisted of protein (whey protein isolate, combined with collagen hydrolysate at a 50:50% ratio), carbohydrate (glucose, maltodextrin), soluble fiber and prebiotics (inulin, fructooligosaccharides), vitamins and essential minerals. The complement was offered twice a day, breakfast and bed-time. Dietary records of three days was used at the beginning and at the end of the trial and the data was compared with the DRI’s. The anthropometric parameters were body weight (W), height (H), body mass index (BMI), calf circumference (CC), corrected arm muscle area (CAMA), bioelectrical impedance analysis (BIA) and fat free mass (FFM). Biochemical parameters were total proteins and albumin, total cholesterol, LDL-c, HDL-c, triglycerides, vitamin B12, folic acid, calcium, magnesium and zinc. Supplementation did not promote significant statistical changes in the anthropometric parameters. Although not statistically significant there was an average 1.88 kg body weight gain during trial. The most significant biochemical response was in blood proteins, deficient at the beginning raised to normal with 40% increase (total) and albumin 45%. Although not deficient at the beginning there was increase in folic acid (51%), magnesium (13%) and total cholesterol (41%) remained within normality.

**P71 Elderly Nutrition**

**Malnutrition prevalence and malnutrition risk in no institutionalized elderly placed in São Paulo’s city, SABE research**

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**Introduction:** The variation resultant of aging have directly influences in the elderly nutritional status. Meantime, the malnutrition is frequently covered-up this age group, therefore, no diagnosing. Researches that measure the predominance of malnutrition in elderly are necessary once it allows the treatment precocious and focus the programs and the public policies destined to the health promotion & diseases prevention of this age group.

**Objective:** Verify the malnutrition frequency and the risks of malnutrition in no institutionalized elderly. Casuistry: Elderly (over than 60 years), of both genders, situated in the urban area of São Paulo’s City (Brazil), who had participated of the Survey on Aging, Health, Wellbeing (SABE), 2000, organized for Pan America Health Organization (PAHO/WHO).

**Method:** The malnutrition was detected from the Nutritional® Mini-Assessment (MAN), was applied the ordered liner and ordered logistic regression test.

**Results:** The sample was of 1788 persons that had represented the population of 699.392 aged ones. Of these, 2.2% (n = 15.600) had presented malnutrition and 23.1% (n = 161.511) with malnutrition risk. It had considerable increase in this prevalence (p < 0.05) in older aged, achieving the percent level of 6,6% in women and 3.9% in men over than 80 years. It did not have noteworthy association between malnutrition and gender (p > 0.05).
Conclusion: The malnutrition prevalence was low, according to the research expectations to no institutionalized elderly (2,2%). But, when associate on the prevalence of malnutrition risk (23,1%), observes that 25% (n = 177,111) of survey population need some type of special nutritional attention. The results show also that the age is a risk factor to malnutrition.

P72 Elderly Nutrition
Nutritional status and bone mass density in postmenopausal women
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Background and Aims: Osteoporosis is a chronic degenerative disorder that is characterized with reductions in bone mineral density. The nutritional status plays an important role in development and maintenance of bone density and prevention or treatment of osteoporosis. In this study, the nutritional status, frequency of dairy products consumption and relationship between dietary calcium and bone mineral density (BMD) in postmenopausal women were carried out.

Materials and Methods: This cross-sectional descriptive-analytical study was carried out on 46 postmenopausal women in Tabriz (age 58 ± 0.81). The subjects were divided to three groups: normal, osteopenic and osteoporotic. For each subject, 24-hours food recall (2 regular days and a holiday) and dairy products Frequency questionnaires were completed. Bone mineral density was measured at lumbar spine (LS) and femur neck (FN) with using DEXA system.

Results: The results of BMD measurement of 6 women were normal, 22 were osteopenic and 18 osteoporotic. The energy and macronutrients intake in all groups were adequate but magnesium intake was lower than the recommended level in all groups. There was a significant difference between normal and osteopenic groups in calcium intake (p = 0.02). Frequency of Dairy products consumption between normal and osteopenic groups showed a significant difference (p = 0.01). There was a strong relationship between dietary calcium and Bone Mineral Density (p = 0.0001, r = 0.572).

Conclusion: The calcium and frequency of dairy products consumption in postmenopausal women was lower than the recommended level, thus nutritional education about increasing dietary calcium or supplements is recommended.

P73 Elderly Nutrition
Nutritional status and chronic disease risks of older adults attending Grand Parents Clubs in Venezuela (Estado Miranda)
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In developing countries the number of persons aged more than 65 years during 2000–2030 is projected to almost triple. Accordingly, here we studied a group of retired, low income individuals who lived at home but spent most of the day in institutions (Grand Parent Clubs) supervised by the local government (Estado Miranda) where they sustain recreational, educative and sport activities. The study included 122 subjects (34 males and 88 females) with ages that varied between 60 and 90 years and BMI ranging between 16.2–32.9 in the males and 16.5–38.1 in the females. Comparing with BMI cut points, 51.6% were normal, 40.2% were overweight and 8.2% were underweight. Considering the whole population, 38% were hypertensive and high levels of cholesterol, LDL cholesterol and triglycerides were found in 22%, 24% and 13% respectively. Low levels of HDL were present in the majority (79%) of the subjects and high ratios Chol/HDL (45%) and LDL/HDL (37%) were frequently found, suggesting cardiovascular disease risks. An evaluation of the nutritional status of these individuals showed that more than half of them had hipoalbuminemia and 29% and 64% had low serum vitamin C and vitamin E respectively. Also, low serum levels of Ca, Mg, Cu and Zn were detected in more than half of the subjects. The study shows that in this group of older adults, an important fraction had risk factors for developing cardiovascular disease combined with indices of malnutrition. Since both conditions are associated with poor health, we conclude that an institutional supervision of risk factors for chronic disease together with proper nutritional practices could be of great benefit for the prospective health of the older adults joining the Grand Parents Clubs studied here.

P74 Elderly Nutrition
Physical strength and vitamin B12 in relation to cognitive score in Spanish institutionalized elderly
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Introduction: In the elderly there is a high prevalence of dementia often accompanied by reduced physical activity and low vitamin B12 levels. Various animal and human studies provide evidence for
the potential of physical exercise in promoting cognitive health in later life.

Aim: Assessment of the relation between physical strength, vitamin B12 status and mental health in Spanish institutionalized elderly.

Methods: In 78 institutionalized elderly from Madrid (56 women, mean age 83 ± 6 years) vitamin B12 status was assessed by serum cobalamin (SCbl) and Holo-Transcobalamin (HTC) status. Physical fitness was tested by hand grip and arm strength, chair stands, and standing balance, cognitive function with the Mini Mental State Examination (MMSE). For statistics, Spearman's rank correlation coefficient (p), and Kruskal-Wallis-H test were used, significance was set at p < 0.05.

Results: Nineteen (24.4%) were cognitively healthy (MMSE score ≥ 24), 16 (20.5%) showed a light (MMSE score 21–23), 27 (34.6%) a moderate (MMSE score 11–20) and 13 (16.7%) a severe dementia (MMSE score ≤ 10). MMSE scores were positively correlated with right and left hand grip, chair stands and arm strength (all p < 0.05). Between the MMSE groups, there were significant differences for right hand grip, left hand grip and arm strength (p < 0.05). SCbl values in the ‘no dementia’ group were higher (521 ± 469 pmol/l) than in the ‘severe dementia’ group (388 ± 202 pmol/l), but without statistical significance. The same trend was observed with HTC (59.3 ± 50.8 vs 41.2 ± 21.7 pmol/l).

Conclusion: Physical strength is associated with cognitive function. The observed differences between vitamin B12 levels in the four cognitive function groups however were without statistical significance.

P75 Elderly Nutrition
Sensitivity of the variables of Mini Nutritional Assessment (MNA) in the determination of the risk of malnutrition or malnutrition in hospitalized elderly

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Introduction: The Mini Nutritional Assessment (MNA) can previously evaluate the risk of malnutrition or malnutrition before clinical changes, being considered an essential method in the Geriatric Evaluation Global.

Objective: To identify the most sensitive questions of MNA for determination of nutritional risk of malnutrition or malnutrition in hospitalized elderly.

Methods: Transversal study with 135 aged, both sex, interned in the infirmary of the unit of Geriatrics of the Clinics Hospital of Sao Paulo – Brazil. The MNA, with 18 questions was utilized, including: anthropometric, global, dietary and subjective evaluation. Each one of these questions presents punctuations, being that score within 17 and 23,5 indicates malnutrition risk and <17, malnutrition. It was used the multiple analysis and Minitab program for analysis statistics.

Results: The most sensitive variables in sequence had been: the loss of weight in the last 3 months (70.37%); presence of psychologi-
P77 Elderly Nutrition

Variables predicting nutritional risk of the elderly

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Introduction: Malnutrition is a common problem among elderly population, but it is under recognized and under treated. Poor nutritional status increases hospital admissions, decreases quality of life and lifespan.

Objectives: To assess nutritional status of elderly age of 75+ and identify the risk factors.

Methods: The GeMSGCE Study (Geriatric Multidisciplinary Strategy for the Good Care of the Elderly) is a population-based health intervention study including the evaluation of nutritional status. A random sample of 1,000 persons was drawn from the total population of the city of Kuopio, eastern Finland. Trained nurses carried out a structured clinical examination and interview. Nutritional evaluation (MNA, mini nutritional assessment) was done to a total of 643 elderly people.

Results: According to MNA 33% had increased nutritional risk and 4% were malnourished. But only 4% (n = 28) was reported to be under weight according to BMI. Risk factors for malnutrition (MNA <23) were identified by use of a multivariate logistic regression analysis. Result showed that amount of physical exercise (OR = 3.6, 95% CI 2.0–6.4), self-experience of health status (OR = 4.4, 95% CI 1.1–17.0), supported dwelling (OR = 2.9, 95% CI 1.2–7.0), dementia (OR = 2.6, 95% CI 1.1–5.8) and low BMI (<20 kg/m²) (OR = 10.6, 95% CI 2.5–43.7) were significant risk factors for malnutrition, but age, gender, education and economical situation were not related to malnutrition.

Conclusion: One third of the elderly were in nutritional risk (MNA). Health care professionals should pay more attention to nutritional status of the elderly who are physical inactive, have demented symptoms or low body weight.

P78 Elderly Nutrition

Whole-grain intake of British elderly people

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Introduction: Whole-grain food consumption has been associated with a reduced risk of diet-related chronic diseases. Quantifying absolute whole-grain (WG) intake will provide a more robust basis for assessing these epidemiological associations. Hitherto, there have been no published reports of typical values and variation among British elderly people.

Objective: To estimate WG intake and sources among free-living elderly people living in Great Britain.

Subjects and Methods: 1,189 adults aged 65 years and over (52% men) from the 1994–5 National Diet and Nutrition Survey. By assigning WG contents to all consumption occurrences of 114 foods with ≥10% WG content, WG intake was quantified from 4-d weighed dietary records, and examined by sex, age, smoking, social class, region and season.

Results: 29% of participants had no WG intake; 78% had <3 16-g amounts per day. Overall, median WG intake was 18 (IQR 0–43) g/d, with no significant variation by sex, age, region or season. However, WG intake was higher among non-smokers than smokers (19 v. 7 g/d) and where the head of household previously had a non-manual versus manual occupation (25 v. 14 g/d) (each P <0.001). Main sources of WG intake were breakfast cereals (43%) and bread (44%, 39% from wholemeal bread). Biscuits provided a further 9% of WG intake. Those aged ≥85 years derived substantially more of their WG intake from breakfast cereals than their younger counterparts (49% v. 42%), mainly owing to higher consumption of porridge – particularly among men. For those living in Scotland, porridge also contributed more to WG intake.

Conclusion: With almost one-third of participants having no WG intake and over three-quarters failing to achieve the amount recommended in the USA, WG intake of British elderly people is low.

P79 Food Databases, Dietary Intakes

Qualitative assessment of menu preparations in a hospital food and nutrition unit – QAMP method

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The nutritionist who works in Food and Nutrition Unit (UAN), weather for healthy or ill communities, needs tools to plan a menu. For a good menu planning, it must be considered important aspects such as color combinations, cocking techniques, sensorial, and others. This study shows the Qualitative Assessment of Menu Preparations – QAMP methodology, which allows to assess the quality of a menu composition according to cocking techniques, colors, repetitions, fruits and vegetables offering, and also determining sulfur concentrations on food. In this study, 31 days of Hospital Menu Preparations had been evaluated in a Nutrition Unit. The results showed that rich foods in fat were offer in 68% of days, and in 100% of the days cooked foods had been presented in natura. The raw salads appear in 87% of the days. The mean menu presented high amount of calories, with 64.5% of fat food. And, in 54.8% of the menus had been found preparations with equal colors and 16.1% in repetitions of preparations. The result of the application of this method offers a global view that opens the possibility to assess in a qualitative way the details before the final process and the final presentation to the patient.

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P80 Food Databases, Dietary Intakes

A method for sampling and study of adipose tissue fatty acid composition in man

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Introduction: The fatty acid composition of human adipose tissue is a useful biomarker of the long term average of dietary fat. The present report describes a simple and risk-free method for the obtaining of small samples of buttock fat for determination of fatty acids composition.

Methods: Aspiration was performed with a 20 ml syringe and 19 G needle. Adipose tissue samples were obtained from 67 healthy subjects aged 32–70. Adipose tissue fatty acids were determined by a temperature programmed gas chromatography method.

Results: In this way, a typical pattern of adipose fatty acid composition in healthy adults has been established. The procedure caused no more anxiety or discomfort than a routine venipuncture.

Conclusion: This method for sampling and determination of fatty acids composition is easy and rapid, and therefore allows application in epidemiological research on the metabolic and nutritional importance of fatty acids.

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P81 Food Databases, Dietary Intakes

A new comprehensive food composition table for dietary polyphenols

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Polyphenols are natural antioxidants present in plant foods. They may exert protective health effects and prevent cardiovascular diseases or cancers. Food composition tables for polyphenols are still incomplete and largely focused on a limited number of flavonoid aglycones. Complete tables are needed by epidemiologists, and the agricultural and food industry. Content values for several hundreds of polyphenols in various food sources are scattered today in over 1,000 literature sources. These values vary greatly according to variety, environment, cultivation and processing. By means of aggregation of a large number of samples and literature sources, representative content values are provided.

We undertook the construction of a comprehensive database gathering all polyphenol content values so far published in peer-reviewed journals, and of a composition table for the main foods and beverages. Each content value is inserted in a Microsoft Access® database, together with the reference of the publication, a description of the food, the compound, and the analytical method used for its determination. Content values are aggregated separately for the different analytical methods. The composition table includes values for polyphenol aglycones, as well as glycoside and ester forms.

The database and composition table is now completed for fruits, vegetables, tea, wine and cereals. Over twenty eight thousand values for 355 compounds collected from 390 publications have been aggregated. Information on polyphenol contents is shown per food group in tables, graphs and reports. The work should be completed by the end of 2007 and freely accessible through a user-friendly interface.

P82 Food Databases, Dietary Intakes

A web-based nutrient databank integrating multiple food databases

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Chemical composition data of foods and nutrients are the fundamental building blocks for nutrition research, food processing, medical treatment, and health policy development. Due to wide variety of foods, constant introduction of new foods, and extensive import and export of foods, it is difficult for any single agency or institution to build a nutrient databank with correct and current food composition data world-wide. With the supports of emerging information technologies, we propose a framework to aggregate food composition data from different sources, and implement a prototype to demonstrate the applications of the database. We design, implement and maintain a global open nutrition database, called NutriBank, which integrates several public national nutrient databases or tables into an open nutrition database system, and supports a Web interface for users to register new data or maintain old data. A friendly bi-lingual user interface is also supported to access and utilize the advanced functionalities of the system, including browsing, advanced searching, similarity searching and comparing of foods or food groups. During the development of the system, we solve issues of interoperability, unit normalization, cross-referencing. We also develop several computer algorithms to automatically find similar foods and cluster food groups accurately. Based on these results, we build an infrastructure consisting of a suite of applications software and utility libraries for research and applications to assess and plan diets for dietary assessment and dietary planning. We found that a Web-based nutrient databank is very convenient for sharing of food composition data and flexible for development of new value-added applications.
P83 Food Databases, Dietary Intakes

Adherence to a Mediterranean diet – experience of middle eastern migrants to the UK

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Introduction: The diet typical of Mediterranean countries has been identified as protective against the development of cardiovascular disease, certain cancers and other conditions. However, it is known that when people migrate from country to country they adopt certain elements of the host country’s diet habits.

Purpose: To evaluate the extent to which migrants from Arab League countries to the UK have maintained their Mediterranean-style dietary habits.

Methods: A food frequency questionnaire developed for use with Middle Eastern diets (Dehghan et al, 2005) was used to gather information from 50 recent migrants to the UK from Middle Eastern countries. Participants were recruited using snowball technique and were asked to record their current food habits. Questionnaires were evaluated using a food composition database compiled for this study.

Results: The surveyed population showed a partial adherence to the Mediterranean diet. Consumption of fruits, pulses and meat was similar to that reported in studies of diets in a number of Middle Eastern countries. Reported vegetable consumption was much lower than reported for Middle Eastern countries but higher than that typical of the UK population. Respondents reported a number of gender differences in food habits with men recording more frequent consumption of dairy and meat items. Those who had been in the UK for longer periods showed higher energy consumption than recent migrants.

Conclusions: It is apparent that the group studied is changing its diet habits following migration to the UK. However, the main elements of the Mediterranean diet are maintained. Reduced vegetable consumption is probably explained by the substantially higher prices in the UK. The study continues to increase sample size.

P84 Food Databases, Dietary Intakes

Advantages of taking photograph in the 3-day dietary record

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Purpose: The 3-day dietary record with photograph (Photo) is applied in the nutritional survey of the National Institute for Longevity Science-Longitudinal Study of Aging (NILS-LSA). The subjects are asked to take photographs before and after meal while 3-day dietary record (3DR). Well-trained dietitians estimate kinds and amounts of food using 3DR, and photograph, if necessary. The aim of this study is to clarify the advantages of taking photograph to estimate real kinds and amounts of food in the 3DR.

Method: The subjects were 63 men and 37 women, aged 40–79 years, who participated in the NILS-LSA. Gross number and kinds of food, weighed or reported only portion size in the 3DR by the subjects were calculated. Then, the dietitians used photograph to find omitted food, and to estimate the real kinds and amounts of food.

Result: During three days, the subjects took 19 pictures. Among the final number of food in Photo (161.5), 49% were weighed (6% were corrected by photograph), 23% were reported only portion size (3% corrected), 8% was reported only food or dish name (5% corrected) by the subjects. Omitted food by the subjects was 21% but added using 3DR (7%) or photograph information (14%) by the dietitians. In vegetables and seasonings, 20% of food count was omitted in the 3DR 10% in beverages, 8% in cereals, 6% in fish. There were statistical differences in cereals, confectioneries, beverages, energy, carbohydrate, and vitamin C between 3DR and Photo. Eight percent of salt in the Photo was derived from omitted food in the 3DR and 6% in some nutrients.

Conclusion: Photograph may be useful to collect or improve 3DR information, especially to estimate intake of vegetables, and seasonings, which were relatively often omitted by the subjects.

P85 Food Databases, Dietary Intakes

Beverages consumption in different Belgian populations

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Objective: To monitor beverages consumption in preschool children (2.5–6.5 y), adolescents (13–18 y) and adult women (18–39 y) and to compare with recommendations.

Methods: Different dietary assessment methodologies were used. In preschool children, parents were asked to collect a 3-day structured estimated dietary record (EDR). In adolescents, a 7-day EDR method was used to quantify food intake. The women completed a 2-day EDR. The Belgian recommended fluid intake (without milk) is 1000 ml for preschool children and 1,500 ml for adolescents and adults. For milk (products) the recommended intakes are respectively 500 ml and 450–600 ml.

Results: The total median consumption of all non-alcoholic beverages is respectively 959 ml in preschool children, 1,200 ml in adolescents and 1,500 ml in women. The median consumption of non-alcoholic beverages without milk (products) is 550 ml in preschool children, 1,011 ml in adolescents and 1328 ml in women. The median intake of milk (products) is respectively 350 ml, 133 ml and 90 ml for preschool children, adolescents and women. The median water consumption is 180 ml in preschool children, 423 ml in adolescents and 575 ml in women. Almost 10% of the preschool children, 5% of the adolescents and 6% of the women never drink water. Almost 60% of the women, 64% of the preschool children and more than 90% of the adolescents consume softdrinks. None of the preschool children, only 12.6% of the adolescents and over 40% of the women reached the age-specific fluid recommendation.
**Conclusion:** In general, fluid intake is too low in all populations; especially the water intake is worrisome. Health implications of low fluid intakes in these populations should be further investigated and health promotion campaigns should take this issue into account.

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**P86 Food Databases, Dietary Intakes**

**Comparison of 3 different nutrient databases**

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Food composition tables are absolutely basic tools in the field of nutrition and health. In Croatia beside the Croatian food composition tables (CFCT) which are poor with nutrients information (only 34 nutrients are presented for 530 raw food items) and the last issue date from 1990, foreign food composition databases are in use to. The aim of this study was to evaluate the comparability of nutrient content of 122 all-day meals with 3 different databases. All-day meals were takeover from the elderly nursing home in Croatia and they were analyzed using the CFCT, USDA National Nutrient Database for Standard Reference and Danish Food Composition Databank (DFCD).

Estimates for 23 nutrients were compared (energy, macronutrient, water, 5 vitamins and 8 minerals). The differences between nutrient values obtained from each of the 3 databases were calculated. These differences were calculated for each menu, and then averaged across the 122 all-day meals for each of the 23 nutrients. Pearson's correlation coefficient was calculated to measure the associations between CFCT and USDA, and between CFCT and DFCD for all investigated nutrients. In both cases correlation coefficients were high (0.28–0.99) for 20 of the 23 nutrients examined.

Our results indicate that for a dominant part of the examined nutrients CFCT is comparable with USDA or DFCD. Therefore these foreign food databases could be used for nutrients intake evaluation in Croatia for the raw and fresh food commonly available at Croatian market including unprocessed items (e.g. rice, milk, meat poultry, fish, fruit, vegetable) and processed food (e.g. pudding, jam, tomato sauce, compote, meat loaf).

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**P87 Food Databases, Dietary Intakes**

**Comparison of dietary intake between normal-weight and overweight or obese adolescents**

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**Purpose:** To investigate the prevalence of overweight and obesity in high school adolescent girls in Tabriz, Northwest of Iran and to determine possible associations with energy and nutrient intakes.

**Methods:** A representative sample of adolescents was drawn from the high school of Tabriz, one of the large cities located in the north-west of IRAN. The population selected (232 adolescents aged 14–18 years), was divided into two groups: normal-weight subjects with a body mass index (BMI) less than 85th percentile and overweight or obese subjects with a body mass index equal or more than 85th percentile. Weight and height were measured and body mass index was calculated. Two days food record and one day 24-hour recall were completed.

**Results:** Overweight girls had an apparently lower energy intake (1721.7 ± 492.2 vs.1957.0 ± 554.5, P = 0.01), carbohydrate (260.4 ± 80.1 vs. 305.5 ± 90.0, P = 0.01) and total fat intake (55.6 ± 21.5 vs. 57.7 ± 24.0, P = 0.03) than their normal-weight counterparts, but they tended to underreport more often. Overweight girls derived a greater percentage of their energy from fat (29% vs. 26%) and less from carbohydrate (59% vs. 61%) than their normal-weight counterparts. Carbohydrate and total fat intake decreased with body mass index (P = 0.001).

**Conclusion:** There is a high prevalence of overweight and obesity in the adolescent population studied (13.8%). The study shows an association between overweight and obesity and nutrient intake.

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**P88 Food Databases, Dietary Intakes**

**Comparison of food consumption pattern of east Azerbaijan State with mean consumption in Iran**

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**Introduction:** Attention to foods problems and nutritional value of food pattern is important in food policy. So survey of food consumption pattern has a key role in assessment of diet sufficiency.

**Objective:** Comparison of food consumption pattern of East Azerbaijan States (E.A.S) with Mean Consumption in Iran.
Methods: Study design was observational-cross sectional. Samples collected with systematic cluster method. Data of household food consumption pattern collected with 24 hour food recall questionnaire and weigh foods standard methods for 3 continuous days. To minimize of season effect, survey performed in 4 seasons. Requirement estimation calculated on base of international recommendations and pattern nutrient value calculated with modified food composition table for Iran. Data were analyzed by MACCESS, MESXEL and SPSS (version 11.5) software.

Results: Compared with the whole Iran, food group portion/weight of food basket of bread and cereal groups 49%, legumes, vegetables, fat and sugars 6–10% were more and fruit, diary products, meat and egg groups 6–13% were lower. In E.A.S; and portion from food basket of Bread was more and rice was lower. E.A.S Percent of nutrient intake/requirement of energy and protein 6–7%, vitamin A57%, vitamin C 32.5%, vitamin B2 and calcium 2–4% and iron 10.5% were more than the whole Iran; also Percents of insecure household for vitamin A, vitamin C and iron 12–19% and energy, protein, calcium and vitamin B2 2–7% were more than mean of the whole Iran.

Conclusion: Findings suggest that E.A.S has better nutritional status than the whole Iran. Distribution of food insecure households for energy and protein and all micronutrients were lower than the whole Iran. More percents of households in E.A.S access to key nutrients more than their needs.

P90 Food Databases, Dietary Intakes

**Determination of water soluble and fat soluble vitamins content of 32 dishes in Kuwait**

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Due to the increased interest in defining the roles of nutrients in the etiology of chronic diseases, knowledge of dietary nutrient content intake is needed. The objective of this study is to determine the water soluble and fat soluble vitamins content of 32 dishes. The content of 12 vitamins were investigated out of which 3 were fat soluble (vitamin A, E and D) while the water soluble vitamins were vitamin C, Thiamin B1, Riboflavin B2, Pyridoxine (B6), Niacin, Pantothenic acid, Biotin, Vitamin B12 and Folic acid. The method used in this study was according to AOAC method. For Vitamin C, the highest levels detected were mostly salads dishes with ranges of 16–21.88 mg/100g edible portion. For the rest of water soluble vitamins the ranges were (0.02–0.56), (0.3–0.37), (0.34–0.47), (0.8–5.47), (0.09–0.71), (0.001–0.1), (traces – 1.93), (traces – 0.08) mg/100g edible portion for Thiamin B1, Riboflavin B2, Pyridoxine B6, Niacin, Pantothenic acid, Biotin, Vitamin B12 and Folic acid respectively. For the fat soluble vitamin, vitamin A ranged from traces to 428 RE/100g edible portion as opposed to 174.74 IU/100 g. Vitamin E content in all dishes studied was low and ranged from traces to 4.53 IU/100g. The variable contents of different dishes depend mainly on the ingredients of the composite dishes, method of cooking and the method of handling and cutting of the ingredients.

P91 Food Databases, Dietary Intakes

**Developments in amino acid pattern of the household diet in Poland**

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Introduction and Purpose of the Study: There were significant changes in the food consumption in Poland during the last a dozen years or so which affected significantly energy and nutrient content of the diet including proteins.
Material and Methods: Results of the household budget surveys showing household food consumption including all protein sources and covering two selected years, i.e. 1989 and 2004 were used. Food quantities were converted into amounts of the proteins and selected amino acids on the basis of the data derived from the national food composition tables and the weights developed at the National Food and Nutrition Institute to routinely convert the household food data into energy and nutrients.

Results: An average total protein content in the household diet was 68g/person/day in 2004 and was 13% lower in relation to 1989. Animal and vegetable protein amounts declined by 11% and 15%, respectively. Lysine content was lower by 13% while that of proline by 15%. The reductions in the content of methionine, cysteine and threonine were within similar ranges.

Comparison of the amino acid pattern of the household diet in the two mentioned years with a reference value (whole egg protein, FAO stand.) showed no changes. The chemical score (CS) evaluated against whole egg protein as a reference value was 68.8 in 2004 and 68.6 in 1989. Methionine and cysteine were the limiting amino acids. Similar evaluation taking FAO standard into consideration showed 100 in both years and absence of the limiting amino acids.

Conclusions: Reductions in the proteins content in the household diet in Poland resulting from the developments in the food consumption during the last a dozen years or so didn’t affect the protein quality evaluated with the use of the reference values.

Methods: Prospective longitudinal study including 345 women 20 to 45 years of age during 9 months of postpartum follow-up. Intra-gestational food intake was assessed at 17 days postpartum, using a food frequency questionnaire. Mixed-results longitudinal linear regression models were developed.

Results: During pregnancy, black and brown women showed higher energy and carbohydrate intake than whites (p = 0.019 and p = 0.009, respectively). No significant differences were detected according to skin color in relation to protein, lipid, saturated fatty acid, cholesterol, or calcium intake. Monthly reduction in postpartum weight retention was 0.17kg in white women (p = 0.002), 0.18 kg in brown women (p = 0.000), and 0.05 kg for black women (p = 0.561). Energy and carbohydrate intake was a predictor of postpartum weight retention in brown women.

Conclusions: Diet during pregnancy was a determinant of postpartum weight retention in brown women. Prenatal nutritional care should be initiated as early as possible and is a key measure to prevent postpartum weight retention and thus maternal obesity.
Fish consumption among young overweight European adults and compliance to varying seafood content in four weight loss intervention diets

Introduction: Fish is considered an important part of a healthy diet and is frequently recommended at least twice a week as main course.

Objective: To study frequency of fish consumption among young overweight European adults and their compliance to varying seafood consumption in four weight loss intervention diets.

Methods: Subjects, 20–40-year-old with BMI = 27.5–32.5 kg/m², in Iceland, Spain and Ireland (N = 324) were recruited through advertisement after meeting inclusion criteria and their seafood intake was carefully evaluated; 85% participated. The subjects were randomly assigned into four groups and were advised energy restricted diets for 8 weeks, including no seafood (control), cod, salmon, or fish oil. Validated food frequency questionnaire was used to evaluate consumption of seafood at baseline, midpoint and endpoint. N-3 fatty acids in blood erythrocytes were measured as an indicator of compliance.

Results: At baseline 34% of the participants reported eating fish at least twice a week as main course. During the intervention six participants reported that they did not finish their fish portions, 15% of the participants consumed fish additional to the study protocol in weeks 1–4 and 23% in weeks 5–8 (p = 0.010). The extra consumption was small (<2 fish meals a month). Changes in w-3 fatty acid composition confirmed good compliance, with increases in the salmon (p < 0.001) and fish oil (p < 0.001) groups, no change in the cod group (p = 0.105) and a decrease in the control group (p < 0.001).

Conclusion: Frequency of fish consumption among 66% of this group of young overweight European adults is lower than currently recommended. Compliance to varying seafood consumption, during the eight weeks of energy restricted intervention, was good, but decreased with time.

Fish factors affecting diet patterns in students of metropolitan autonomous university

P95 Food Databases, Dietary Intakes

Dietary assessment is essential for research reporting nutritional adequacy in a given population. Data can be used to determine the prevalence of inadequate or excessive intakes of food. Reliable estimates of habitual nutrient consumption are also essential to correct derivation of dietary patterns, associating intakes with status indices in a longitudinal study on 2006, for identifying the impact of dietary components on health and human welfare. It is important to minimise the impact of a daily variation of estimated habitual food and nutrient intakes mainly when a few days dietary records are available. The aim of this study was to assess the daily variation in food and nutrient intake on a sample of students at Metropolitan Autonomous University in Mexico. Seven day dietary records were analysed for 250 male and 300 female age 18 to 25 reported being well during dietary assessment. Macronutrients: proteins, lipids, carbohydrates and fibre, micronutrients: Na, K, Ca, P and Fe were analysed. On data obtained for both sexes across all age groups, significant daily variation (p < 0.01) was observed in a very low consumption of vegetables excluding potato products, during whole week. Beverages and alcoholic drinks consumption was higher on week ends. No consistent variation occurred for cereal and cereal products, milk and milk products, meat fruit or soft drinks for any of the sex-age groups. Fish intake was very seldom. In conclusion students from this survey, diet quality was generally higher on Saturday and Sunday but did not vary substantially during week days with respect to energy and nutrients intake. Others factors affecting dietary patterns are cultural traditions and socioeconomic status.

Intake of minerals in Croatian adults

P96 Food Databases, Dietary Intakes

The role of minerals in nutrition of Croatian population is still underestimated and insufficiently investigated though they have important protective effects in human health. The aim of this research was to examine sodium, potassium, magnesium, phosphorus, iron and cuprum intake in 120 adults, aged 18–54 years (mean 33.8 yr). The research was conducted using 24-hour recall method, and was repeated 10 times during one year. Participants were separated according the age into two groups (<30 yr, and >30 yr), as well as according the sex. There were significant differences in daily intake of Na, K, Mg and Cu between age groups, but not for P and Fe. When divided by sex, significant differences in daily intake were found for...
all minerals. When nutritive density was considered, significant difference was found only for K and Mg regarding sex. In conclusion, considering recommendations examined population took too high amount of sodium, and non satisfying amount of iron.

**Acknowledgment**

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 role in the acceptance, thus one of the most important parameter is flavour, responsible for pleasing factor when eating escamoles. People perceive sensorial value but do not identify healthy and diet aspects. The aim of this study is to evaluate the influence of escamoles preparation in relation ship to taste and acceptability parameters. Three different dishes butter fried, butter-garlic fried and cook with a chili sauce. Sensory analysis preformed by 105 customers of a high class restaurant in México, conducted in two sessions a day, tasted during week and weekend days. Sensory analysis results showed that penailists preferrend samples butter fried followed by butter garlic fried and cook with a chili sauce sample was ranked as the less appre- ciated, because escamoles flavour was probably considered decrease by chili. In conclusion the escamoles butter fried keep flavour better than the other dishes, sensory characteristics are important factors for the acceptance by population of escamoles food.

P100 Food Databases, Dietary Intakes
The nutrient composition of meat and its contribution to the human diet
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Meat is still a central element in our meal even it suffers from a bad image in terms of dietetic value. It is often not recognized to contribute to the supply with several valuable or even essential nutrients. The aim of this study was therefore to update and emphasize the nutrient composition data of meat. Based on these, an estimation of the relative contributions of the average meat consumption to the dietary intakes of different nutrients was made. The mean daily intake of meat (142 g) in Switzerland in 2005 provided the basis. The meat samples were purchased from local supermarkets and butchers in order to consider different origins in terms of production system (meat labels).

The mean daily fat intake from meat and meat product were 7 and 14g/d, respectively, giving a total of 21g/d which accounts around 17% of daily consumed fat (122 g). The fat consisted of 39% saturated, 47% monounsaturated and 15% polyunsaturated fatty acids in average considering the amounts of the meat cuts eaten. Concerning the long-chain n-3 polyunsaturated fatty acids (LCn3PUFA) we estimated that 17% (41 mg/d) originated from meat, consisting predominantly of docosapentaenic acid (DPA). With the mean daily intake of meat, iron and zinc intake were about 1.1 and 3.2mg/d, respectively. Thus, the recommendations given by the D-A-CH for iron were met to 7% (women) and 11% (men) and for zinc to 46% (women) and 32% (men). The better availability of iron and zinc from meat has to be taken in account. Considering selenium, the intake was found to be 22 µg/d which fulfills a great amount of the recommended valuations (30–70 µg/d).

In conclusion the study showed that meat can make a great contribution to meeting the nutrient requirements when eaten in a mixed and balanced diet.

P102 Food Databases, Dietary Intakes
Traditional Portuguese leafy vegetables as source of Lutein
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There are examples in literature [1,2] suggesting that lutein and zeaxanthin carotenoids found in fruits and vegetables may protect against the common eye disease of macular degeneration. These pigments are found in the human macula and retina. Age related macular degeneration (AMD) is the leading cause of irreversible vision loss in the elderly population and as their proportion is increasing in our
country, the public health impact of this disease will become even more severe. As there is no definite agreement among scientists and medical doctors about the real benefit of vitamin/mineral supplements [1], patients with AMD or at a risk of developing the disease should be encouraged among other actions, to eat a balanced diet rich in fruit and vegetables.

Portugal has traditional dark green leafy vegetables (galega kale, Portuguese cabbage, turnip leaves and purslane) but there are no reports about their contents in carotenoids. In our laboratory carotenoids in these vegetables, in raw and cooked form, were quantified by a chromatographic method [3], which consists in sample extraction, concentration and separation by reverse phase HPLC with photodiodes detection at 450 nm, identification by retention time and spectral comparison (DAD) with standards and quantification through external standards calibration, based on peak areas. A Certified Reference Material (BCR European Commission) was analysed with satisfactory Z-scores. Method validation in our laboratory gave detection and quantification limits respectively, 5.7 and 17.3 μg/100 g.

The analysed vegetables appear to be very good sources of lutein (>1 mg/100 g), the higher sources being purslane (4.85 mg/100 g) and galega kale (3.74 mg/100 g), therefore eventually capable of helping patients judged to be at risk of AMD.

Acknowledgement

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References


P103 Food Databases, Dietary Intakes

Trends in dietary intake in Portugal in 1966–2003 compared with other Mediterranean countries

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Objective: To assess the trends in dietary intake in Portugal in 1966–2003, and to compare these trends with those from other Mediterranean countries.

Methods: FAO’s Food Balance Sheets from Portugal and other Southern European countries were analyzed. Trends for the different foodstuffs were assessed by linear regression.

Results: The per capita availability of calories has increased in Portugal, France, Greece, Italy and Spain in the past 40 years. Portugal presented the most rapid growth with an annual increase of 28.5 ± 2.2 kcal (slope ± standard error), or +1000 kcal overall. In animal products, Portugal had an annual increase of 20.7 ± 0.9 kcal, much higher than the other four countries. Conversely, the availabilities of vegetable and fruit only showed a slight growth of 1.0 ± 0.1 kcal/year and 2.5 ± 0.4 kcal/year, respectively, thus increasing the ration of animal to vegetable products intake. Olive oil availability increased in all countries with the notable exception of Portugal, where a significant decrease was noted. Wine supply decreased in all five countries; in contrast, beer supply started to take up more alcohol share. Percentage of total calories from fat increased from nearly 25% to almost 35% in Portugal during the study period, mainly at the expenses of calories from carbohydrates, whereas the share of protein showed just a slight increase. Furthermore, fat and protein were increasingly provided by animal products.

Conclusion: Portugal is gradually moving away from the traditional Mediterranean diet to a more Westernized diet as well as France, Greece, Italy and Spain. Noticeably, the trends of diet transition were observed relatively faster in Portugal than in the other four Mediterranean countries.

P104 Food Databases, Dietary Intakes

A comparative study on iron intake in first-degree relatives of type 2 diabetic patients with impaired or normal glucose tolerance

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Introduction: A relationship has been reported between serum ferritin and some components of insulin resistance, as well as increased risk for developing type 2 diabetes. So it is probable for dietary content of iron to have an influence on the risk for diabetes development. In this study, the iron intake has been investigated in first degree relatives of type 2 diabetic patients with normal or impaired glucose tolerance.

Materials and Methods: Based on the results of OGTT, 210 first degree relatives of type 2 diabetic patients were divided into 2 groups with normal and impaired (diabetic + IGT) glucose tolerance. Using a 3-day food questionnaire, the daily intake of energy, red meat, fish and poultry meat, magnesium, iron, zinc and chromium were calculated and compared between 2 groups.

Results: The mean of age and BMI were 48.9 ± 0.8 kg/m2 and 28.7 ± 0.8 kg/m2 (P = 0.654) in impaired and normal groups, respectively. Iron intake was significantly higher in impaired group, as compared with normal subjects. (P = 0.015), but no significant difference was observed between 2 groups concerning the intake of other nutrients.

Conclusion: Keeping in mind the role of other risk factors, the higher iron intake observed among subjects of impaired group shows a probable relationship between increased intake of iron and the higher risk for developing type 2 diabetes.
P105 Food Databases, Dietary Intakes

Development of a food frequency questionnaire for a multicentre HPV cohort study in men

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Because of the connection between diet and disease, estimates of usual food intake are of increasing interest in different contexts. This study was conducted to design a food frequency questionnaire (FFQ) for assessing the habitual diets of men, to be used in the multicentre HIM Cohort Study - Natural History of HPV in men. A 24-hour Dietary Recall (24hDR) was obtained from 1,600 men, in a probabilistic sample of the municipality of São Paulo, Brazil. Foods were grouped into food items, mainly according to the similarity of nutritional value. It was identified the most important sources of total calories, carbohydrates, proteins, total fat, cholesterol, saturated fat, monounsaturated fat, polyunsaturated fat, trans fat, dietary fiber, insoluble fiber, soluble fiber, vitamin E, folate, retinol, vitamin C, calcium, phosphorous, iron, zinc, sodium, calcium and betacarotene. All reported foods were ranked in terms of their contribution to the total nutrient intake. The percent contribution for each nutrient was calculated utilizing Block’s formula, and 54 food items were included in the FFQ. The time frame reference for asking the food intake was the preceding year, and 4 sizes of portions was allowed to be chosen. To calculate portion sizes, the frequency distribution of equivalent-gram weights for 24hDR was divided into percentiles, as follows: the P50 corresponding to the reference portion (medium) and small, large and extra-large to P25, P75 and P100, respectively. A validation study is ongoing to evaluate the performance of the questionnaire.

P106 Food Databases, Dietary Intakes

Digital photographs and 2-dimensional drawings to aid portion size estimation in Sri Lankan children: development and validation

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Availability of a choice of country specific visual aids caters to individual cognitive variability as well as differences in food presentation between countries. This study aimed to validate digital colour photographs printed to life size and 5 x 7, and 2-dimensional line drawings, against actual food. Visual aids were tested for 15 commonly consumed foods in three portion sizes. Only line drawings were used for fruit and beverages. Forty-eight girls and 32 boys (aged 10–16 years) were allowed 20 seconds viewing time per weighed actual food. Trained interviewers recorded estimations made by subjects, individually for the different aids following a prescribed sequence. Over or under estimation (as measured by mean difference between actual and estimated weights of all participants) by each dietary aid was assessed for each food using paired t test. Significance of these estimations was compared between visual aids across foods.

Underestimation was greater with life size photographs (83.3%) while 5 x 7 yielded greater overestimation (70%). Ranges of estimation error was −63 g to 3 g for life size, −47 g to 44 g for 5 x 7 and −29 g to 39 g for line drawings. Line drawings did not show a significant error in estimating rice, pulse and chicken (p > 0.05). All three aids underestimated dhal and carrot (p < 0.05). Highest error was in estimating pulses using life size photographs (63 g) while the lowest were with carrot, fish and dark green leaves using all three aids (<10 g).

Our results suggest that all three aids can be used effectively for estimation of portion sizes in this population. Use of 5 x 7 photographs in the development of an atlas together with line drawings is feasible. Further study could assess minimization of estimation error by inclusion of more portion sizes.

P107 Food Databases, Dietary Intakes

Internet survey on basic eating and living habits in adults

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Understanding basic attitudes of the public towards food, diet and health is extremely important when producing a diet guidebook for any country and in promotion of regular diet. The purpose of this paper was to evaluate habits and attitudes of adult individuals towards diet and health. The survey included 2985 individuals from 6 Croatian regions, users of Podravka’s culinary portal www.coolinarika.com. The results were analyzed in SPSS and Microsoft Office Excel. Most of the subjects take 3 meals a day, which is in compliance to eating recommendations of other countries that emphasize the importance of taking more meals in a day. The results show that lunch is the most frequent meal, followed by breakfast and then dinner. Women skip dinner more often than men, while men skip breakfast and snacks between full meals. When shopping for groceries or when choosing food, most important criterion for the subjects is that it tastes good. The subjects eat fish less often than meat. Milk is consumed the most, every day, and cheese 2 to 3 time a week. Potato can be found on the menu more often than pasta and rice. Most of the subjects consume fats in the form of vegetable oils. Most of the subjects consume fresh and green cooked vegetables 2 to 3 time a week, and legumes once a week. Only one third takes fruit every day, citrus fruits and other fruits equally. Body mass index shows that 55% of the subjects are of normal weight, while 39% is overweight. The results show that most of the eating habits in Croatia have not undergone any significant changes lately, but are similar to results of previous surveys of eating habits in Croatia.
**P108 Food Databases, Dietary Intakes**

**Dietary energy density as a marker of dietary quality in Swedish children and adolescents**

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**Introduction:** Low energy density (ED) diets have been associated with lower energy and fat intakes, and, by containing fewer nutrient-dilute, energy-dense foods, may be more healthful. Information on dietary ED in children and adolescents is scarce.

**Purpose:** To see if dietary ED is associated with the consumption of recommended food groups and if it could be used as a simple indicator of diet quality.

**Methods:** The European Youth Heart Study involves a cohort of 273 Swedish 9-year olds (54% girls) and 180 15-year olds (61% girls). A 24-hr dietary recall was performed and ED (kcal/g) was calculated by dividing the sum of energy (kcal) from all foods, milk and fruit juices (excluding all other beverages), by the total amount eaten (g). Subjects were classified into tertiles of dietary ED, and, by sex and age, into low-, medium- and high-consumers of different food groups. The differences in consumption across tertiles of ED were investigated using Chi-squares, with Cramer’s V to determine association strength.

**Results:** Lower-ED diets were significantly positively associated with the consumption of fruit, vegetables, low fat milk and yogurt, cereals and high-fibre bread. Higher-ED diets were positively associated with low-fibre bread, burgers, sweets and chocolate, sweetened drinks and savoury snacks. The strengths of the associations were strongest for low fat milk and yoghurt (0.206) and sweetened beverages (0.377) and modest for other food groups.

**Conclusion:** A greater proportion of the subjects consuming lower energy-dense diets were consumers of the foods currently recommended by Swedish nutritional guidelines, and non-consumers of those which are discouraged. Total dietary energy density could therefore be a useful, simple indicator of a healthful dietary pattern.

**P110 Food Databases, Dietary Intakes**

**Portion size estimation is not dependent on weight status**

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Data from dietary recalls is used to establish relationships between diet and health, to track progress of a number of different health objectives, and to aid in setting health policies of government agencies and non-governmental organizations. However, portion sizes of foods eaten have been shown to be difficult to assess, especially for certain categories of foods such as meat. In addition, various authors have suggested that obese individuals may be obese in part because they underestimate portion sizes to a greater extent than does the non-obese population. This research compared responses of overweight and non-overweight consumers in the United States to various portion sizes of foods. A 5-point portion size estimation scale ranging from extra small to extra large was used in two studies. The studies were designed to compare results from obese and non-obese participants. Few differences based on body mass index (BMI) were noted which suggests that overweight and obese people did not perceive portion size differently than did non-obese individuals. Some differences in portion size estimation were noted between people who said the sizes shown were larger than what they normally eat and those who said the amount was the same or less than they normally ate, but this was not dependent on BMI. Information from this study suggests that obesity is not a result of differential interpretation of portion size by obese individuals.
**P111 Food Databases, Dietary Intakes**

**A diet quality index based on the French dietary guidelines – Programme National Nutrition Santé (PNNS) and the SU.VI.MAX study**

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**Objectives:** One approach to evaluating overall diet quality is through the use of a dietary score. An a priori diet quality index was developed based on the French national dietary guidelines to measure the quality of the diet.

**Materials and Methods:** The SU.VI.MAX (Supplémentation en vitamines et minéraux anti-oxydants) study included 12741 middle-aged adults who were followed for an eight year period. Subjects were invited to complete a 24 hour recall every 2 months. A previously validated manual containing food codes and photographs of portion sizes was distributed to each patient at the beginning of the study.

**Results:** The sample consisted of adults who were 45–60 years of age at the time of inclusion and who had completed at least three dietary records over the first two years of the study (n = 4395). To develop an a priori diet quality index corresponding to the nutritional objectives defined by the PNNS, food categories from the SU.VI.MAX database of 900 food codes were first created. Foods comprised of more than one category were broken down into components (based on French recipes created by dieticians) in order to avoid potential underestimation of amounts consumed for some food categories. Since dietary guidelines are reported in daily servings, average serving sizes were defined to calculate intake frequencies for each recommendation which are reported in grams per day (for example, the recommendation of five portions of fruits and vegetables was defined as 80 grams per lunch). To evaluate adherence to the dietary recommendations, points were proportionately assigned and then summed to obtain a total score.

**Conclusion:** The recent PNNS dietary guidelines provided an opportunity to develop this previously non-existent tool in France.

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**P112 Food Databases, Dietary Intakes**

**Intake and recommendations of omega 3 fatty acids across the globe**

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It is thought that omega-3 fatty acid intake is less than recommended, but intake data are limited. We reviewed population intake data of alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA), and total omega-3 fatty acids. In total 60 selected papers and reports provided data on omega-3 intakes in different countries. For total omega-3 fatty acids, average population intakes were highest in Greenland Inuit (>3.5 g/d). In other regions, intakes were highest in northern Europe (2.2 g/d), followed by Japan (1.9 g/d) and mid and southern Europe (1.7 g/d), and lowest in the US (1.4 g/d). ALA intakes were highest in northern Europe (1.6 g/d), followed by Japan (1.4 g/) and mid Europe (1.3 g/d), the US (1.2 g/d), and lowest in southern Europe (0.8 g/d). In general, estimates of average ALA intakes were lower than the 1–2 g/d recommended for optimal health. Intakes of EPA plus DHA were lower in US (0.2 g/d) than in to Europe (0.3–0.6 g/d). In Japan, EPA plus DHA intake was 1.0 g/d. Most recommendations for EPA+DHA are in the form of advice to eat fatty fish 1–2 times per week, which corresponds to about 400–500 mg/d of EPA + DHA. Average population intakes in Nordic countries are at the level of these recommendations. However, an average intake at recommended level still means that half (with normal distribution) or majority (with distribution skewed to the right) of the individuals is below recommendations. Intakes are below recommendations in mid-western Europe.

Data are available only a limited number of countries and food consumption data are always imprecise. However, the data summarized here strongly suggest that a majority of people in western populations have intakes of ALA and EPA/DHA that are lower than recommended for optimal health.

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**P113 Food Databases, Dietary Intakes**

**Comparison of the nutritional composition of dishes obtained by analysis and by the use of food composition tables**

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The Nutritional Study of the Andean Population of Jujuy (ENJU) included a dietary assessment based on the realization of a 24 h recall. In order to convert the information about food consumption into nutrient intake, a self-made food composition table (FCT) was created. Food composition data came from LATINFOODS and European (Spanish) tables.

**Objective:** To compare the nutritional content of composite dishes cooked in canteens from North-western Argentina determined both by laboratory analyses of the samples and through the use of FCT.

**Material and Methods:** Three food samples and details about the ingredients, amounts and cooking techniques were collected for 13 composite dishes during the field work of the ENJU. Most of them came from school canteens. The content of protein, fat, carbohydrates, iron, zinc, water and energy were determined using two methods: The first one was based on the information of each recipe and the use of FCT. The second method was based on laboratory analyses of food samples using AOAC techniques. The results obtained using both methods were compared by paired t-test and correlation analyses.

**Results and Conclusions:** Correlation of the results of macronutrient, micronutrient, water and energy contents obtained by both methods were positive and significant. No statistically significant
differences between both methods were observed in the content of water ($p = 0.67$), energy ($p = 0.88$), carbohydrates ($p = 0.34$), proteins ($p = 0.41$) and lipids ($p = 0.07$). However, statistically significant differences were observed in the results about the mineral content of dishes. On average, the use of FCT halved the content of iron and zinc of the dishes compared to the analytical results. These results confirm that there is a greater variability in the micronutrient determination of foods compared to their macronutrient content.

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**P114 Food Product Technologies**

**A sustainable food supply in a changing global and climate environment**

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Changing climate patterns, water scarcity and escalating food transportation kilometres are key factors currently impacting on the food security and equitable access to healthy food. At the same time chronic conditions are escalating. Food for Life is new focus on a whole of food chain from paddock to palate to health is emerging in Victoria, Australia. It engages all stakeholders from farmers to manufacturers, to retailers to consumers as well as government and non Government agencies.

By co-co-ordinating research, food technology, food manufacturing, nutrition policy and consumer education to have the dual outcome of creating innovation in the food supply as well as improving population access to healthy foods – there will be benefits, not only to economic growth but also contribute to chronic disease reduction. Simultaneously a community based program has commenced with local government as the central focus for the multi-faceted programs, linked with a communication strategy, a food security network, research and evaluation. The uniqueness of this program Food For All is the emphasis on local government to ‘plan’ access to nutritious food through integrating food access considerations across local government work units, such as transport, land use planning, housing as well via Municipal Public Health plans. Initiatives to grow demand for local food production and supply, greater focus on sustainable agriculture and a re-focus on creating consumer awareness and demand for healthy foods that also are the most environmentally sound, are key features. This presentation will provide specific detail of major achievements at each point in the food change from paddock to palate to health.

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**P115 Food Product Technologies**

**B vitamins in ostrich meat produced in Latvia**

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Meat is an important dietary source of the water soluble B – complex vitamins that in general to take part in the utilization of energy, help to regulate many chemical reactions and support normal vision and healthy skin. The amount of B vitamins in meat can depend on factors such as the species, age and degree of fatness.

Ostrich meat differs from the meat of other animals. It is not fat, it is lean and easily separated from bones and connective tissue. It is more digestible compared to other types of meat, soft and does not require long culinary treatment. Although it can be compared with beef due to its red color and taste, ostrich meat is as tender as chicken meat, and is characterized by short muscle fibers.

The objective of our experiment was to analyze the B1, B2 and B5 content in ostrich meat and compare it with beef and chicken produced in Latvia and available at the retail. All vitamins are determined by standard flurometric method according to AOAC Official Methods.

Our results show that ostrich meat contains significant quantities of vitamin B1, B2 and B5. The highest content in ostrich meat were calculated for B5 (11.45 mg/100 g) and the lowest – for B2 (0.098 mg/ 100 g).

We also observed the differences in all B vitamins among meat of different species. The richest meat of vitamins B is ostrich meat. It contains more than 18% B1 and B2 and more than 7.5% B5 compared with beef and more than 30% B1 and B2 and B5 27% more than compared with chicken.

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**P116 Food Product Technologies**

**Biochemical change of packed dried apples**

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Dried fruits are very delicate to biochemical changes during storage, due to low water content, as well as low aw value. The ‘shelf life’ of these products depends on the aw value.

Due to its composition, dried fruits is very sensitive to the influence of moisture, light and oxygen.

Light catalyzes a number of undesirable processes during storage, and the packaging has to protect the packed product from the negative influences of the environment.

Problems of product stability during storage are also connected with oxygen. Oxidative changes during storage affect the composition and sensory characteristics and lower the nutritive value and overall product quality.

Moisture is one of the most important factors for quality preservation of low-water content products. During the storage of these products, moisture affects the energy activation of certain processes which cause the quality change of packed product.
Materials for dried apples packaging are necessary to have appropriate barrier characteristics for water, oxygen nitrogen and carbon dioxide molecules, as well as for electromagnetic rays, especially those with low wavelengths in UV region.

The results of tested characteristics of packed dry apples and barrier features different packaging materials are presented in this paper. During storage of packed dried apples qualitative changes, influenced by different packaging materials, may occur. The changes of water content, aw value, characteristic colour and sensory characteristics of packaged dried apples point out to influence of the type, combination as well as the barrier features of used packaging materials.

**P117 Food Product Technologies**

**Centesimal composition of homemade enteral diets**

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Enteral nutrition is characterized by oral and/or enteral supplementation in case of restriction of use of oral feeding. This work aims to determine the centesimal composition of homemade enteral diets, based on meat protein hydrolysates.

**Material and Methods:** The obtention of the beef protein hydrolysates was enzymatic as described by PINTO e SILVA et al. (1999), added with gelatin, as per ATZINGEN (2005). Three formulae with meat hydrolysates (beef, chicken and turkey) were analyzed; they were added with legumes, corn starch, glucose and soybean oil. Humidity, ashes, protein, lipids and carbohydrates were evaluated by the methodology recommended by Instituto Adolfo Lutz. The cholesterol analysis was carried out by HPLC. The fatty acids were separated by gas chromatography; the values of fibers according to PROSKY et al., 1988. The minerals were determined by spectrophotometer of Atomic Absorption.

**Results:** The formulae were classified as hypo caloric. The protein contents of the formulae varied from 2.09 to 2.52 g/100 g, lipids from 1.04 to 1.32 g/100 g, carbohydrates 9.32 and 9.67 g/100 g, containing 8 g/L fibers. The cholesterol varied from 14.32 mg/100 g (chicken) to 37.59 mg/100 g (beef). As for fatty acids contents, it was verified that the three formulae show more concentration of monounsaturated fatty acids. Concerning the minerals, the copper values varied from 0.056 mg/100 g and 0.066 mg/100 g, zinc from 0.276 mg/100 g to 0.622 mg/100 g, iron from 0.468 mg/100 g to 0.628 mg/100 g and calcium from 1.336 mg/100 g to 1.406 mg/100 g.

**Conclusion:** The formulae presented adequate protein contents, predominance of monounsaturated fatty acids, being recommended to patients who require nutritional supplementation at hospitals or in Homecare conditions.

**P118 Food Product Technologies**

**Continuous hydrolysis of Lactose milk and whey by immobilized α-Galactosidase**

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Enzyme engineering is a fast-growing application in the pharmaceutical and food markets. Enzymes can be operated in the liquid or immobilized form. In this study, hydrolysis of lactose in milk and sweet whey were studied by immobilized α-Galactosidase. The enzyme was adsorbed onto DEAE-Cellulose, DEAE-Sephadex A-50, Duolite A 147, Duolite C 464 and Duolite ES 468, and cross linked by glutaraldehyde. Results, showed that phenol-formaldehyde resins (Duolites) were excellent adsorbent supports for immobilization of α-galactosidase (continuous operation for more than one month). No detectable loss in activity of immobilized enzyme on Duolite resins were observed. The half lives of immobilized enzyme on DEAE-Cellulose and DEAE-Sephadex were low. The immobilization of α-Galactosidase on Duolite C464 and Duolite ES 468 (phenol-formaldehyde resins) were better than DEAE-Cellulose and DEAE-Sephadex. The optimum pH of the immobilized α-galactosidase on DEAE-Cellulose and DEAE-Sephadex A-50, showed acidic shift whereas one immobilized on Duolite C464 and Duolite ES 468 shifted towards the alkaline side of pH, and the pH-activity curve became broader than that of the free enzyme. The immobilized α-galactosidase on Duolite A147 showed no change in optimum pH, but did exhibit changes in pH-activity profile. The heat stability of immobilized α-galactosidase increased significantly but the optimum temperature had no change. Continuous hydrolysis of milk and whey lactose was examined in designed packed bed reactor. In conclusion, the immobilized α-galactosidase on Duolite C464 and Duolite ES468 are not only suitable for hydrolysis of acid whey but also for hydrolysis of sweet whey and milk, and the enzyme immobilized on these two carriers had no detectable activity loss after more than one month.

**P119 Food Product Technologies**

**Effect of conventional and microwave cooking on vitamin C and carotenoids in fresh broccoli**

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The effect of conventional and microwave cooking on the content of vitamin C and carotenoids and their changes during 2 days storage as well as in the sensoric properties in fresh broccoli were investigated.

The examined parameters vitamin C (ascorbic acid = L-AA, total ascorbic acid = TAA) and carotenoids (lutein, zeaxanthin, b-carotene) were determined with an HPLC–method. The contents of dehydroascorbic acid = DHAA were calculated using the subtraction method (DHAA = TAA-AA). The sensory evaluation was performed.
with an objective Quantitative Descriptive Analysis (QDA) and with a hedonic ranking test of preference.

In comparing the conventional and microwave cooking of broccoli, an advantageous assessment of the microwave preparation was observed in all examined parameters.

On the day of preparation the microwave cooked broccoli showed higher concentrations of TAA (12%) and L-AA (32%) and a lower content of DHAA (22%) than the conventionally prepared product, as well as the concentrations of lutein and β-carotene (about 28% and 53% respectively). The difference in the amount of the heat sensitive zeaxanthin between the two kinds of preparation was not relevant. After 2 days storage the microwave preparation proved to be better for both, the vitamin C (7% higher TAA-content) and the investigated carotenoids (41% and 64% higher content of lutein and β-carotene, respectively) preservation.

In contrast to the results of the chemical analysis which demonstrated the favourable effect of microwave cooking on the preservation of vitamin C and carotenoids in fresh broccoli, the sensory evaluation revealed that due to a lower intensity of bitterness and higher juiciness the conventionally prepared broccoli showed a higher overall score, and was preferred by the consumers.

In conclusion, immersion of chicken legs in a 2% acetic acid solution can reduce L. monocytogenes populations on fresh poultry.

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**P120 Food Product Technologies**

**Efficacy of acetic acid against Listeria monocytogenes attached to poultry skin during refrigerated storage**

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Raw poultry is a well-recognized source of Listeria monocytogenes and many surveys have confirmed the presence of this pathogen on fresh poultry. Some authors have associated cases of listeriosis with the consumption of undercooked chicken. There is a great interest in reducing surface microbial contamination of poultry, with particular regard to reducing the levels of pathogens. The Regulation (EC) No 853/2004 of the European Parliament and Council provides a legal basis for the use of substances other than potable water to remove surface decontamination from foods of animal origin.

The aim of this study was to evaluate the effect of acetic acid washing on the growth of Listeria monocytogenes on poultry legs stored at 4°C for 8 days. Fresh chickens legs were inoculated with Listeria monocytogenes. After the inoculation, the chicken legs were dipped into either a 1% (v/v) or 2% acetic acid solution or distilled water (control).

Surface pH values, sensorial characteristics and L. monocytogenes and mesophiles counts were evaluated after treatment (day 0) and after 1, 3, 6 and 8 days of storage at 4°C. Significant differences (p < 0.05) in mesophiles counts were found between the legs treated with 1 or 2% acetic acid and the control legs. Legs washed with 2% acetic acid solution showed a significant (p < 0.05) inhibitory effect on L. monocytogenes compared to control legs, being about 1.31 log units lower in the first ones than in control legs after 1 day of storage.

The application of gastronomics techniques has been great allied in the improvement of the acceptance of the diets on the part of the patients in hospital environments generating improvement of the state and the quality of life of the same ones. This research had as objective to evaluate the acceptability of the without-salt hospital diet for the hospitalized patients, before and after the application of adjusted gastronomics techniques to the reality of the Hospital. The study in question it was based on methodology of quantitative research, of transversal and experimental cut. Forty and two patients had been analyzed, of both the sexes, that made use of without salt hospital diet for saw verbal of normal consistency. Gastronomics techniques to the menu of the hospital had been applied, being analyzed the preparations as the rice, beans, meats and garrisons. To the patients who had taken care of to the inclusion criteria the diets with and without the application of the gastronomics techniques had been offered and applied an acceptance questionnaire. Of the 42 analyzed patients, 100% had presented HAS associate to the other patologies. Thus 66.66% controlled the salt in its feeding in house and yours acceptability of the diet she was bigger. In the second phase of the study, 10.5% of the patients had started to consume of 76 the 100% of the diet. After the analysis of the study, was possible to reach the considered objectives, concluding the importance is the application of gastronomics techniques unifying the creativity to a restrictive diet, that, many times, is not well accepted for the patients due its proper condition of salt absence.
Phenolic compounds are found at different levels in many medicinal plants including seaweeds. The heat treatment changes antioxidative activities and the contents of polyphenolic compounds in seaweeds. This work was conducted to evaluate the effect of different drying methods on antioxidative activities and the amount of antioxidant compounds in Undaria pinnatifida and Hizikia fusiformis measured by polyphenolic contents, DPPH radical scavenging activity, and nitrite scavenging activity. Samples were treated by two drying methods at two different temperatures (hot-air drying at 40°C and 60°C: HD-40 & HD-60, vacuum drying at 20°C and 30°C: VD-20 & VD-30). The different drying conditions affected the amount of total phenolic compounds in Undaria pinnatifida and Hizikia fusiformis. At the condition of VD-20, the total phenol compounds was 101.94 mg/100 g in Undaria pinnatifida and 857.79 mg/100 g in Hizikia fusiformis, respectively. The total phenol contents of the samples were significantly higher in VD group than in HD group and declined with increased temperature. The DPPH radical and nitrite scavenging activities of the samples treated with VD were higher compared to those of the extracts treated with HD. Hizikia fusiformis showed higher DPPH radical scavenging activities in extracts by vacuum-dried, (VD-20; 82.67%, VD-30; 83.45%) than those by hot-air drying (HD-40; 70.44%, HD-60; 71.23%) and higher nitrite scavenging activities in extract by vacuum-dried (VD-20; 87.43%, VD-30; 88.45%) than those by hot-air drying (HD-40; 72.14%, HD-60; 73.45%). The results showed that the drying methods influenced the contents of antioxidant compounds and overall antioxidative activities of seaweeds and vacuum drying gave better results for antioxidant activities of Hizikia fusiformis.

Influence of extrusion cooking on functional properties of soy-corn meal mixtures

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Extrusion cooking is a modern and sophisticated high temperature-short time (HTST) processing technology. In food industry, the products of extrusion cooking are of great importance today. In this work soybean proteins were incorporated in direct expanded extrudates based on corn flour. The goal was using twin screw extrusion, to produce crispy and colour acceptable extrudate, by means of products textural properties from mixtures of corn flour and defatted toasted soybean flour. Colour is an important indicator of food quality. Mixtures of corn flour and various concentrations of defatted soybean flour (7.5%, 15%, 22.5%) were used. Mixtures were extruded in twin-screw extruder APV Baker (co-rotating type) with following conditions: feed moisture content (FMC) was 18.5%, 21.5%, 24.5%; screw speed was 300 rpm; expansion temperature was 130°C; feed rate was 70 kg/h. Textural properties (breaking strength index – BSI) was determined using SMS texture analyser. Colour of extrudates was determined by colorimeter Colortec PC using L, a and b parameters. BSI has largest value for the sample with 22.5% of added soybean flour and FMC intake of 24.5% and it was 5,338 N/mm under the maximum peak force of 20,381 N in bending mode. This results indicates as follows; less protein better expansion index; more water and protein affect hardening of the sample and decrease of expansion. The obtained results demonstrate that extrudates with addition of soybean protein were harder due to a fact that soybean protein concentrate has a property of cell walls hardening and ability of nonevaporated water binding. Colour results indicated that samples were whiter as protein level increased. Also, both redness and yellowness decreased as protein increased, under same manufacturing conditions.

Influence of low-melting milk fat fraction on crystallization and physical properties of chocolate

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Investigated milk fat fraction differ in physical attributes, first of all in melting point and solid fat content and the influence crystallization process of cocoa butter i.e. chocolate mass. It means that this fractions slow down crystallization rate, decrease melting point of mixture with cocoa butter and cause chocolate softness. It is very important for quality of chocolate especially chocolate with nuts or sunflower kernel. The aim of this paper was to investigated the influence of low-melting (26°C) milk fat fraction on crystallization processes in chocolate mass and define the optimal concentration of this fraction with suitable precrystallization temperature time regime. Solid fat content of chocolate which designate the influence of precrystallization changes in chocolate mass with addition of milk fat fractions, was investigated. The precrystallization was performed in a laboratory crystallizer that is in a modified Brabender pharograph, which measures the rheological characteristics as indirect parameter of crystallization properties of chocolate mass depending on milk fat fraction concentration and precrystallization temperature. The experiments were performed according to the factorial plan 32 (two factors on three levels) and the results are statistical treated. The results showed that addition of high-melting milk fat fraction slow down the chocolate mass crystallization more then low-melting milk fat fraction. The optimal condition for achieving the satisfactory tempering rate (optimal concentration of crystals in chocolate mass) are addition
of 3% low-melting milk fat fraction and precrystallization temperature of 25°C. Investigated fraction influenced decreasing in solid fat content of chocolate regardless on precrystallization temperature.

**P125 Food Product Technologies**

**Molecular weight and osmolality of meat protein hydrolysates**

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Partially hydrolyzed protein (with molecular weight between 5 and 20kDa) can be used to supplement specific nutritional and physiological needs or to substitute synthetic amino acids. Milk, soybean and meat protein hydrolysates constitute peptides of low molecular weight and their absorption is more efficient than those of free amino acids, besides being less hypertonic.

**Objectives:** To determine the molecular weight and the osmolality of meat protein hydrolysates.

**Material and Methods:** The methodology to obtain the meat protein hydrolysates is described by PINTO e SILVA et al. (1999), adding gelatin as per ATZINGEN (2005). To determine the molecular weight of the peptides, the electrophoresis in SDS-PAGE system technique was applied. The osmolality was determined in osmometer (Advanced Wide-Range Osmometer 3W2) by cryoscopic method.

**Results:** The hydrolysates presented very similar electrophoresis’ profiles, with predominance of peptides with molecular weight lower than 3.5 kDa. 53% of the peptides found in turkey hydrolysates presented molecular weight distribution between 3.4–1.9 and 1.7–1.0 kDa. 59.7% of the peptides found in chicken hydrolysates presented molecular weight distribution between 3.2–1.7 and 1.5–1.0 kDa. 56.3% of the peptides found in beef hydrolysates presented molecular weight distribution between 3.2–1.8 and 1.7–1.0 kDa. The osmolality values were: 761.5 ± 2.1 mosm/kg (beef), 869.0 ± 1.4 mosm/kg (chicken) and 843.0 ± 1.4 mosm/kg (turkey).

**Conclusion:** Considering their molecular weight, the hydrolysates can be used in enteral formulae aimed at individuals with absorption alterations. Exclusive and dilution guarantees the use without gastrointestinal disturbances. These measurements, when properly interpreted, increase the probability of satisfactory performance. In the industrial conditions, dealing with day to day problems associated with commercial production these tests remain of great significance.

In the present study, using different statistical procedures (cluster analysis and factor analysis), some of the most commonly used wheat and flour quality parameters: farinograph water absorption (Wabs), protein content (Pr), zeleny sedimentation value (Zsed), falling number (FN), extensigraph energy (E), amylograph maximum viscosity (Avis), wet gluten (Wg), dry gluten (Dg) and resistance of extension/extensibility (r/e), determined on the samples (134 in total) of Serbian wheat varieties collected throughout the region of Vojvodina, were analyzed in order to evaluate their influence on the bread volume and yield.

Three main factors were accounted for 73.6% of the total variability in the dependent structure. The first factor included Wabs, Pr, Zsed, Wg and Dg, the second factor included E and r/e, and the third factor included FN and Avis, which accounted for 38%, 18.6% and 17.0% of the total variability in the dependent structure respectively.

Cluster analysis using Ward’s method as an amalgamation rule and the Euclidian distance as a measure of the proximity between wheat and flour quality tests resulted in dendogram. Results showed that Wabs, Pr, Zsed, Wg, Dg E, and r/e were the variables most closely related to the yield of bread while Avis and FN were the variables most closely related to bread volume.

**P127 Food Product Technologies**

**Protein hydrolysates of fish: Homemade preparation, nutritional value and microbiological pattern**

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The fish skeletal muscle is rich in protein content of high nutritional value and lipids high in polysaturated fatty acids.

**Objectives:** Enzymatic obtention of homemade fish hydrolysates; characterization of its nutritional value and microbiological pattern.

**Material and Methods:** For obtaining the hydrolysates of fish the methodology by Pinto e Silva (1999) was followed. The techniques of washing the fish muscles were obtained by adapting the method by Lutz (1985) and Bergey Manual of Bacteriology. Three samples kept in common refrigerators have been analyzed according to preservation time: fresh hydrolysates, after 72 hs and after one week.

**Results and Discussion:** The hydrolysate which showed best results was obtained from meat extracted from fresh tilapia, immersed in common refrigerators have been analyzed according to preservation time: fresh hydrolysates, after 72 hs and after one week.
P128 Food Product Technologies

**Purified chickpea or lentil proteins reduce VLDL metabolism and lipoprotein lipase activity in epididymal fat, but not in muscle, compared to casein, in growing rats**

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It is well known that plant proteins, particularly soybean protein have a lowering effect on plasma cholesterol and triacylglycerols (TG) concentration compared to animal. The protein itself, as well as nonprotein constituents, naturally present in soybean isolate such as isoflavones, may be implicated.

The aim of the present study was to determine the effect of various dietary plant proteins compared to casein, on plasma TG concentration and VLDL amounts and composition. Moreover, lipoprotein lipase (LPL) activity in epididymal fat, gastrocnemius and heart was investigated to determine in these tissues their capacity to release free fatty acids from their TG substrate and the liver capacity to stock or export the TG.

Weaning male Wistar rats were fed ad libitum one of the following diets: 200 g/kg diet of purified proteins of lentil (L), or chickpea (CP) or casein (CAS) for 28 d. Compared with CAS diet, the CP and L protein diets exhibited similar cholesterolemia, but lower triglyceridemia (2- and 2.5-fold) and VLDL particle number, as measured by the diminished contents of VLDL-TG and VLDL-apolipoproteins (apo). CP and L protein diets reduced liver TG and cholesterol compared to CAS diet. Furthermore, LPL activity in adipose tissue (AT) of rats fed CP or L was 1.6-fold lower compared to rats fed CAS. There was no significant difference in heart and gastrocnemius LPL activities with the three proteins.

Therefore, the low nutritional performance of purified CP and L proteins related to CAS is associated with decreased plasma VLDL and AT-LPL activity. The lowered liver TG and VLDL-TG and VLDL-apo contents confirm that hypotriglyceridemia is essentially due to impaired synthesis, exportation and transport of TG by VLDL which prevent lipid storage in adipose tissue.

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P129 Food Product Technologies

**Selection, characterization of bacteriocin-producing lactic acid bacteria from Senegalese traditional fermented foods and application to improve preservation of tropical fish commodities**

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Twelve bacteriocin-producing isolates were detected from 220 colonies of lactic acid bacteria selected from 32 samples of traditional senegalese fermented food. Identification made by phenotypic analyses and 16S rDNA sequence revealed three Lactococcus lactis subsp. lactis strains and one Enterococcus faecium. The presence of genes encoding nisin and enterocin B in two Lactococcus species and Enterococcus specie, respectively, was demonstrated by PCR techniques with specific probes. Sequences of the respective PCR amplified fragments matched sequences reported for nisin Z and Enterocin B.

The nisin-producing Lactococcus lactis subsp. lactis CBW1-B1410 strain has been selected for its high production of bacteriocin in broth, and applied to biopreservation of three commercial lean and fat senegalese fish species identified as sumpat grunt, giant African threadfin and smoothmouth sea catfish, using a total bacteria count of 6 log CFU/g as the end of storage. The combination of salt with cell-free supernatant of overnight culture to level of 14% (m/v), declined of 1.5 log CFU/g the total bacteria counts in three fish species and delayed the growth of bacteria for many days, resulting an extention of 12, 7.5 and 7 days of the self-life for lean, moderately fat, and fat fish species, respectively, in comparison to the use of NaCl alone as preservative.

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P130 Food Product Technologies

**Study of the sonication conditions for the formation of protein microspheres and the encapsulation of various ingredients**

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Encapsulation is a process, that generally consists of entrapment of unstable components such as color, aroma, fragrance, flavor, drugs inside a stable matrix, to prevent their oxidation, evaporation and other chemical changes during storage or delivery. Under specific
conditions sonications is known to convert any protein into microspheres, it has also been demonstrated that during sonochemical spherization process different drugs can be entrapped inside these microspheres thus providing a fast and efficient method for encapsulation of other components. Using bovine serum albumin as a model protein we have studied the effect of sonochemical parameters on the efficiency of microsphere formation. Decane (with and without benzaldehyde) was added to a 25 ml of 5% w/v aqueous protein solution. The bottom surface to the high intensity (750 W) ultrasonic horn was placed at the interphase between the organic and aqueous phases and sonicated at various conditions for 3 min such as to generate an acoustic power range of 47 to 130 W/cm². The following parameters were evaluated: temperature, amplitude, total volume (25 to 40 ml), continues versus pulse sonication (20s ON, 40s OFF or 15sON, 50s OFF total irradiation was 3 min). Temperature, total power and energy absorbed by the model system were monitored and recorded. The formed microcapsules were analyzed by optical microscopy (Digilab UMA 600, Varian) and by scanning electron microscopy (SEM). Preliminary analysis of the data have indicated that lower initial temperatures (either 20 or 80°C) and pulsed irradiation (20s ON, 40s OFF) were more favorable for the formation of the microspheres and that the acoustic power had no specific effect.

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**P131** Food Product Technologies

**Vitamin C uptake significance in comparison to the recommended daily intake (RDI) and cooking methods applied on table potato breeds cultivated in Latvia**

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Potato is an important staple food in Latvia because from the total vegetable intake in the diet 70% is coming from potatoes. Vitamin C serves many important functions in the body, like an antioxidant activity, participates in collagen synthesis and other vital roles and is known as the most unstable vitamin and is easily leached during cooking. For this reason, vitamin C loses during mechanical and heat treatment processes have to be taken into account from the nutritional standpoint.

Thereby the amount of vitamin C in 10 table potato breeds cultivated in Latvia was determined by using different cooking methods and the RDI of vitamin C was estimated for different age groups. Hereupon, several cooking methods were applied: peeled and unpeeled boiled, baked potatoes; peeled and sliced in to small strips and cooked by using pan frying and deep fat frying methods. The amount of vitamin C was determined with the iodometric method.

Significant differences on vitamin C loss were found between different potato breeds and cooking methods. Therefore, according to the RDI, the results show that in each age group the highest vitamin C uptake is attained when using unpeeled potatoes prepared in oven (i.e. 35.92% vitamin C from RDI, for the age group 7–12 month) while the lowest was when using deep fat fried potatoes (i.e. 17.16%, age group 7–12 month). Obviously attention has to be paid to risk groups, like infant and women during pregnancy and lactation period.

Consequently for those people who is in the risk group and suffer from vitamin C deficiency ‘Folva’ and ‘Braslpa’ breeds is suggested. Therefore for women in pregnancy and lactation period it would be recommended to use unpeeled potatoes prepared in oven with average vitamin C content of 8.38%.

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**P132** Food Product Technologies

**Baked products of high nutritive value made with legumes and cereals**

M. Granito; Y. Valero; R. Zambrano

Food Science Laboratory, Simon Bolivar University, Caracas, Venezuela

The consumption of baked products, rich in saturated and hydrogenated fats and poor in vitamins and minerals, together with a sedentary lifestyle, is a contributing factor for the prevalence of child obesity. The objective of this work was to partially substitute wheat flour for fermented and unfermented legume flour in the formulation of sensory accepted brownies and cakes, of lower energetic density and higher protein quality intended for school snacks. Vanilla flavoured cakes with 20% of fermented and unfermented Phaseolus vulgaris and brownies with 30% fermented and unfermented flour of Cajanus cajan were formulated. These were evaluated by 10 trained panellists with a 7-point hedonic scale, finding values higher than five in the flavour, smell, texture and overall appreciation for all the products evaluated. In addition, the acceptability was measured with a group of 90 school children, finding values of 77% for the brownies and of 72% for the cakes. The chemical characterization was carried out following the AOAC methodology (2000). The protein content of the cake was of 12 and 13%, whilst it was of 10 and of 11% for the brownies for the fermented and unfermented flours, respectively. The protein digestibility was 91% and in 87%. The calorie supply per 50 g serving was 240 for the cake and 231 for the brownie. It was concluded that the products developed can be a healthy alternative for the school children snack.

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**P133** Food Product Technologies

**Improving micronutrients content in formulated infant complementary food in Nigeria**

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Micronutrients are needed mostly during the growing period for optimal functioning of the body. Their deficiencies have created a lot of problems in infants in developing countries. Effects of fermenta-

ation on micronutrients content of formulated complementary food were investigated. Paddy and parboiled rice, soybean, and crayfish were obtained from the open market in Jos. The paddy rice was boiled and cooked by using pan frying and deep fat frying methods. The consumption of baked products, rich in saturated and hydrogenated fats and poor in vitamins and minerals, together with a sedentary lifestyle, is a contributing factor for the prevalence of child obesity. The objective of this work was to partially substitute wheat flour for fermented and unfermented legume flour in the formulation of sensory accepted brownies and cakes, of lower energetic density and higher protein quality intended for school snacks. Vanilla flavoured cakes with 20% of fermented and unfermented Phaseolus vulgaris and brownies with 30% fermented and unfermented flour of Cajanus cajan were formulated. These were evaluated by 10 trained panellists with a 7-point hedonic scale, finding values higher than five in the flavour, smell, texture and overall appreciation for all the products evaluated. In addition, the acceptability was measured with a group of 90 school children, finding values of 77% for the brownies and of 72% for the cakes. The chemical characterization was carried out following the AOAC methodology (2000). The protein content of the cake was of 12 and 13%, whilst it was of 10 and of 11% for the brownies for the fermented and unfermented flours, respectively. The protein digestibility was 91% and in 87%. The calorie supply per 50 g serving was 240 for the cake and 231 for the brownie. It was concluded that the products developed can be a healthy alternative for the school children snack.

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**P132** Food Product Technologies

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The consumption of baked products, rich in saturated and hydrogenated fats and poor in vitamins and minerals, together with a sedentary lifestyle, is a contributing factor for the prevalence of child obesity. The objective of this work was to partially substitute wheat flour for fermented and unfermented legume flour in the formulation of sensory accepted brownies and cakes, of lower energetic density and higher protein quality intended for school snacks. Vanilla flavoured cakes with 20% of fermented and unfermented Phaseolus vulgaris and brownies with 30% fermented and unfermented flour of Cajanus cajan were formulated. These were evaluated by 10 trained panellists with a 7-point hedonic scale, finding values higher than five in the flavour, smell, texture and overall appreciation for all the products evaluated. In addition, the acceptability was measured with a group of 90 school children, finding values of 77% for the brownies and of 72% for the cakes. The chemical characterization was carried out following the AOAC methodology (2000). The protein content of the cake was of 12 and 13%, whilst it was of 10 and of 11% for the brownies for the fermented and unfermented flours, respectively. The protein digestibility was 91% and in 87%. The calorie supply per 50 g serving was 240 for the cake and 231 for the brownie. It was concluded that the products developed can be a healthy alternative for the school children snack.
rice and dehulled soybean mix was formulated in a standard ratio 70:3 g. A modified standard formulation of parboiled rice, dehulled soybean, malted rice and crayfish mix in the ratio of 65:25:5:5 g was prepared. From the formulation, fermentation of different blends at varying periods was carried out for 24, 48, 72, 96, and 120 h. The unfermented standard and modified standard (PR:DSB:MR72:CFo) blends were the controls. The macro elements (calcium, phosphorous, magnesium and lead) and the micronutrients (iron, iodine, selenium, copper, zinc, molybdenum, manganese, vitamins A, B1, B2, C and niacin) were determined by chemical analysis. The unfermented (standard and modified standard) blends had lower mineral values than the fermented blends except the PR:DSB:MR72:CF96 and PR:DSB:MR72:CF120 blends fermented for 96 and 120 h. All the fermented blends had higher vitamin values than the two unfermented control blends. The increases in most of the minerals showed the optimum time of 72 h. These results suggested seventy-two (72) hours as optimum fermentation period.

The roles of GSL are related to membrane functions, such as membrane surface functions, roles in ontogeny and organogenesis, receptor functions, cell growth regulation, and regulation of membrane-bound enzyme. To clarify the biological roles of GSL, it is essentially required to distinctly compare differences among animal species.

The total GSL in the brain and liver of ayu sweetfish were extracted according to the procedure of Svennerholm and isolated with DEAE-Sephadex A-25 and IB column chromatography. After purification, GSL were compared with 1D-TLC. The concentrations of GSL were determined by densitometric scanning and the resorcinol method. Sugars, sialic acids and fatty acids in GSL were subjected to GLC analysis.

The neutral GSL of the brain showed a very simple distribution with ceramide monohexoside (CMH) as the main component, contrary to this, several components including CMH (88.6%) and ceramide dihexoside (CDHG11.4%) were observed in the liver. The gangliosides content of brain was 213 µg/g tissue. The concentration thereof in the liver (28 µg/g tissue) corresponded only to 1/10 of that in the brain. The main ingredient of mammalian extraneural tissue is GM3, but the major ganglioside present most in ayu sweetfish livers was noted to be GM4(24.4%) containing only N-acetyl-neuraminic acid, followed by GD1a (22.3%) and GM3 (13.3%). Contrary to brain, fatty acids of CMH and CSE in the liver indicated high ratio of the hydroxyl fatty acid (49.5% and 48.7%). There is organ specificity in this regard. Generally, hydroxyl fatty acids have a lower melting point and higher hydrophilicity than normal fatty acids having the same carbon chain. Thus interesting compositions may contribute to enhance the reactivity and to adjust the fluidity of membrane.
P136 Food Product Technologies

The energy values of red and white wines produced by ‘13 jul-Plantaze’ AD Podgorica, Montenegro

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Purpose: This paper shows the energy values of red and white wines, on the basis of results of chemical analysis of parameters which determine the energy values of these products.

Methods: Chemical analysis was made on the content of alcohol, fat components, proteins, carbohydrates and organic acids. For the determination of these parameters were used methods gravimetry, volumetry as well as GC and HPLC techniques. In this study were analyzed 22 samples of dry first-class wines, (produced in years 2004 and 2005): Procorde, Perla Nera, Saso Negro, Cabernet, Merlot and Vranac and first-class dry white wines Krstac and Chardonnay.

Results: The energy values of red wines varied from 831.4 kcal/kg (Vranac-2005) to 922.1 kcal/kg (Vranac- 2004. For the white wines these values were in the range of 818.2 kcal/kg (Chardonnay &minus;2005) and 841.7 kcal/kg (Krstac-2005).

Conclusion: The results of this study show that energy values of red wines are for the 1.6–8.7% higher than energy values of white wines. Among the different samples of red wines the highest energy values were founded in the samples of Vranac and Saso Negro.

P137 Food Product Technologies

The quality of the honey from the region of Montenegro

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Introduction and Purpose: This paper shows the quality of honey from the region of Montenegro, on the basis of chemical analysis of parameters of quality determined by Directive 2001/110EU. Generally good ecological conditions and variety of plants species (3,600 on the territory of 13,812 km², among them lot’s of exotic’s species) are convenient environment for the quality of the honey of this region.

Methods: Analyses were made on the 45 samples of honey, from different locations of three geographic areas of Montenegro: Northern, Central and area of the Mediterranean Cost. Analyses were made on the content of water, monosaccharide (glucose and fructose)and disaccharides (saccharose), insoluble substances, total acids, activity of diastases, content of hydroxymethylfurfural (HMF) and content of minerals-total and separate( Na, K, Ca, Mg, Cu, Fe, P and Zn).For the determination of these parameters were used: gravimetry, refractometry, volumetry, spectrofotometry, HPLC and AAS/ICPS. The taste, aroma and appearance were determined by sensorial way.

Results: The values of content of water varied between 16.8–18.8%, for the glucose 26.6–37.0%, saccharose 0.6–0.8%, total minerals 0.6–0.8%.The range of variation of separate mineral content were following: Ca 22.3–180.5 mg/kg; Mg 10.6–138.3 mg/kg; P 16.4-78.8 mg/kg ;Zn 0.5–0.8 mg/kg ; Cu 0.2–0.7 mg/kg; Fe 0.6–7.0 mg/kg; Na 119.1–1039.6 mg/kg; K 171.2–2917.8 mg/kg.

Conclusion: Of all analyzed, 2 samples (4.4%) didn’t correspond to Directive 2001/110 EU, for the reason of higher content of total acids. In this study, the honey with origin of Northern and Central areas showed the high content of mono/disaccharides and total minerals, while samples of area of Mediterranean cost, showed the high content of Fe.

P138 Food Product Technologies

The effect of cultivation type and cultivar on sensory characteristics of fresh strawberry and their purées

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Strawberries are highly valued for their sweetness, highly desirable taste and flavour, pleasant colour and are one of the most important cultivated berry fruit in Croatia. It is widely accepted that consumer acceptance of foods is mainly determined by their sensory perception which is increasingly being used as a tool to qualify and quantify certain food properties. Important quality attributes for fresh fruit consumption were found to be colour, taste, flavour and texture attributes.

Some studies have reported that organic foods themselves are more nutritious and tastier than conventionally grown products. The topic of organic food and organic agriculture attracts considerable public, commercial and research interest so the purpose of the present investigation was to profile the sensory characteristics of fresh fruit and their purées in two strawberry cultivars, Elsanta and Marmolada, grown in conventional and organic cultivation in Croatia.

Quantitative descriptive analysis was used to describe the sensory properties of fresh fruit as well as their purées. All obtained results were statistically evaluated. Conducted sensory evaluation indicated that organic cultivation and cultivar Marmolada had positive influence on colour in all investigated samples. The most common sensory attributes which make variations between cultivation types and cultivars are found to be fruity flavour, odour intensity, sweet, sour and harmonic taste in fresh samples, and strawberry aroma, greeny flavour, sour, sweet, sour and harmonic taste, homogeneous texture and viscosity in purées. No influence of cultivation type or cultivar was observed with respect to fresh samples and purées in sensory attributes such as flowery and earthy flavour, off-flavour, odour intensity and off-odour.
Antioxidative properties of wheat flours

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Knowing that many food products (first of all bread as a frequently used product) contain flour it is interesting to determine the antioxidative potential of some wheat products with the scope to assume the participation of these components in specific health benefits as the prerequisite to select some of them in the category of functional food.

With the aim to determine the antioxidative potency of several kinds of wheat products we investigated ethanolic extracts of wheat flour type 400, 500 and 850, integral wheat flour and wheat bran to evaluate the free radical scavenging capacity of these extracts using DPPH test. Additionally, total phenolics contents of investigated samples were determined. DPPH effects of investigated extracts were compared to ethanolic extracts of commercial antioxidants, such as BHT and a-tocopherol.

The total phenolics of ethanolic extracts were ranged from 19.45±b0.35 (for wheat flour type 400) to 410.63±b6.98 (for wheat bran) mg gallic acid equivalents/g of sample. All investigated extracts showed the similar scavenging activities on DPPH radicals (IC50 values for examined extracts were ranged from 31.26±b0.06 to 39.36±b0.30 mg/ml), which were much lower than DPPH effect achieved using ethanolic extracts of BHT and a-tocopherol (0.1 mg/mL of those antioxidants bring about DPPH effect of 74.56%, 78.07% respectively).

Similar scavenging activities on DPPH radicals suggest that all kinds of wheat products contained similar antioxidative compounds and molecular structure. The obtained results indicate relatively low antioxidant potency of the investigated products. It points out the necessity of enriching flours with additives having better antioxidative effects, if such products wanted to be regarded as functional food.

Antibacterial activity of probiotic yoghurt and soy-yoghurt against Escherichia coli and Staphylococcus aureus

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Yoghurt milk and soymilk samples were inoculated separately with E.coli or S. aureus immediately after adding the starter (bifidobacteria and/or yoghurt culture) to investigate the antimicrobial activity of probiotic yoghurt and soy-yoghurt. Probiotic yoghurt containing Bifidobacterium lactis (Bb-12) and Bifidobacterium longum (Bb-46) exhibited a slight pH drop and slight increase in the titratable acidity compared with plain yoghurt during the refrigerated storage period. Plain yoghurt and probiotic yoghurt containing Bb-12 and Bb-46 inoculated with or without test organisms showed a considerable increase in lactic and acetic acids than the probiotic soy-yoghurt containing Bb-12 and Bb-46 which produces not only lactic and acetic acids but also formic acid. From the initial count of E. coli, % decreases were 96.00, 99.43, 99.14, 97.14 and 98.43%, for the plain yoghurt, probiotic yoghurt containing Bb-12 & Bb-46 and soy-yoghurt containing Bb-12 & Bb-46, respectively. E.coli counts were disappeared in probiotic yoghurt, soy-yoghurt and plain yoghurt after 2, 3 and 5 days of storage, respectively. The decrease percentage for the plain yoghurt, probiotic yoghurt containing Bb-12 & Bb-46 and soy-yoghurt containing Bb-12 & 46 were 85.62, 93.36, 95.58, 93.36 and 95.58 from the initial inoculum level, respectively. The growth of

Aflatoxin B1 binding by Lactobacillus rhamnosus GG reduces its intestinal transport and toxicity in Caco-2 cells

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The probiotic Lactobacillus rhamnosus GG (GG) is able to bind the potent hepatocarcinogen aflatoxin B1 (AFB1) and thus potentially restrict its absorption from the intestine. In this study we investigated the potential of GG to reduce AFB1 availability in fully differentiated Caco-2 cell monolayers, adapted to express CYP 3A4. To study intestinal transport, GG suspension (1×1010 CFU/ml) and AFB1 solution (150 μM) were prepared in culture medium, added to differentiated Caco-2 cells grown on transmembrane filters, and aliquots of medium were taken and AFB1 determined by HPLC fluorescence detection. Furthermore, the integrity of the epithelial cell layer was monitored using transepithelial resistance (TER) measurements. AFB1 transport from the apical to basolateral chamber within the first hour was reduced from 11.1±1.9% in the absence of GG to 6.4±2.5% when co-incubated with GG (1×1010 CFU/ml) (p=0.019). During this time period GG bound 40.1±8.3% of the added AFB1. AFB1 alone significantly reduced the TER in a time dependent manner. TER was reduced by 30.1% (p=0.01), 49.4% (p=0.004) and 64.4% (p=0.001) after 24, 48 and 72 hours respectively, compared to untreated controls. Co-incubation with GG protected against AFB1 induced TER reductions at 24 hours (p=0.002) and 48 hours (p=0.04), but not at 72 hours. These results clearly show that GG can bind AFB1 in Caco-2 model and are therefore suggestive that this binding would restrict AFB1 uptake in vivo. Aflatoxins may have a direct effect on the integrity of the intestine. In this model GG protected against the deleterious effect on TER caused by AFB1. The protective effects of this probiotic should be further explored in humans naturally exposed to aflatoxin through diet.
S. aureus was not detected in the probiotic yoghurt containing Bb-12 and Bb-46 after the 10th day of storage. Low numbers of S. aureus survived in the plain yoghurt and probiotic soy-yoghurt Bb-12 & Bb-46, after 15 days of cold storage.

S. aureus was not detected in the probiotic yoghurt containing Bb-12 and Bb-46 after the 10th day of storage. Low numbers of S. aureus survived in the plain yoghurt and probiotic soy-yoghurt Bb-12 & Bb-46, after 15 days of cold storage.

**P142 Functional Foods**

**Antioxidant properties of sugar beet fibers**

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Functional food, which has adequate nutritive effects, and positive effects on the health of the human organism, represents the core interest of nutritionists today. It has been proven that dietary fibers are necessary in the prevention of the so called western diseases.

Whether dietary fibers created from sugar beet pulp will be classified into a group of components for the production of functional food primarily depends on their content and the optimal ratio of the soluble and insoluble fibers in them. The fibers gained from sugar beet pulps, based on their origin, should contain one more functional property, and that is the antioxidant property.

The aim of this work is to prove the presence of antioxidant properties of dietary fibers produced from sugar beet pulp even after the decolourisation by H₂O₂.

For gaining dietary fibers sugar beet cassettes were used, and a commercial product – Fibrex was used for comparison (particle size <125 μm).

The sugar beet cassettes were subject to discontinual sugar extraction (60 min, 75°C, pH ~6.0). After pressure and drying on 80°C untreated fibers were produced. The so called treated fibers are those which are decolorized with the solution of H₂O₂ (pH = 11, 60°C, 12 h). The dried fibers are grounded and fractionated (particle size <150 μm).

The antioxidative properties of fibers are defined by the total phenolics content, DPPH scavenging activity and AOA.

During the treatment, the content of soluble fibers rises as well as the brightness and the water holding capacity. The content of total phenols decreases, the fibers have weaker antioxidative activities. The untreated and the Fibex fibers have similar antioxidative activities, which show the need for optimising the treatment conditions.

**P143 Functional Foods**

**Barley green matter as a potential source of some nutritional substances**

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Losses of nutritional factors during technological processing, storage, culinary treatments together with wrong eating habits can lead to the diet deficient in some nutritional factors.

Young plant parts are characterized by increased contents of some bioactive substances. Evaluation of barley grass grown in the Czech Republic as a potential source of some nutritional substances are presented. Barley green matter was analyzed for vitamin C, total polyphenols, phenolic compounds and saccharides; enzyme activity of catalase was also determined. To assess enzyme activity of catalase, a spectrophotometric method based on the measurement of the drop of absorbance at 240 nm was used. Ascorbic acid was determined by potentiometric titration. Total polyphenols were determined by a spectrophotometric method. Phenolic compounds and monosaccharides were performed by a HPLC method.

The contents of vitamin C, total polyphenols and ferulic acid decreased with the age of barley plants. The influence of variety has not been proved unequivocally.

The content of vitamin C between 0.107–6.357 g/kg DM, of total polyphenols between 17.167–35.559 g/kg DM and of ferulic acid between 0–5.916 g/kg DM were found. Catalase activity amounted 4.5–35.1 TSU. The highest catalase activity was found in early growth phase (18.5–35.1 TSU). The monosaccharide profile showed high contents of glucose (15.400–88.400 g/kg DM) and fructose (37.600–81.400 g/kg DM) and decrease of their contents with plant growth. The contents of saccharose and galactose were low, fluctuating between 0–7.700 g/kg DM and 3.700–5.300 g/kg DM, resp. The analysis of some nutritional substances have yielded data indicating that this is a valuable plant material for utilization in foods and food supplements.
Baseline levels of p-cresol, 15N-excretion and bifidobacteria influence the response of prebiotic treatment in healthy subjects

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Introduction: Dietary intervention with prebiotics can cause changes in the colonic microbiota and influence their metabolic activities. The present study investigated whether the response to prebiotic treatment is influenced by the baseline composition and activity of the microbiota.

Methods: The short- and long-term (4-wk) effect of lactulose (10 g b.i.d. (n = 29)) and oligofructose-enriched inulin (OF-IN: 10 g b.i.d. (n = 19)) was evaluated in healthy volunteers. Lactose-(15N, 15N)-ureide was used as a marker to study the NH3-metabolism. Urine (48-h) and faeces (72-h) were collected and analysed for p-cresol (protein fermentation metabolite) and 15N-content by GC-MS and combustion-IRMS, respectively. Faecal bifidobacteria were quantified by real-time PCR analysis.

Results: The decrease in urinary 15N and p-cresol excretion after short-term lactulose and OF-IN treatment significantly correlated in both groups with baseline 15N and p-cresol levels (p<0.001). A significant correlation was found between the effect of 4-wk lactulose treatment on 15N and p-cresol excretion and their initial levels (p<0.001), whereas for OF-IN a significant correlation was observed on p-cresol (p<0.001), indicating that subjects with higher baseline levels showed higher response rates to prebiotic treatment. Also a significant correlation was seen between baseline bifidobacteria counts and the effect of prebiotic treatment (p<0.001 (lactulose) and p<0.01 (OF-IN)), indicating that subjects with lower initial bifidobacteria showed higher response rates to prebiotic treatment than those exhibiting higher numbers under baseline conditions.

Conclusions: The response to prebiotic treatment as indicated by the fate of NH3, p-cresol and bifidobacteria is determined by the initial colonic conditions.

Biopotency of the fructooligosaccharides (FOS) and hormonal replacement therapy (HRT) by estrogen on calcium retention in ovariectomized rats

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Osteoporosis is a systemic skeletal disease characterized by low bone density and functional foods are perspective in her treatment.

The purpose this study is to compare the biopotency of prebiotic fructooligosaccharides (FOS) and the hormonal replacement therapy by estrogen (HRT) on calcium retention in the ovariectomized rat. The rats (276.0 ± 3.4 g body weight) were ovariectomized (OVT) and 30 days after they received FOS (50 g FOS/Kg diet) and/or HRT (30 μg/Kg body weight) for 20 days (G1 = OVT + FOS + HRT; G2 = OVT + FOS + saline; G3 = OVT + water + HRT; G4 = OVT + water + saline). The total alkaline phosphatase activity, content of bone calcium, radiodensity, biomechanic properties and scanning electron microscopy (SEM) were performed. The data were analyzed by two-way ANOVA/Tukey’s test (p<0.05). The administration of FOS enhanced (22%) the calcium intestinal absorption and the treatments had reduced (G1,G2,G3 = 13.7 ± 0.8; G4 = 25.4 ± 1.0 mol/L) the total alkaline phosphatase activity. In the tibiae calcium deposition, the FOS treatment increased (G2 = 354.9 ± 17.7 gCa/Kg bone), but when the FOS administration plus HRT (G1 = 380.4 ± 26.6 gCa/Kg bone) this effect is more strong. However, the isolated HRT treatment not showed difference as compared to the G4 animals group (G4 = 255.1 ± 7.0 gCa/Kg bone). This result is supported for radiodensity analysis (G1 = 121.2 ± 0.9; G2 = 111.6 ± 1.0; G3 = 99.3 ± 1.6; G4 = 97.8 ± 2.5 grey shade). In femur biomechanical properties, the G1 (126.7 ± 6.1N; 28.6 ± 3.7 × 10–3 J) and G3 animals group (137.3 ± 6.8N; 34.2 ± 3.8 × 10–3 J) suggests an increased effect on the bone capacity in absorbing energy. These results can be observed in the qualitative analysis of the SEM. Prebiotics substances consumption should be introduced for prevention of osteoporosis or treatment associated with HRT.

Casein phosphopeptide-induced calcium uptake in intestinal cells is related to cell differentiation degree

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Introduction: Casein phosphopeptides (CPPs) are known to bind minerals and prevent the precipitation of calcium ions. In a human intestinal tumor cell line, HT-29, they elicit a marked and transient rise of intracellular free calcium concentration. The aim of the present study is to understand if this CPP induced calcium uptake is correlated to cell differentiation degree. Moreover, stated the vitamin D role on intestinal cell differentiation, to explore a possible interplay between the two nutrients.

Methods: Synthetic and natural CPPs were employed. Cytosolic calcium changes were measured on single cells by video-microscopy. Intestinal cell differentiation was studied by Transmission Electron Microscopy and enzyme activities.

Results: CPP administration in HT-29 cells induces a calcium increase in 10% of the undifferentiated cells and in 75% of the differentiated cells, while the amount of the intracellular calcium reached does not vary. The same results were obtained using Caco2

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cell line, even if in this case the percentage of responsive cells at a full differentiation degree never exceeds the 30%. Pretreatment of undifferentiated HT-29 and Caco2 cells with vitamin D induces a well differentiated cell phenotype. In these vitamin D-pretreated cells CPP administration evokes a calcium increments in all the analyzed cells, with sustained oscillations and calcium rises. The same vitamin D pretreatment on the two differentiated cell lines neither modifies their phenotype, nor affects the CPP influence on calcium uptake.

**Conclusion:** The ability of CPP to increase calcium uptake is strictly related to the differentiation degree of the intestinal cells.

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**P147 Functional Foods**

**Chemometric analysis of A-gliadin presence in food products**

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Sequences that contain motifs potentially toxic to patients with celiac disease may be detected in polypeptide chains of numerous food proteins containing prolamine fractions. Detrimental components that must be eliminated from the diet are primarily wheat gliadins (A-gliadin), so it is important to detect allergenic proteins or proteins responsible for food intolerance. We developed a strategy for the detection and identification of specific proteins. This strategy is based on integrated chemometric analysis of proteins and specific products of their proteolysis, separated chromatographically and characterized spectrally and by MS.

It was demonstrated, using the databases of protein and bioactive peptides BIOPEP (www.uwm.edu.pl/biochemia) as well as the method of in silico protein proteolysis, that pepsin releases, among others, a peptide fragment containing potentially toxic tetrapeptides. This fragment is characteristic only of α-gliadins (A-gliadin) and is not present in pepsin products of hydrolysis of the other fractions of wheat proteins and proteins of other cereal species. The results of in silico proteolysis were verified by in vitro hydrolysis of all fractions of wheat gliadins as well as of barley and oat proteins. The hydrolysis product specific to A-gliadin was identified based on chromatographic-spectral analysis (RP-HPLC) and mass spectrometry (MALDI – ToF Pro). The results provided the basis for developing a spreadsheet for a qualitative and quantitative evaluation of proteins toxic to patients with celiac diseases, found in raw materials and food products.

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**Comparative study of the antioxidant capacities of complex dishes**

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These last years, the consumers seek more and more to associate to the nutritional value food, a beneficial effect for health. The food characterized by high antioxidant power seems to correspond to this request. The evaluation of the antioxidant capacity of a food is in the majority of the cases is estimated starting from the values of the various ingredients before formulation. Several phenomena are likely to modify the antioxidant power (adsorption, synergistic effect, degradation…) during the time of the lifespan of a foodstuff. Thus, in order to quantify this antioxidant power, it is suitable to determine it on prepared dishes.

The objectives of this work are to adapt a reproducible method for the quantification of the antioxidant capacity on complete feeding stuffs, and to compare this index of several products containing a broad range of raw material.

The study was carried out on 20 prepared dishes. For each dish the equivalent Trolox (TEAC) (method with the ABTS. +) and total phenolic compounds of the ethanolic extracts were determined.

The results obtained show that it is possible to use the developed method based on the ABTS as a protocol for the determination of the antioxidant capacity. The application to 20 prepared dishes shows that these preparations are characterized by a significant variation of the antioxidant capacity according to their composition. Nevertheless, these results also showed that the antioxidant power can be predicted neither from the concentration of the total phenolic compounds, nor from the antioxidant activity of raw materials.

These results will allow creating an index of an antioxidant power of the complex food.

This study also suggests the need for evaluating this index on the elaborate product and not from the raw materials.

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**P149 Functional Foods**

**Consumption of chicory products beneficially affects large bowel ecosystem in rats**

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Inulin is a natural oligosaccharide extracted from chicory with potential application in functional foods and in promoting gastrointestinal health. Depending on the degree of chicory root processing, products with different physiological properties could be obtained. The aim of the study in rats was to compare the effect of different
chicory products (unprocessed or debittered flours, and a lyophilized extract) on caecal metabolism.

The following diets were administered for 4 weeks to Wistar rats: C (control, with 7.5% of sucrose), IN (7.5% of inulin from debittered chicory flour), F (7.5% of fructans, i.e. 80%:20% inulin and fructooligosaccharides (FOS), respectively; source of inulin like in the IN group, FOS a commercial preparation), F + PPL (7.5% fructans, i.e. 80%:20% inulin and FOS, and 0.01% of polyphenols from the unprocessed flour), and FOS + PPH (7.5% of FOS and 0.05% of polyphenols from the lyophilized extract).

All chicory treatments caused a significant increase in caecal tissue weight. A significant increase in digesta mass and concentration of protein was only observed in the FOS + PPH group. Ammonia concentration and pH of digesta were diminished by all treatments (to a larger and lesser extent in the F and FOS + PPH groups, respectively). The highest activity of gluconuclease was observed in the control group (0.97 U/g fresh digesta), while it was effectively reduced in chicory groups (to 0.37–0.77; P < 0.05). Diet supplementation with chicory products increased the concentration (per g of digesta) and content (per caecum) as well as the proportion of propionic and/or butyric acids at the expense of acetate, when compared to the control rats.

In conclusion, the chicory preparations examined exerted beneficial changes in the caecal metabolism in rats.

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**P150 Functional Foods**

**Consumption of vitamin C and iron-fortified fruit juices and effect on the nutritional status of iron and vitamin C in young women**

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**Objective:** To assess the impact derived from the consumption of iron and ascorbic acid-fortified fruit juices on the nutritional status of iron and vitamin C in young women.

**Subjects and Methods:** Thirty two young women (20–30 y) with marginal status of iron participated in a crossover (21 days each) supplementation study with 2-months wash-out in between. Subjects consumed 2 × 250 ml/day vitamin C-fortified juices providing ca. 500 mg vitamin C/day supplied as fruit juice (control) and fruit juice containing milk (11% final product, CPPs) and iron (sulphate, 3 mg/100 ml). Blood samples were collected and analyzed before and after each supplementation period for serum iron, ferritin, transferrin, haemoglobin and VCM, and for ascorbic acid levels in plasma (HPLC). Quality control was contrasted by participating in the Vitamin C Quality Assurance Programme conducted by NIST (MD, USA). Data were analysed using Wilcoxon-rank signed tests and ANOVA with post-hoc Tukey test.

**Results:** Upon vitamin C and iron-fortified juice consumption for 21 days, serum levels of ferritin and iron increased without reaching statistical significance. Plasma levels of ascorbic acid increased significantly in both periods regardless of the presence of iron in the juice.

**Conclusions:** Vitamin C and iron-fortified fruit juices may help to improve iron nutritional status without altering the effect on vitamin C status.

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**P151 Functional Foods**

**Date fiber, a byproduct of date syrup (Debis) extraction influences serum lipid concentrations in rats fed 0.2% cholesterol**

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Dietary fiber has been recognized as an important dietary constituent, which posses a wide range of positive properties. It was found that some components of dietary fiber, particularly soluble in water, might influence lipid metabolism. Many sources of dietary fiber have been tested in animals and humans. The scientific community continues to search for new sources of dietary fiber. Date is one of the most important fruit crops in the United Arab Emirates. Dates are a good source of fiber and other nutrients. They are commonly eaten with milk, yogurt or coffee. They are also used to produce Debis, a date syrup extraction. The effect of date fiber (DF), a by product of date syrup (Debis) extraction on lipid metabolism was investigated in male Sprague Dawley rats adapted to 0.2% cholesterol (CHO) diets. The rats were divided in four groups of 5. The basal diet consisted of AIN 76 diet. The control group (C) consumed the basal diet with 0.2% of cholesterol. To the control diet were added 2, 3, or 5% of DF. Plasma total cholesterol (TC), LDL cholesterol (LDL-C), HDL cholesterol (HDL-C), triglycerides (TG), and the ration HDL-C/LDL-C were measured. The results showed that the addition of 2, 3 and 5% DF did not affect weight gain, feed intake and feed efficiency. The addition of 5% DF to the diet significantly (P < 0.05) increased HDL-C (40.2 vs 21.9 mg/100 ml; +83%) and lessened the rise in plasma LDL-C (24 vs 47.3 mg/100 ml; −97%) and increased the HDL-C/LDL-C ratio (1.6 vs 0.5; 220%). The addition of DF to diets containing 0.2% CHO did not affect total cholesterol and triglycerides. These results demonstrate that DF possesses hypolipidemic that are evident when it is added to the diet of rats fed cholesterol.
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**Effect of chicory root fructans and polyphenols on serum lipids level and biomarkers of antioxidant status in rat model study**

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Chicory (Cichorium intybus L.) root is a rich source of fructans but it also contains a significant amount of polyphenols, especially chlorogenic and dicaffeoyl quinic acids. They are known to exert many-sided systemic effects, e.g. modulate lipid and antioxidant status of the host. The purpose of the 4-wk study was to evaluate the effect of a chicory preparation containing both fructooligosaccharides (FOS), and polyphenols on a serum lipids level and biomarkers of the antioxidant status in rats.

Experimental diets contained 7.5% of FOS (from a commercial preparation) or the same amount of FOS and 0.05% of polyphenols (from chicory roots). The concentrations of glucose, triacylglycerol (TAG), and cholesterol (total and HDL) in the serum, as well as the changes in serum total antioxidant status (TAS), glutathione peroxidase (GPx), superoxide dismutase (SOD) activities, and in the level of thiobarbituric acid-reactive substances (TBARS) in selected tissues were assessed.

The chicory root preparation caused a significant decrease in TAG and an increase in HDL-cholesterol concentrations, compared with the sucrose control group. The effect of the FOS preparation had the same tendency, yet it was statistically insignificant. The lowest concentration of TBARS in the kidneys, liver and serum was determined in rats administered the diet with the chicory preparation (P < 0.05 vs. the control). The rats fed the diet containing chicory fructans and polyphenols were characterized by the highest activity of SOD (P < 0.05 vs. the FOS-group) and the level of TAS (P < 0.05 vs. the control and FOS groups).

In conclusion, compared to the control diet and that supplemented with FOS, the dietary addition of the chicory root preparation, containing both fructans, and polyphenols, is favourable.

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**Effect of conjugated linoleic acid (CLA) on serum lipid profile and liver cholesterol in rats fed semi-purified AIN-93G diet**

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The objective of this study was to assess the effect of CLA-supplemented AIN-93G diet on serum lipid profile, plasma malondialdehyde (MDA) and liver cholesterol in rats. Wistar male rats were housed in colony cages in a temperature-controlled environment with a 12-h light cycle. The animals were randomly assigned to two groups (n = 6) and fed experimental diets: I-AIN-93G (control), II-AIN-93G + 1.0% CLA (Luta-CLA 60). After 21 d, the animals were anesthetized using thiopental sodium (25 mg/100 g BW), blood samples were collected into test tubes with and without anticoagulant, centrifuged (4,000 g, 10 min) to obtain plasma and serum, respectively. Moreover, livers were dissected and frozen (−80°C) in order to determine the amount of cholesterol in the tissue. Serum samples were analyzed using commercially available kits for: total cholesterol (TC), HDL-cholesterol (HDL-C) and triacylglycerols (TAG) (Cormay; Olympus Diagn.). LDL-C + VLDL-C was calculated as the difference between TC and HDL-C. MDA was determined in plasma samples using kit OXI-TEK TBARS. The data were analyzed by one-way ANOVA and treatment means were compared by the Duncan’s multiple range test at P < 0.05. The CLA-supplemented diet affected neither growth nor liver mass of rats. The same was true for the following serum lipoproteins: TC, HDL-C, LDL-C + VLDL-C. In contrast, TAG concentrations were significantly (P < 0.05) decreased in rats fed the CLA-supplemented diet (2,36 vs 1,58 mmol/l) whereas plasma MDA was only slightly affected (17,98 vs 16,08 mmol/ml). In conclusion, dietary CLA fed at 1% level (w/w) in AIN-93G diet for rats, decreased serum TAG as well as liver cholesterol concentrations, thus showing a potential anti-lipidemic effect.

**P154** Functional Foods

**Effect of curcumin and saikosaponin A on carbon tetrachloride-induced liver injury in rats**

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Curcumin and saikosaponin A, the bioactive ingredient of turmeric and Bupleuri Radix, respectively, act as a free radical scavenger and antioxidant. This study investigated the effects of curcumin and saikosaponin A on inflammation and fibrosis in rats with carbon tetrachloride (CCl4)-induced liver injury. Male Sprague-Dawley rats were randomly divided into: control, CCl4, CCl4 + curcumin (CU; 0.004%), CCl4 + saikosaponin A (SA; 0.005%), or CCl4 + curcumin + saikosaponin A (CU + SA; 0.004% + 0.005%) group. Rats were injected with 40% CCl4 at a dose of 0.75 ml/kg body weight once a week for 7 weeks one week after oral administration of curcumin and/or saikosaponin A. After 8-week curcumin and/or saikosaponin A treatments, plasma and liver were collected for pathological and biochemical analyses. The pathological results showed that all curcumin or saikosaponin A treated groups ameliorated liver fibrosis. However, only the CU + SA group diminished necrotic hepatocytes. The CCl4 group significantly increased plasma alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities at week 1 compared with the control group. Curcumin or saikosaponin A treatment alone and combination decreased plasma ALT and AST
activities at week 7 and 8 compared with the CCl4 group. All curcumin or saikosaponin A treated groups reduced hepatic pro-inflammatory cytokines – tumor necrosis factor-alpha (TNF-alpha), interleukin-1beta (IL-1beta), and IL-6 levels compared with the CCI4 group. Curcumin or saikosaponin A treatment alone and combination increased hepatic anti-inflammatory cytokine – IL-10 level. Additionally, all curcumin or saikosaponin A treated groups suppressed hepatic anti-inflammatory cytokine – transforming growth factor-beta1 (TGF-beta1) and hydroxyproline concentrations.

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**P155 Functional Foods**

**Effect of defatted corn germ and bran consumption on oxidative stress induced by vitamin E deficiency in rats**

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Cereals are important, because they contain nutrients and energy and also antioxidants. Accordingly, the aim of this study was to determine antioxidant capacity of defatted corn bran with its germ (DCGB), in rats with oxidative stress induced by vitamin E deficiency. In the study there were 8 groups of 7 rats each: The first two groups (Controls) received diets with either a fiber free (FFCF) or a whole corn flour (WCF). Two groups received similar diets but deficient in vitamin E and the four remaining groups received vitamin E deficient diets but with increasing concentration of DCGB (14.5, 21.7, 29 y 43%). The experiment lasted 21 days and on the last day, vitamin E level in serum and liver, catalase and glutathione reductase activity in erythrocytes and thiobarbituric acid reactive substances (TBARS) in the serum of the studied rats were determined. Total antioxidant capacity (TAC) of corn flour, whole corn flour and DCGB was determined by ORAC. Although food intake was similar in all groups, growth and feed efficiency were lower in the DCGB and in the whole corn flour consuming rats. Vitamin E deficient rats had very low levels of this vitamin in serum and liver but they showed high serum TBARS. However, the increment in TBARS seen in these rats was less apparent in the rats consuming WCF and decreased even further with the diets containing 14.5 or 21.7% DCGB. Catalase activity increase whereas glutathione reductase decrease in response to oxidative stress. TAC of FFCF, WCF and DCGB were: 28.0 ± 2.2; 7.9 ± 0.9 and 4.6 ± 1.5 micromol trolox/g respectively, suggesting that it increased with their corn fiber content. This study indicates that dietary WCF and DCGB reduce oxidative stress and suggests that this could be associated with their dietary fiber content.

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**P156 Functional Foods**

**Effect of functional food (probiotic yoghurt) on the anti-oxidant balance in healthy women**

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**Introduction:** Functional foods (FF) aimed at improving the consumers’ health have become an important and rapidly expanding segment of the European food market. Nutritional science has been expanding the knowledge of how functional foods influence the consumers in relation to specific health parameters. However, many aspects concerning FF are discussed controversial.

Considering the involvement of free radicals in immunological processes we tried to verify and compare the effects of probiotic (L.casei) and conventional yoghurt on the anti-oxidant balance in plasma of humans.

**Subjects and Design:** After a preadjustment phase of 7 d, female volunteers consumed 100 g/d of probiotic (probiotic group = PG: n = 17) or a conventional fermented milk product (conventional group = CG: n = 16) for 14 d (T1-T2) and 200 g/d for another 14 d (T2–T3). A wash-out phase lasting 14 d followed.

**Methods:** Total antioxidant capacity (TAC) was determined photometrically, malondialdehyde (MDA) and conjugated dienes (CD) using HPLC methods.

**Results:** Depletion of several plasma antioxidants led to a significant (p < 0.001) decrease of the average TAC values during the period T1-T3 in both tested groups. In this interval the mean plasma levels of oxidant parameters as MDA and CD increased significantly in the PG (MDA: p < 0.01; CD: p < 0.001) and the CG (CD: p < 0.01), resulting in significant negative correlations of TAC/CD and TAC/MDA in both groups (PG: p < 0.01; p < 0.05; CG: p < 0.01).

Although several analysed parameters changed during the study partly more distinct in the PG than in the CG, no significant differences between the groups were observed.

**Conclusion:** These results indicate a possible influence of both, probiotic and conventional yoghurt on the anti-oxidant balance in plasma of healthy women.
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Effect of hot water extracted Lycium barbarum and Rehmannia glutinosa on carbon tetrachloride-induced liver injury in rats
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Poly saccharide-rich Lycium barbarum and Rehmannia glutinosa have been considered to have immune-modulating property. This study investigated the effects of hot water extracted Lycium barbarum and Rehmannia glutinosa (HE) on carbon tetrachloride (CCl₄)-induced liver injury in rats. Male Sprague-Dawley rats were randomly divided into: normal diet (group A), normal diet + peritoneal injection of olive oil (control) (group B), normal diet + CCl₄ injection (group C), 1× HE (0.05% HE for each) + CCl₄ (1× HE), and 3× HE (0.15% HE for each) + CCl₄ (3× HE) groups (n = 10 per group). Rats were injected with 40% CCl₄ at a dose of 0.75 ml/kg body weight once a week for 7 weeks once a week after hepatic extract treatment. After 8-week hepatic extract treatment, plasma and liver were collected for pathohistological and biochemical analyses. The pathohistological examination showed that both 1× and 3× HE treatments for 8 weeks diminished necrotic hepatocytes, chemoattraction of inflammatory cells, and liver fibrosis. Both 1× and 3× HE treatments decreased plasma alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities, and reduced hepatic pro-inflammatory cytokines – tumor necrosis factor-α (TNF-α) and interleukin-1β (IL-1β) (IL-1β) levels compared with CCl₄ treatment alone. The 1× HE treatment increased hepatic anti-inflammatory cytokine IL-10 level. Both 1× and 3× HE treatments suppressed liver fibrosis markers – transforming growth factor-β1 (TGF-β1) and hydroxyproline contents. In conclusion, herbal extract treatment (0.05% and 0.15% for each) for 8 weeks can protect against necrotic damage indicated by the decrease of plasma ALT and AST activities, and prevent liver fibrosis by down-regulation of inflammation in rats with CCl₄-induced liver injury.

P159 Functional Foods
Effects of garlic extracts on differentiation and bone-resorption mediators in osteoblastic MC3T3-E1 cells
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Bone remodeling is maintained by bone formation and bone resorption, and is mainly regulated by calcium and estrogen. Recently, several other biochemical molecules, including matrix metalloproteinase (MMP), nitric oxide (NO) and cytokines, have been indicated to play significant roles in bone remodeling. Because garlic has been reported to be able to prevent bone loss, this study was aimed at investigating the effect of garlic extracts, diallyl sulfide (DAS) and allyl methylsulfide (AMS), on the differentiation and bone remodeling-associated factors in osteoblastic MC3T3-E1 cells. The results indicated that DAS (1–10 µg M) and AMS (1–10 µg M) showed no cytotoxicity on MC3T3-E1 cells. During the mineralization process, DAS slightly increased alkaline phosphatase (ALP) activity and collagen content, whereas AMS had no such effect, and both DAS and AMS increased MMP-2 activity. On the other hand, DAS and AMS dose-dependently inhibited the tumor necrosis factor-alpha (TNF-α) stimulated production of NO and interleukin-6 (IL-6), two molecules that enhance bone resorption. In conclusion, DAS enhances osteoblastic differentiation by increasing collagen content, activity of ALP and MMP-2, whereas AMS acts through enhancing MMP-2 activity. Additionally, both DAS and AMS suppressed TNF-α-induced production of bone resorption mediators, NO and IL-6.
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Effects of ginsenosides on carbon tetrachloride-induced hepatitis and fibrosis in rats

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Chronic hepatitis has been currently become the 7th leading cause of death in Taiwan, and is associated with the occurrence of hepatocellular carcinoma. This study investigated ginsenosides on carbon tetrachloride (CCl4)-induced hepatitis and fibrosis in rats. Male Sprague-Dawley rats were randomly divided into 4 groups: control, CCl4, CCl4 + Panax ginseng extract (GE; 80% ginsenosides with Rb1, Rb2, Rg1, Rg2, Rg3, Rd, Rc, and Rb1), and CCl4 + Rb1 (Rb1; 98% Rb1) groups. Rats were intraperitoneally injected with an equivalent dosage of olive oil as the control group. After 9-week treatments with ginsenosides, plasma and liver were collected for pathological and biochemical analyses. The pathological results showed that the GE and Rb1 groups significantly reduced hepatic fat deposition (P < 0.05), especially the Rb1 group. The GE group decreased hepatic necrosis and collagen accumulation. Both GE and Rb1 treatments reduced plasma alanine aminotransferase and aspartate aminotransferase activities, as well as plasma and hepatic triglycerides elevated by CCl4 (P < 0.05). The GE group inhibited hepatic pro-inflammatory cytokines – tumor necrosis factor-alpha and interleukin-1beta (P < 0.05), and tended to suppress soluble intercellular adhesive molecule-1 level. Both GE and Rb1 decreased collagen precursor \( \gamma \)-V hydroxyproline level (P < 0.05). Therefore, Panax ginseng extract and Rb1 can moderate hepatic necrosis and inflammation induced by CCl4 to inhibit liver fibrosis.

P162 Functional Foods

Evaluation of oral administration Pracparatum mungo in BALB/c mice CYP gene induction using quantitative RT-PCR

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Pracparatum mungo is green bean through natural fermentation, then soaking in aqueous Chinese herbal medicine mixture, finally dry by room temperature process to become the refining of natural functional food. Pracparatum mungo has been used as a traditional medicine for liver protection and detoxification in China. Cytochrome P450 compose a super family of similar protein involved in detoxification and elimination, as well as activation of a wide variety of compounds. Most CYP family members are localized in the liver. 20 female BALB/c mice were divided into 2 groups. Group A received only the vehicle and normal chow diet. Group B were oral administered Pracparatum mungo (50 mg/per day) and normal chow diet. Animal were scarificed after 4 weeks. Liver slices were prepared for RNA preparation and real time quantitative RT-PCR. The cDNA sequences of mice CYP1A2, 2B10, 3A11, 2E1 and B-actin were obtained from GenBank. PCR primers and probe sequences were designed using PrimerExpress sofware. From our result, Pracparatum mungo significantly induced CYP1A2, 2B10, 3A11, 2E1 mRNA levels. In summary, the Pracparatum mungo induction CYP gene expression profile could used as safety information and provided information of interaction with other drug metabolism.
P163 Functional Foods

Feeding laying hens with either flaxseed, fish oil concentrate or combination of both: influence on lipid composition of the egg yolk

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There are two main conventional sources of omega-3 polyunsaturated fatty acid (n-3PUFA) enrichment in egg yolk; one is alpha-linolenic acid (ALA-18:n-3), which is abundant in seeds such as flaxseed, the others are long-chain n-3 PUFAs (LCn-3PUFA) in the form of EPA(20:5n-3), DPA(22:5n-3), DHA(22:6n-3), which are mostly found in marine species such as fish an marine mammals. Laying hens have developed enzymes for elongation and desaturation of ALA to DHA. The supplementation of chicken basal diet with flaxseed can produce an appreciable amount of LCn-3FA in egg yolk. However the there is a limitation for using flaxseed in the chicken feed, due to sensory quality.

The aim of this study was to compare these two feeding options in order to deuce consequences for quality of the eggs produced as well as to explore the mechanism of n-3PUFA in the yolk.

In feeding method the chicken were given one of the following diets: basal diets, basal with 1% concentrated PUFA, 15% flaxseed, 1% PUFA plus 15% flaxseed. The diets were fed for 7 weeks, then eggs were collected randomly from each group. The lipid were extracted from pooled yolk samples for fatty acids analyses by gas chromatography.

The results revealed that 15% flax diet lead to an appreciable amount of LCn-3PUFA which was the same range as those diet fed to chicken with 1% LCn-3PUFA. Feeding flaxseed resulted in 18 fold increased in 18:3n-3, too, which was in expense of the saturated palmitic acid (16:0) and this is of nutritional value to human health. Furthermore, feeding additional 1%LCn-3FA to 15% flax diet did not result in promote the accumulation of LCn-3PUFA in egg yolk.

In was concluded that flaxseed is a suitable feed ingredient for enrichment of n-3PUFA in egg yolk, increasing both, LCn-3PUFA and ALA.

P164 Functional Foods

Functional food ingredients promoting oral Health

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Many functional food ingredients have been identified, which may, via different mechanisms, contribute to maintain good dental and oral health. In view of the overall interest in functional ingredients for foods and oral health care products, it is timely to analyse and review the state of knowledge of all such ingredients, with respect to their specific properties.

The activity, which intends to run for two years, aims to address a number of functional food ingredients, such as polyols, noncarcogenic disaccharides, intense sweeteners and milk proteins/caseinophosphopeptides and other calcium compounds, together with tea and cocoa components as well as ways to minimise the erosive potential of drinks and other foods.

The goal of the project is to generate, compile and disseminate up to date information on substances and formulations, which contribute to maintain good oral/dental health and to provide the scientific substantiation for claims. Potential claims would be evaluated using the PASSCLAIM (Process for the Assessment of Scientific Support for Claims on Foods) model.

The poster is intended to present the outline of the project and if feasible the preliminary findings.

The project is supported and coordinated by the Oral Health Task Force of ILSI Europe, which has the mission to review scientific data on the relationship between diet and oral health and to disseminate its research results to the general public through its various publications.

P165 Functional Foods

Garlic decreases body weight accompanied with up-regulation of lipolytic gene expression and down-regulation of adipogenic transcription factor

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Obesity is viewed as a serious public health problem. This study was aimed to investigate the effect of garlic (Allium sativum Linn) on obesity. Male C57BL/6J mice were fed with high-fat diet to induce obesity. The diet-induced obese mice were subsequently fed with 2% or 5% garlic (w/w) supplemented diet for 8wks. The body weight, adipose tissue mass, and lipid profiles of plasma were measured. The mRNA levels in adipose tissue were analyzed using quantitative realtime PCR. Experimental diets supplemented with 2% or 5% garlic reduced body weight by 8% or 20% respectively, compared to control
diet. 5% garlic diet decreased the epididymal adipose tissue mass by 29%. The concentration of plasma triacylglyceride and free fatty acids were significantly lower in the mice fed with garlic diet (p < 0.05). The mRNA levels of lipolytic genes, such as hormone sensitive lipase (HSL), acyl-CoA oxidase (ACO), and carnitine palmitoyl transferase I (CPT-I) were significantly increased by garlic supplementation (p < 0.05). Whereas the mRNA levels of adipogenic transcription factors, such as peroxisome proliferator-activated receptor gamma (PPAR-γ), CCAAT/enhancer-binding protein-alpha (CEBP-α) and sterol regulatory element-binding protein-1c (SREBP-1c) were significantly decreased by garlic supplementation (p < 0.05). These results suggest that garlic has an anti-obesity action through increase of lipid catabolism and suppression of adipogenesis.

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P166 Functional Foods

High total antioxidant capacity (TAC) products added to diet

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Introduction: Evidence supports the strategy of increasing antioxidant-rich foods consumption to reduce the risk of chronic diseases. 

Aim: To assess the effect of consumption of antioxidant-enriched products on antioxidant status, oxidative stress, inflammatory response and liver function, in healthy volunteers.

Methods: The study design was based on a 3 + 3 weeks randomised crossover placebo-controlled intervention study interrupted by a 3 week washout period. Thirty subjects had followed alternatively a diet added with high total antioxidant capacity (TAC) products or with placebo products. On the last day of each period of intervention, subjects underwent a physical examination, provided blood and 24 h urine samples. Blood biochemistry, markers of oxidative stress, inflammation, haemostasis and circulating antioxidant vitamins were determined. Diet was registered in the last week of each period by a 7-day dietary record.

Results: Both placebo and test periods significantly increased energy, protein, carbohydrate and dietary fibre intakes and percent energy from carbohydrate, while decreasing percent energy from fat. High TAC diet (HT) significantly increased TAC, vitamin C and E intake. No change was observed in body weight, blood pressure or any urinary and blood marker, except for protein carbonyls that decreased significantly (p < 0.05) during the HT diet. HT diet increased significantly (p < 0.05) plasma ascorbic acid and alfa-tocopherol, while carotenoids did not change.

Conclusions: The consumption of TAC enriched foods effectively increases antioxidants intake, thus changing body oxidative status by raising plasmatic levels of antioxidants and reducing plasma oxidised protein. However, HT diet was not able to modify the considered pathophysiological biomarkers.

P167 Functional Foods

Hop supplementation and oxidative metabolism

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Introduction: Hop is a leguminous plant whose flowers are used in the production of beer to give it characteristic bitterness. In its composition flavonoids stand out. These are phenolic compounds with recognised antioxidant properties, which may have a protective role against processes induced by oxygenic reactive species, such as inflammatory processes.

Objective: To study the effect of hop supplementation over oxidative stress and inflammatory parameters.

Experimental Design: The research was done with a group of elderly nuns (32) (Mean ± SD), with an ordered and homogeneous lifestyle. This group followed a uniform diet, in which 400 mg/day of commercial hop (Elusan®) was supplied for 45 days.

2 blood extractions were carried out (before and after the supplementation).

With regard to the oxidative damage to macromolecules we have determined the levels of substances coming from lipid peroxidation which react with thiobarbituric acid (TBARS), and the content of carbonyl groups (GC) of proteins. In inflammatory indicators, the complement C3 and C4 fractions, the reactive C protein, interleukin-1α, interleukin-6 and the tumour necrosis factor alpha (TNF-α) were defined.

Results: After 30 days of supplementation, we observed a decrease in the oxidative stress parameters compared to previous values, TBARS decreased in a 15% (p < 0.00).

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Impact of functional foods enriched with bioactive antioxidant multi-components on oxidative stress in breast cancer patients

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Background: It is well known that cancer increases free radicals and that certain diets can influence oxidative stress. There is little evidence about the functional effect of multi-component functional foods on oxidative stress in breast cancer.

Methods: Thirty four female patients with histologically confirmed breast cancer, stages IIIB and IV were enrolled in a randomised controlled trial. 7pts received 15ml/day balsamic vinegar from apples and honey, with Hyppophae Rhamnoides, 5pts received 150g/day defatted extruded soy cereal, and 5pts 100ml/day tomato juice with Epilobium angustifolia. Oxidative stress was done by the FORT (free oxygen radical) test. Total hydro- and liposoluble antioxidants (ACW, ACL) in serum were measured by chemoluminometry. The values were compared between entry and after 3 weeks.

Results: Mean age was 57.84 ± 11.2. The metabolic syndrome was present as follows: waist circumferences > 88 cm in 75% cases, insulin resistance measured by IRHOMA > 2.5 in 71.1% cases, TGL > 150mg/dl in 62.2% cases, HDL < 50mg/dl in 55.6% cases, confirming the association with breast cancer. Radicall activity > 310 FORT units relevant for increased oxidative stress was present in 95.1% cases. In the nutritional intervention group ACW at inclusion was 118.3 ± 69.8 micromol/l and did not change significantly. However, ACL at entry was 103.7 ± 41.0 micromol/l and decreased to 61.9 ± 17.2 micromol/l, accompanied by an increase of oxidative stress in 3pts on soy cereal.

Conclusion: The unexpected increase of oxidative stress could be explained by the impaired absorption of bioactive components due to the negative effect of the heavy proteins in the defatted extruded soy. Further study is needed for a proper design of functional foods that can lead to significant effects on human health.

Impact of NUTRIOSE® 06, a soluble fiber, on intestinal well-being and immunity maintenance

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Irritable Bowel Syndrome (IBS) is the most common gastrointestinal disease, affecting 20% of the general population and characterized by abdominal pain and infraclinical intestinal inflammation. Fiber supplementation is a classical treatment option of IBS but the role of fibers on intestinal pain and inflammation remains poorly known.

Aim: To evaluate in vivo in mice the role of a prebiotic-like soluble fiber NUTRIOSE® 06 on intestinal mediators involved in the regulation of pain (mu opioid receptor = MOR) and inflammation (proliferator-activated receptors gamma = PPARg; interleukin-1 beta = IL-1b; tumor necrosis factor alpha = TNFa).

Method: NUTRIOSE® 06 10% and its control Dextrose were orally administered during 4 weeks to healthy mice having free access to food and tap water. MOR, PPARg, IL-1b and TNFa mRNA levels were quantified blindly by real time Polymerase Chain Reaction (PCR) from mice’s colon samples.

Results: Compared to the control supplementation, NUTRIOSE® 06 induced a significant increased colonic expression of the analgesic receptor MOR (p < 0.01) and of the anti-inflammatory nuclear receptor PPARg (p < 0.01), together with a significant decreased concentration of IL-1b mRNA (p < 0.003) and a trend to decrease TNFa mRNA levels (p = 0.056).

Conclusion: IBS, although being a not life-threatening disorder in adult people, often leads to disabling (social events, traveling, work). A four weeks administration of NUTRIOSE® 06 improved significantly biological markers of abdominal pain and inflammation in mice. These results advance our understanding of fiber effects on intestinal pain and inflammation, showing that NUTRIOSE® 06 may influence regulation of local immunity and suggesting that it may be a promising and safe treatment of IBS patients.
Carotenoids, found in fruits and vegetables, are important dietary nutrients having antioxidant potential and are consequently being considered as important preventive strategic molecules. Transport proteins, embedded in lipid membranes, facilitate the import of nutrients into cells or the release of toxic products into the surrounding medium. Using high throughput screening (HTS) techniques, 11 selected carotenoids were screened for their interaction with ABC Transporters (MDR1, MRP1, MRP2, MRP3 and MXR) and Uptake Transporters (OATP-8, OATP-B and OATP-C). Measurements were performed on membrane vesicles or cell lines containing the transporter studied. The Propidium iodide method was used to study the cytotoxicity of the compounds. Some compounds (Lutein, Violaxanthin, Neoxanthin, Capsanthin, etc.) showed significant interaction with MXR, MRP1 and/or MDR1. A large number of carotenoids have shown an activation or inhibition of one or more Uptake Transporters. The cytotoxicity test performed on all carotenoids showed that these compounds did not alter membrane integrity. These results suggest that dietary constituents can regulate the expression of ABC and Uptake Transporters. The results also might provide valuable information on the absorption or excretion potential of nutrients in the human body and on food-drug interactions.

P171 Functional Foods
Isolation and identification of estrogenic compounds in Yam tuber (Dioscorea alata cv. Tainung no. 2)
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Yam (Dioscorea) tuber, often recommended by folklore medicine to treat menopausal syndrome, has been shown to improve the status of sex hormone in postmenopausal women. However, phytoestrogenic activity and active compound have never been reported. In this study, a transactivation assay using CHO-K1 cells transiently cotransfected with a (UAS)-4tk-alkaline phosphatase reporter and a chimeric receptor of GAL4-hERα (or β) LBD was established for the measurement of estrogen receptor activation. It was found that ethyl acetate extract (EAE) of various species/varieties of Yam tubers activated estrogen receptor α and β to various extents. Using the transactivation assay to track the active components, EAE of Dioscorea alata cv. Tainung No.2 (TNG2 EAE) tuber was fractionated by repeated silica gel column chromatography. The active compounds were isolated and purified by preparative HPLC. Base on NMR and Mass spectroscopy, two new compounds, hydro-Q9 chromene (1) and γ-tocopherol-9 (2), together with 3 known compounds, RRR-α-tocopherol (3), coenzyme Q9 (4), and 1-feruloylglycerol (5) were isolated and shown to activate ERα and β. The maximum fold of induction relative to 1 nM 17β-estradiol on ERα were 77% (50.4 µM) (1), 77% (26.6 µM) (2), 112% (11.6 µM) (3), 77% (25.2 µM) (4) and 32% (149.2 µM) (5); on ERβ were 102% (50.4 µM) (1), 84% (26.6 µM) (2), 204% (46.4 µM) (3), 27% (25.2 µM) (4) and 72% (149.2 µM) (5). The EC50s of ERα activation are 10.8 µM (1), 12.7 µM (2), 2.5 µM (3), 13.3 µM (4) and 3.1 µM (5), of ERβ activation are 7.4 µM (1), 3.2 µM (2), 9.2 µM (3), 1.1 µM (4) and 20.1 µM (5). These results provide basis for the beneficial effect of yam for menopausal women.

P172 Functional Foods
Mentha spicata tea as inhibitor of noenzymatic protein glycation in vitro
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Introduction: The protein glycation contribute in some pathological conditions including diabetic complications. This reaction produce advanced glycation endproducts (AGEs) characterized by fluorescence emission, a brow color and intra- e intermolecular cross-linking. It has been reported that antioxidants molecules, radical scavengers and chelating agents can inhibit the formation of AGEs. The Mentha spicata tea (MST) is amply used in both Mexican cuisine and in the traditional medicine.

In this study, we tested the effectiveness of MST to protect against noenzymatic protein glycation.

Methods: A MST was prepared and set to 250 mmequiv Acid Gallic of total phenolic. The antioxidant activity as measured by α-carotene bleaching. The iron-chelating ability and the concentration of saponins were determined. The protein glycation (Ribose-Bovine serum albumin) in 0.1 M phosphate buffer, pH 7.4, 5 days at 37°C in the presence of MST was assayed. In other assay aminoguanidine was added instead of MST as control. The fluorescent products of the reaction were analyzed by fluorescence emission spectra. The absorbance spectra (200–700nm) of glycation products were also obtained.

Results: The determined concentration of saponins was 18g/ml for MST, while the antioxidant activity was found to be similar to the butylated hydroxytoluene (BHT). MST also showed at high iron-chelating ability (57%). The formation of fluorescent products and brow products was inhibited at 98% in both systems. Interestingly, both brow- and cross-linking products formation was detected only with aminoguanidine, while in MST were prevented.

Conclusion: MST is a natural antioxidant with an excellent protein glycation inhibitory activity. It is suggested its use against diabetic complications.
P173 Functional Foods

Nutritional bioactive and antioxidant properties of selected fruit seeds

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There is a growing interest in the food industry and in preventive health care in the evaluation of natural nutritives with antioxidant properties. Consumption of a diet rich in antioxidant active polyphenol compounds has been linked with a reduced risk for cardiovascular diseases and certain types of cancer. The objective of this study was to quantify the total polyphenol compounds and to evaluate the antioxidant and free radical scavenging properties of seed extracts of pomegranate, papaya and melon.

The ground seeds were dried and extracted with 80% ethanol in water. The obtained solid extracts were analyzed for their content of total polyphenols (Folin-Ciocalteu method). The antioxidant activities were determined with the DPPH* radical scavenging method in terms of their Efficient Concentration EC50 (mg antioxidant /mg DPPH*).

All the seed extracts showed remarkable amounts of total polyphenols and considerable free radical scavenging activity (EC50). Comparatively, the amount of total polyphenols (mg/g) in the seed extracts decreased in the order papaya (20.9) > pomegranate (9.9) > melon (3.5). Correlating with the polyphenol content, the extract of papaya seeds proved to have the highest antioxidant activities (EC50: 6.2), followed by the pomegranate seed extract (EC50: 10.1), whilst the extract of melon seeds showed only relatively poor inhibitory effectiveness (EC50: 28.4).

The results indicate that fruit seed extracts, above all papaya seed extracts, have remarkable antioxidant properties in correlation with their total polyphenol content. An application as functional natural antioxidant food additive and as health promoting dietary supplement seems to be worth considering.

P174 Functional Foods

Nutritional interest of cereal products in view of their content in fructans: Analytical and physiological approach

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Background: Cereals can be considered as an important source of non digestible carbohydrates (NDC), such as fructans, which could be interesting through their fermentation in the gut.

Aim of the Study: 1) To quantify fructans and other fermentable NDC in different cereal products. 2) To evaluate the functional effects generated by cereal meals in normal and obese animals.

Methods: 1) The quantification of fructans, resistant starch, and soluble/insoluble fibers was performed by AOAC validated methods in barley, wheat and spelt whole meal, flour and bran fractions. 2) Wistar rats were fed a control diet ± 70% whole meals (spelt or wheat) for 4 weeks. C57bl/6j mice were fed a high fat diet ± 10% wheat bran (aleurone-enriched or crude fraction) or fructans for 4 weeks.

Results: Wheat and spelt whole meal were richer in fructans than barley; whereas there was no difference in basal resistant starch content between cereal products. Insoluble dietary fibers represented the major part of non digestible compounds. Wheat and spelt whole meal did not modify body weight, adipose tissue, glucose or lipid homeostasis, but increased caecal weight and caecal acetate and butyrate content versus controls. The fermentation in cereal groups could not be attributed to fructans or resistant starch content. Caeal fermentation and the decrease in adiposity – observed in fructan-fed mice – was not observed in mice supplemented with bran fractions.

Conclusion: Spelt and wheat bran contain significant amount of NDC, prone to be fermented; fructans can not explain per se the extent and the profile of fermentation observed in animals; we propose that arabinoxylans could be an interesting candidate explaining the physiological effects of cereals products related to gut fermentation.

P175 Functional Foods

Olive polyphenols anti-inflammatory activities and molecular mechanisms

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Olives are a rich source of polyphenol with potent antioxidant activities which may contribute to the health benefits of the Mediterranean diet. We investigated the anti-inflammatory activities of olive phenolic compounds, especially hydroxytyrosol (OH-T) and a standardized mix of olive juice polyphenol (HIDROX) in cell-based in vitro systems and in in vivo models of acute inflammation. OH-T and HIDROX dose-dependently inhibited the production of nitric oxide (NO) and prostaglandin E2 (PGE2) in lipopolysaccharide (LPS) -stimulated macrophages. We have found by immunoblot analysis that OH-T impeded the LPS-induced degradation of transcription factors (TF), impairs the subsequent nuclear translocation of TF and the associated gene activation. The mRNA level of distinct inflammatory genes (e.g. interleukin-1α, inducible NO synthase and PGE2 synthase) was dose-dependently modulated by OH-T. In addition, we demonstrated that OH-T reduced the binding of monocytes to inflamed endothelial cells by impairing the expression of chemokines and intracellular adhesion molecules (ICAM). The olive phenolics also have anti-inflammatory effect in vivo reducing the carrageenan-induced paw edema in rat. Finally, OH-T and HIDROX were able to inhibit the LPS stimulated production of TNF-α in mice suggesting a possible use in the treatment of inflammatory and autoimmune diseases. A comparative analysis of the main olive polyphenols suggests that OH-T is one of the main active compound of HIDROX. The data revealed that the olive phenolic compounds contained in HIDROX have pleiotropic anti-inflammatory effects.
mediated by factors that regulated gene expression. They also modulate cellular and molecular events related to endothelial dysfunction.

**P176 Functional Foods**

**Oral administration of trans-resveratrol modulates intestinal immune system in rats**

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Trans-Resveratrol, a natural polyphenol present in grapes, has been described as immuno-modulator in vitro. However, little is known about its activity on immune response in vivo. Consequently, we investigated for the first time, the effect of trans-resveratrol on gut-associated lymphoid tissue (GALT) and spleen lymphoid populations. Effects on intestinal secretion of IgA and serum IgA and IgG concentrations were also studied. A group of adult male rats was administered by gavage 20 mg/kg of trans-resveratrol in cyclodextrin (20%) for 28 days, whereas another group received only the solvent. At the end of the treatment, lymphocytes from mesenteric lymph nodes (MLN), Peyer’s patches (PP) and spleen were isolated, double stained and analyzed by flow cytometry. Immunoglobulin concentration in serum and intestinal content was quantified by ELISA. trans-Resveratrol diminished total lymphocytes in MLN, but were not altered in PP. B lymphocytes were reduced in MLN of the trans-resveratrol group, but were not affected in PP. trans-Resveratrol increased T lymphocytes and its two main subpopulations (Th helper, Th and T suppressor/cytotoxic, Ts/c) in MLN and PP. Importantly, trans-resveratrol lowered activated Th lymphocytes in MLN and PP, in 35% and 65%, respectively. Ts/c activated lymphocytes were not changed in MLN but were reduced in PP of the resveratrol group in 35%. No differences were shown in the spleen. Serum IgG and IgA remained unchanged between groups. Conversely, intestinal IgA secretion was reduced by trans-resveratrol. In conclusion, trans-resveratrol exerts an immuno-modulatory effect on organized-GALT by lowering activated T lymphocytes, without any outcome on the peripheral immune system.

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**P177 Functional Foods**

**Physiological functionalities of the novel low glycemic carbohydrate isomaltulose (Palatinose™)**

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Low GI foods have manifold physiological effects, most obviously low glycemia and insulinaemia. In this paper, an example for a way how to reduce the GI in foods by maintaining the full carbohydrate availability is illustrated by using the slowly digestible Palatinose™ instead of classical rapidly digestible carbohydrates. It will focus on the physiological mechanisms and impact on body functions associated with this replacement. The slow, but complete digestibility of Palatinose™ was confirmed in a study with 10 ileostomized subjects who received 50 g Palatinose™ either in beverages or in beverages and foods. Effects of such replacements were investigated in studies for substrate metabolism and physical performance in double-blind cross-over designs with 21 healthy athletes and 20 subjects with metabolic syndrome. Performance and metabolic/clinical parameters were analysed and showed higher fat oxidation at the same carbohydrate intake level with the slow digestible carbohydrates and maintaining high physical performance. The influence on mental performance was investigated in 15 healthy subjects. Palatinose™ helped to deal with mental challenges over a prolonged period of time. The effect of different glycemic carbohydrate sweetened beverages on food intake, hunger and satiety is studied in 40 healthy subjects. In summary, the use of the slow digestible, available carbohydrate Palatinose™ results in clear metabolic and physiological functional effects in humans.

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**P178 Functional Foods**

**Potential prebiotic effect of almond (Amygdalus communis L) seeds**

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A prebiotic is ‘a nondigestible food ingredient which beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon and thus improving host health’. Although any dietary material that enters the large intestine can be considered as potentially prebiotic, currently the most well known prebiotics are non-digestible oligosaccharides.

Lipid is the main storage component in almonds and is located as intracellular oil bodies; it makes up approximately 55% of the total weight of the seed. In this study we describe the potential prebiotic properties of almond seeds using in vitro fermentation with representative human gut bacteria. In order to assess the effect of lipid, finely ground almonds (FG) and defatted ground almonds (DG) were tested in batch fermentations after performing in vitro gastric and duodenal digestions.
Incubation with FG determined an increase in the number of bifidobacteria and lactobacilli after 8h fermentation time, whereas the clostridial population remained stable. No significant changes in bacterial population occurred with addition of DG. A prebiotic index (PI), which gives relative indication of the prebiotic potential, was calculated for FG and DG and compared to the values obtained with fructo-oligosaccharides (FOS), a well established prebiotic carbohydrate.

The effect of almond fraction addition on the bacterial production of short chain fatty acids (lactic, acetic, propionic and butyric acids) in the fermentation vessels was also determined using HPLC.

**Acknowledgement**

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**P179 Functional Foods**

Probiotic strains reduced food intake and the severity of DSS-induced inflammation in mice model

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Probiotics are known to be helpful in the prevention or treatment of many gastrointestinal disorders, however their efficacy depends on the strain and on the host response. The aim of the study was to evaluate the protective effect of two probiotic strains in the murine model of DSS-induced colitis.

Lactobacillus paracasei NCC2661 (LP) and Bifidobacterium longum NCC3001 (BL) were administered separately or together, to BALB/c mice daily by gastric gavage. One group of control mice received only the spent culture medium. The probiotic treatment lasted 14 days and all mice were given DSS 1% in the drinking water during the last 7 days to induce the colitis. Food intake was controlled daily and the severity of inflammation was assessed by macroscopic and histologic scores. The expression of cytokine (TNF-α), mucin and TFF3 genes in the colonic mucosa was determined by RT-PCR.

Probiotic treatments affected significantly the weight gain of mice (P < 0.0001) before DSS (0–7 days), which could be due to a significant reduction of food intake (P < 0.003). This effect was not strain-specific. On the contrary, probiotics prevented DSS-induced body weight loss, and reduced mucosal macroscopic (P < 0.001) and histologic scores in the distal colon (P < 0.007). However, TNF-α gene expression was not changed in the colonic mucosa. In addition, probiotics did not restore DSS-induced alterations of Muc and TFF3. Both strains had the same effect and no additional effect was observed when they were administered together.

These results indicate that the probiotic strains LP and BL have the potential to prevent intestinal inflammation; however their mechanism of action remains to be specified. In addition, we suggest that these two probiotics may impact on food intake in non-colitic mice.

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**P180 Functional Foods**

Protecting activity against free radical and chelating effects of Mexican red cactus pear (Opuntia spp) fruit

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**Introduction:** Oxidative stress promoted by reactive oxygen species plays an important role in several human pathologies. Many clinical studies have suggested that natural antioxidant compounds may be helpful in the treatment of these diseases. The antioxidant activity in a molecule may be due to the prevention of reaction initiation, the chelating activity of the metal catalyst, and the decomposition of peroxides. Cactus pears are widely distributed in Mexico, the antioxidant ability of a large number of Mexican native species remains unknown.

In this work, the study of the antioxidant activity of several Mexican red cactus pears (Opuntia spp) fruit was performed.

**Methods:** The juice of red cactus pear fruit (JCP) was obtained from three commercially ripe fruits and stored frozen at −72°C. Thawed samples were filtered (0.45 μm) before analyses. The antioxidant activity was determined: the scavenging activity onto DPPH• (2,2-diphenyl-1-picrylhydrazyl radical), the antioxidant activity against the color loss of an emulsion of β-Carotene, the chelating activity of ferrous ions, and the scavenging effects on hydroxyl radicals (.OH) generated in a Cu(I)-dependent manner.

**Results:** The JCP exhibit powerful DPPH• scavenging activity (3,500 mmeqv TROLOX). The protecting activity against the oxidation of β-carotene was 41%. The chelating effect on ferrous-ions was 57%. The facility to form a complex with metals ions interfered with the Fenton reaction, thus the formation of the .OH decreased. The JCP showed high copper chelating ability because it was needed high concentrations of Cu(II) (>1,000 μM) for absorbance decrease at 523 nm of JCP.

**Conclusion:** JCP may act as a powerful natural antioxidant and also could be an important additive for functional foods.

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**P181 Functional Foods**

Screening of anti-gout activity of some plant food

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The anti-gout activity of methanol and petroleum ether extracts of celery leaves, celery seeds, rosemary, cinnamon and turmeric as functional food components was studied in potassium oxonate treated rats (250 mg/kg body weight, intraperitoneal). Blood samples were collected from all rats after an overnight fast and after 3 and 6h from oxonate injection for determination of erythrocyte sedimentation rate
(ESR), plasma uric acid, nitric oxide (NO) and malondialdehyde (MDA). Urine samples were collected for 6h after injection for the determination of uric acid. Assessment of total phenolic contents, fatty acids and unsaponifiable matter (UNSAP) in the plants under study was carried out. Results showed that oxonate treatment produced significant increase in all studied parameters. Oral administration of different extracts (500mg/kg body weight) showed significant reduction in plasma and urine uric acid levels, petroleum ether extract of celery seeds was the most promising. The administration of different extracts showed significant reduction in inflammatory markers and MDA with variable degrees. GLC investigation of the UNSAP extracts showed significant reduction in inflammatory markers and MDA with variable degrees. GLC analysis of the fatty acids methyl ester showed that celery seeds and leaves contain the highest contents of oleic and linoleic acid respectively. Linolenic acid was only present in celery seeds and leaves. All the studied plants were rich in phenolic contents, celery seed was superior in this respect. In conclusion, the studied plant extracts showed significant anti-gout activity associated with both antioxidant and anti-inflammatory effects which may be due to presence of phenolic compounds, unsaturated fatty acids, B-sitosterol and B-amyrine.

**P182 Functional Foods**

**Screening of Chinese herbal extracts with estrogenic activity**

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Estrogenic activity is known to be mediated by Estrogen Receptors. In this study, a transactivation assay using CHO-K1 cells transiently co-transfected with a (UAS)4-alkaline phosphatase reporter and a chimeric receptor of GAL4-hERα (or β) LBD was used to screening a series of herbs commonly used in the formulations of gynecological remedies in traditional Chinese medicine. Herbal materials were extracted by 80% or 100% methanol, or ethyl acetate (EA). It was found that 6 Chinese herbs, Glycyrrhiza inflata (GI), Polygonum multiflorum (PM), Angelica sinensis (AS), Prunus persica (PP), Rehmannia glutinosa (RG), and Atractylodes macrocephala (AM), and four potable flowr herbs, Chrysanthemum morifolium (CM), Nelumbo nucifera (NN), Jasmium sambac (JS), and Osmanthus fragrans (OF) activated ERα#945; or ERβ or both. It was found that methanol extract of GI and EA extract of RG and AM activated both ERα#945; α#61472; and ERβ. The maximal folds of induction relative to 1 nM 17β-estradiol on ERα#945; and ERβ, respectively are 23% and 58% (GI); 17% and 34% (RG); 44% and 76% (AM). EC50s (µg/mL) on ERα#945; and ERβ, respectively are 0.81 and 0.30 (GI); 0.91 and 4.43 (RG); 2.22 and 4.01 (AM). Interestingly, methanol extracts of PM, NN, JS, CM and OF activated ERβα#61472; but not ERα#945;. The maximal folds of induction on ERβα#61472; are 49% (PM), 42% (NN), 47% (CM), 19% (JS) and 22% (OF) that of 1 nM 17β-estradiol. In contrast, methanol extract of AS and PP activated ERα#945;α#61472; but not ERβ, the maximal folds of induction are around 20% that of 1 nM 17β-estradiol. Results of this study provide a rational basis for the use of these herbs in the formulation of gynecological remedies in traditional Chinese medicine.

**P183 Functional Foods**

**Screening of lactobacillus strains for bio-preservative production and probiotic activities from Iranian yogurt**

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Lactic acid bacteria (LAB) are the best strains for bio-preservative production and probiotic application. The preserving effect of these organisms is partially due to the production of fermentation end-products but may also be due to the formation of small, heat stable inhibitory peptides, often referred to as bacteriocins. The probiotic potential of 100 isolated strains of lactobacillus spp. from iranian yogurt was investigated. The strains were examined for resistance to acidic pH, lactic acid and bacteriocin production, antimicrobial activities against enteric pathogenic bacteria and other important indicator strains. From the results obtained in vitro, 34 strains inhibited growth of indicator strains, five strains, lactobacillus brevis Y46MA, L. brevis Y43SA, L. agilis Y48NA, L. agilis Y48A and L. amylovorus Y83SA produced peptide antimicrobial agents. These strains were selected for further studies such as L(+) and D(−) Lactic acid production, bacteriocin production, purification and characterization.

**P184 Functional Foods**

**Short term and long term study of oligofructose enriched inulin and arabinoxylanoligosaccharides on colonic NH3-metabolism by means of lactose-[15N, 15N′]-ureide in healthy volunteers**

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**Introduction:** Oligofructose and inulin are well known prebiotics whereas arabinoxyloligosaccharides (AXOS) are recently proposed as new prebiotics. AXOS with a degree of polymerisation of 9 and degree of substitution of 0.25 are obtained by chemical and enzymatic degradation of arabinoxylan, which is extracted from wheat bran. AXOS with a degree of polymerisation of 9 and degree of substitution of 0.25 are obtained by chemical and enzymatic degradation of arabinoxylan, which is extracted from wheat bran. We investigated short and long term effects of oligofructose enriched inulin (OF-IN) and AXOS in healthy subjects by means of lactose-(15N, 15N′)-ureide (15N-LU) to quantify the effectiveness of...
prebiotics by measuring their influence on the colonic NH3-metabolism.

**Methods:** In this cross-over study, 9 healthy volunteers consumed OF-IN for 2 weeks and AXOS for 2 weeks (5 g/d), with a 3-weeks washout period in between. Before the start (baseline), on the first day (short term effect) and immediately after (long term effect) each intake period, the volunteers received a test meal labelled with 15N-LU. After each test meal, urine (48 h) and faeces (72 h) were collected. 15N-enrichment in urine and faeces was measured by combustion-IRMS.

**Results:** A significant decreased urinary 15N-excretion and a significant increased faecal 15N-excretion were observed at short term intake of OF-IN and AXOS as compared to baseline. After the long term intake of OF-IN and AXOS a tendency towards a decreased urinary 15N-excretion and increased faecal 15N-excretion was observed. The shift from urinary to faecal 15N-excretion after short term intake of OF-IN and AXOS suggests a lower generation of ammonia in the colon and/or a higher uptake of 15N due to an increased bacterial metabolism and growth.

**Conclusion:** OF-IN as well as AXOS influences beneficially the colonic NH3-metabolism, indicating their prebiotic properties.

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**P185 Functional Foods**

**Stability and antioxidant capacity of food polyphenols in two chemical models of the gastric tract**

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Diets rich in fruits and vegetables are associated with a lower incidence of cardiovascular and degenerative diseases. Dietary antioxidants, such as polyphenols, are possible mediators of these beneficial effects. Indeed polyphenols could play a key role within the gastro-intestinal tract, where they are accumulated in large concentrations after a meal rich in plant products and where lipid peroxidation induced by dietary iron is quite fast. The main goal of this work is the in vitro investigation of lipid oxidation processes possibly taking place in the gastric tract and their inhibition by food polyphenols.

Modelling of the gastric conditions is achieved by sonication sunflower oil in mildly acidic buffer in the presence of albumin or phospholipids. Lipid oxidation is initiated by metmyoglobin, a form of dietary iron from red meat, and assessed by the spectrophotometric measurement of dienylhydroperoxides. Some dietary abundant polyphenols (quercetin, rutin, (+)-catechin, caffeic acid, chlorogenic acid) are evaluated for their capacity to inhibit heme-initiated lipid oxidation in the model gastric emulsions. Consumption of polyphenols and formation of the degradation products are followed by HPLC-UV and HPLC-MS.

Results indicated that all the tested polyphenols inhibited lipid peroxidation in concentrations found in food (25–100 μM). Quercetin proved to be the best inhibitor in both models. Phospholipid-stabilised emulsions were less strongly inhibited by food polyphenols compared to albumin-stabilised ones outlining the influence of lipid droplet sizes and polyphenols interactions with albumin. Structure elucidation of the polyphenol degradation products revealed the formation of several oxidation products that are themselves potent inhibitors.

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**P186 Functional Foods**

**Rice bran improves glycemic control, increases insulin secretion, and lowers free fatty acids and LDL cholesterol levels in type 2 diabetics**

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Rice bran might help lower cholesterol in moderately hypercholesterolemic persons, but its effects on adiponectin and glycated hemoglobin levels in type 2 diabetes mellitus patients have not been clarified. Twenty-eight type 2 diabetic volunteers were randomly divided into two groups: double-blind groups supplemented with either 20 g of stabilized rice bran or a placebo once daily for 12 wk. All subjects kept dietary records and were instructed not to change their normal dietary habits or medicine intake. Following supplementation, postprandial glucose and the area under the glucose curve (AUC-glucose) of the rice bran group were significantly lower (p < 0.05) by 14.4% and 17.5%, respectively. Compared with the baseline, the glycated hemoglobin (HbA1c) values in the rice bran group were also significantly lower (p = 0.03). The area under the insulin curve (AUC-insulin), the homeostasis model assessment index, and the insulin/glucose ratio in the rice bran group were significantly higher (p < 0.05) by 35.5%, 7.9%, and 18.6% than the respective values of the placebo group. Serum total cholesterol and low-density lipoprotein concentrations in the rice bran group were 9.2% and 13.7% lower than those of the placebo group (p < 0.05). The plasma free fatty acid and adiponectin concentrations in the rice bran placebo group were 20% lower and 57% greater, respectively (p < 0.05). In conclusion, the present study is the first demonstration that stabilized rice bran lowers HbA1c values, through higher adiponectin levels which improves insulin secretion in type 2 diabetics. Adiponectin may become a new control mark for type 2 diabetics.

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**P187 Functional Foods**

**Study finds fruit and vegetable consumption low and lacking a variety of colors**

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Many fruits and vegetables, especially those that are bright orange, red, blue, green and purple, are high in phytochemicals,
which help prevent diseases such as cancer, and vitamins, which are needed for good health. Therefore, nutritionists recommend that individuals consume adequate amounts of a variety of fruits and vegetables, and that they make the content of their diet as colorful as possible. Indeed, many educational initiatives have focused on this for several years. We investigated the total amount consumed, the number of eating occasions, and the colors of fruits and vegetables that were eaten by 108 participants. Using data collected from in person interviews that included a 24-hour dietary recall, fruit and vegetable intake was assessed, and individual items were divided into color categories. Fruits were eaten by 52 percent of the individuals, with a total of 81 eating occasions, and a mean total intake of only one-half cup. Colors most frequently represented included red (i.e. apples), 31 percent, orange (mostly orange juice), 27 percent, and yellow (banana), 19 percent. Vegetables were eaten more frequently with a total of 237 eating occasions, and a mean total intake of 1.6 cups. White starchy vegetables (usually potatoes) accounted for 27 percent of those occasions, followed by light green (normally green beans) at 24 percent, and dark green leafy at 9 percent. Thus consumers are not including an adequate amount of fruits and vegetables in their diets, and had very little variety in what they did consume. Several vitamins and other healthy components could be missing from the diet as a result of these limitations.

### P188 Functional Foods

**Supplementation of Eleutherococcus senticosus (CIWUJIA) on cardiorespiratory function and fat metabolism in college students**

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Eleutherococcus senticosus (ES) has been used to increasing energy and vitality for over 2,000 years in Chinese medicine. This study examined the effects of oral ES supplementation on cardiorespiratory function and fat metabolism for 8 weeks. Eighteen healthy male and female college students successfully completed the trial, after randomly receiving in a double-blind design an oral dose of 600 mg ES or placebo (P). Subjects did the cycling exhaustion exercise tests, which at baseline and after 8 weeks of daily supplementation. Blood parameters were collected before, between and after each exhaustion exercise trial. Statistical analyses showed significant differences (p < 0.05) between the ES and P groups at the endurance exercise time increased 30% (from 2,032 s to 2,639 s) and the HRmax increased 4% (from 181 to 191 beat/min) on the ergometer. After the exhaustion exercise, blood lactic acid decreased 18% (from 12.34 mmol/L to 10.12 mmol/L) and 20% (from 327 µmol/L to 294 µmol/L) increased in blood free fatty acid. We conclude that oral ES supplementation 600 mg per day for 8 weeks may increases the availability of fat for oxidation in working muscle during high intensity endurance exercise, and does enhance cardiorespiratory function. And this dosage have no side effect to human. We recommend Eleutherococcus senticosus as an effective nutritional supplement.

### P189 Functional Foods

**The amount of B1 and B2 vitamins in milk with added prebiotics and fermented by bifidobacteria**

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Fermented dairy products are still the major food vehicles in which probiotic bifidobacteria are delivered. A number of parameters including added prebiotic compounds can influence the survival of bifidobacteria and production of different fermentation products. The synthesis of B vitamins by bifidobacteria enhances the nutritional quality of the fermented milk product.

The objective of this study was to analyze the amount of vitamin B1 and B2 in milk with added prebiotics and fermented by Bifidobacterium lactic.

Lactulose (Duphilac, Netherlands) and inulin (Ratifilne, Belgium) were added (1, 2, 3, 4 and 5%) to 100g of milk. The milk samples were inoculated with Bifidobacterium lactis (BB-12, Chr. Hansen, Denmark) and incubated at 38°C for 16 hours. Fermented milk products were analyzed for B1 and B2 vitamin content by AOAC Official standard assay procedures. Fermented milk without prebiotics is used as control.

Obtained data shown the lactulose concentration added to milk from 1% to 3% enhanced the growing production of vitamin B1 from 0.39 mg kg⁻¹ to 0.49 mg kg⁻¹ and B2, from 2.36 mg kg⁻¹ to 3.02 mg kg⁻¹. No significant difference was observed in amount of vitamin B1 and B2 between sample with added 5% lactulose and control. The similar data was obtained analyzed the fermented milk samples with added inulin concentration from 1% to 4%. Laboratory studies have generally shown that the increasing of vitamin B1 and B2 concentration’s in milk fermented by Bifidobacterium lactic depends on the concentration of lactulose and inulin.

### P190 Functional Foods

**Traditional yoghurt culture: Standardization and biodiversity**

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Yoghurt is considered today as the product of milk fermented with symbiotic cultures of S. thermophilus and Lb. delbrueckii subsp. bulgaricus under certain conditions. In the context of the strictly controlled yoghurt production procedure, the bacterial growth is predetermined and often differentiated in its profile as compared to the variety of microorganisms grown in the minimally controlled traditional preparation procedure. The diversity of microorganisms grown in traditional yoghurt is a result of the ‘spontaneous’ or ‘natural’ fermentation of milk. Some of the microorganisms grown through
‘spontaneous’ fermentation may contribute to the organoleptic, technological or nutritional properties of the product distinguishing it from its contemporary analogue. In the present study, we investigated the microbial content of twelve yoghurts stated as ‘traditional’, which were manufactured at a household, semi-industrial or industrial level. Also, we investigated the potentiality of yoghurt production through ‘spontaneous’ fermentation, and the prevailing microflora of the fermented milks produced was determined. The study aimed to contribute towards the determination of the microflora of traditional yoghurt. The yoghurts examined had limited non-starter lactic acid microflora. Moreover, the populations of the starter lactic acid bacteria of the yoghurts prepared in household scale were below the recommendations of international organizations. S. thermophilus and Lb. delbruecki subsp. bulgaricus were not detected in the fermented milks examined. Due to the ‘spontaneous’ fermentation, the predominant microflora of the fermented milks produced was determined. The study aimed to contribute towards the determination of the microflora of traditional yoghurt. The yoghurts examined had limited non-starter lactic acid microflora. Moreover, the populations of the starter lactic acid bacteria of the yoghurts prepared in household scale were below the recommendations of international organizations. S. thermophilus and Lb. delbruecki subsp. bulgaricus were not detected in the fermented milks produced through ‘spontaneous’ fermentation, while P. pentosaceus and L. lactis predominated among the isolated lactic acid bacteria. Further studying is needed towards the production of yoghurt via the ‘spontaneous’ fermentation of milk.

This study confirms that increased dietary protein increases colonicocyte genetic damage in rats and concurrent feeding of RS can reverse the effect. Importantly it also shows that where dietary starches are cooked, HAMSB affords particularly effective protection.

P192 Functional Foods

Acute effects of the rice covered with microcrystalline cellulose coating and addition of microcrystalline cellulose to rice on postprandial blood glucose in humans

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Microcrystalline cellulose is thought not to affect the viscosity of the digesta and to be relatively inert with the exception of effects caused by adsorption and dilution. However, we have previously found that ingestion of microcrystalline cellulose reduces the postprandial blood glucose increment by increasing the digesta viscosity in the acute study using rats. The purpose of the present study is to examine effects of microcrystalline cellulose on postprandial blood glucose in humans. We employed four types of rice: a rice covered with 5% microcrystalline cellulose coating, which we developed, a rice with 5% microcrystalline cellulose addition, and a rice covered with 5% indigestible dextrin coating, and normal rice because rice is a staple food for Japanese. The four types of rice were studied in a crossover study using 10 healthy volunteers with 22–44 ages after an overnight fast. Subjects consumed a test rice containing an equal amount of carbohydrate, which based on chemical composition analysis, with equal chewing rate and count. Postprandial glucose and insulin were evaluated for 180 min after the meals using laboratory kits (Wako). The order of postprandial glucose level was as follows, normal rice = indigestible dextrin coating > cellulose coating > cellulose addition (p < 0.05 by multiple comparison after Friedman test).

P191 Functional Foods

Butyrylated high amylose starch is more effective than high amylose starch in preventing dietary protein-induced colonicocyte genetic damage in rats

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Previous studies have shown that high protein diets increase colonicocyte genetic damage and that the damage was ameliorated by the concurrent feeding of resistant starch (RS) as high amylose maize starch (HAMS). The protective effect of HAMS may be due to increased butyrate production by bacterial fermentation. Typically, dietary RS comes in cooked products, but the RS content of HAMS is lowered by cooking, potentially limiting its effectiveness. Butyrylated HAMS (HAMSB) is more heat stable and a more reliable vehicle for of increasing colonic butyrate. This study investigated the effect of cooked starches on colonic butyrate levels and their impact on dietary protein-induced colonicocyte genetic damage.

Rats were fed diets containing 10 or 20% cooked HAMS or HAMSB and 25% casein as the protein source. The study included a low (15%) and high protein (25%) controls. After 28d of feeding, colonic tissue and digesta samples were collected. Genetic damage was assessed using the comet assay. Digesta butyrate levels were determined by gas chromatography.

Genetic damage was 2 fold higher in rats fed 25% protein diet compared with those fed 15% casein (P < 0.001). Concurrent feeding of 25% protein and either HAMS or HAMSB lowered genetic damage significantly. 20% HAMSB was twice as effective as 20% HAMS with damage lowered to the level of the low protein control. Large bowel digesta butyrate was significantly increased in rats from the 10% and 20% HAMS, 10% and 20% HAMSB groups with the highest levels in the latter group.
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P193 Functional Foods

The beta-adrenergic antagonist propranolol partly abolishes thermogenic response to bioactive food ingredients

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Background: A combination of tyrosine, capsaicin, catechines, and caffeine has been shown to possess a pronounced thermogenic effect in humans.

Objective: To investigate whether the thermogenic response to the bioactive combination (BC) could be diminished or abolished by propranolol.

Design: Twenty-two men (age: 29.0 ± 7.1 y; BMI: 26.0 ± 3.6 kg/m², mean ± SD) participated in a 4-way, randomized, double-blind, placebo-controlled crossover study. The effect of the following was tested: 1. placebo; 2. BC; 3. BC + 5 mg propranolol; 4. BC + 10 mg propranolol. Resting metabolic rate (RMR), respiratory quotient and the thermogenic response were measured for 5 hours post-intake. Systolic and diastolic blood pressure (SBP and DBP, respectively), heart rate (HR) and appetite ratings were assessed every half-hour.

Results: BC increased RMR by 5% (73 (36;110) kJ/5-h (mean (95%CI), P <0.0001) compared to placebo. Both propranolol doses blunted the thermogenic response by 50% compared to placebo (P <0.01). Propranolol 5 or 10 mg reduced fat oxidation by 5% (P = 0.001) and by 7% (P = 0.0002) compared to placebo, respectively. BC increased SBP by 3% (4 ± 1.0 mmHg, P = 0.003) compared to placebo. The effect of BC on SBP was reduced by 25% by propranolol (P = 0.07). BC (with or without propranolol) increased DBP by 6% (4 ± 1 mmHg, P <0.0002). Propranolol decreased HR by 5% (3 ± 1 bpm (P <0.0001)) compared to placebo and BC. No effects were observed on appetite ratings.

Conclusion: The study confirms the thermogenic properties of BC. The 50% reduction of the thermogenic response by propranolol indicates that beta-adrenergic pathways are partly responsible for the thermogenic response.

P194 Functional Foods

The effects of L-arabinose on intestinal sucrase activity in man

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Background: In vitro studies with Caco-2 cells have shown that L-arabinose inhibits intestinal sucrase activity. Potential nutritional advantages of consuming L-arabinose in combination with sucrose may therefore be a delayed digestion of sucrose and a lower absorp-

tion of glucose, resulting in both lower blood glucose and insulin levels.

Objective: To investigate the effect of L-arabinose in a sucrose containing drink on intestinal sucrase activity in healthy volunteers by measuring postprandial blood glucose and insulin, and selected intestinal hormonal responses to increasing doses of L-arabinose.

Design: Fifteen healthy subjects participated in a randomized double-blind cross-over 4-arm study. Sucrose drinks supplemented with 0, 1.3, 2.7, and 4 w/w% L-arabinose were tested. Blood was collected fasting and every 15 to 30 min for the following 180 min., and analyzed for glucose, insulin, triacylglycerol, glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1). Appetite sensations were recorded every half hour and subsequent energy intake from an ad libitum lunch was registered. Gastrointestinal symptoms were monitored for 24-h.

Results: Supplementation of 4% L-arabinose compared to pure sucrose produced a significantly declined blood glucose peak, a significantly decreased and delayed insulin peak (23% reduction in insulin release), and a significantly increased GLP-1 peak (53% increase in GLP-1 release). No effects on triacylglycerol and GIP were observed. No gastrointestinal side effects and no major effects on appetite ratings or energy intake were observed.

Conclusions: 4% L-arabinose in a sucrose drink has a positive impact on postprandial glucose, insulin and GLP-1 responses in man, with no gastrointestinal side effects.

P195 Functional Foods

Association of durum wheat and legume flours into food matrix: Impact on nutritional value

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The health effects of the Mediterranean diet are attributed to the consumption of various categories of foods including durum wheat and legumes. The design of a new Mediterranean food prepared from the close assembly of these 2 foodstuffs could 1) Help consumers to increase their consumption of legumes which has decreased considerably, whatever the countries, to the point at which they are generally only eaten a few times a year on average and 2) Give a complex food matrix, resulting from specific association of the wheat and legume constituents. Better nutritional properties than those resulting from a simple addition of the two food sources could be obtained. In order to demonstrate the impact of the matrix structure on the food nutritional properties (glycaemic index, fibre fermentescibility, protein digestibility and allergenicity), a french national research project called PASTALEG, financially supported by the Agence Nationale de la Recherche, started in January 2006. The food model chosen in the project is a dry pasta made from durum semolina enriched with one or two of the legumes traditionally used in the Mediterranean diet. PASTALEG research project goes from the design of the food matrix to the study of its structure and its technological and nutritional func-

10th European Nutrition Conference
P196 Functional Foods

Effect of brewer’s yeast supplementation on serum glucose and lipids in type 2 diabetic subjects with dislipidemia

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Introduction: The role of trivalent chromium (Cr3+) in improving glucose tolerance has been reported since the sixties. Organic chromium, such as found in brewer’s yeast, is much better absorbed than inorganic chromium man. Over half of the chromium in brewer’s yeast is in a volatile, organic form. The following research is an effort to investigate the role of brewer’s yeast in improving blood glucose and lipids in Iranian diabetic patients.

Method: The effect of chromium supplement in the form of brewer’s yeast on glucose and lipid profile was studied in 50 type 2 diabetic patients with dislipidemia. In a clinical trial study we were given brewer’s yeast tablets which containing 14.4 microgram chromium per day for 4 and 8 weeks. Fasting blood glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides were measured at the beginning and at the end of 4 and 8 weeks after consuming brewer’s yeast.

Results: Supplementation of chromium have not effect on the serum total cholesterol. The mean HDL-cholesterol level was significantly increased in both 4weeks 8 weeks periods (P<0.001), the mean LDL-cholesterol level significantly decreased in both 4weeks period (P=0.034) and 8 weeks period (P<0.001). The mean triglyceride levels significantly decreased in both time (P<0.001). Chromium supplementation decreased fasting serum glucose level significantly(P=0.043) at 8 weeks but did not significantly effect after 4 weeks period. No significant changes in weight and dietary intake were found.

Discussion: Improved glucose level and lipid profile following chromium supplement suggests that low chromium status in patients. A larger scale study is needed to help decide on the convenient form, and dosage required to achieve optimal response.

P197 Functional Foods

Potential anti-inflammation effects of lipophilic extract of Chlorella through a nitric oxide (NO)-dependent blocking pathway

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Inflammation is a host response to tissue injuries and is characterized by movement of leukocytes. Bacterial lipopolysaccharide (LPS)-induced NO production in macrophage has been used as a simple screen method for anti-inflammatory components. Chlorella and its hydrophilic extracts have been shown to posses many physiological functions, including immune system improvement, hypoglycemic effects, lowering hyperlipidemic state in high fat-fed animals etc. However, lipophilic extract of Chlorella (LEC) is less appreciated in term of its physiological actions. Since Chlorella has been shown to improve immune function in animals, we then used the lipophilic extract to investigate the possibility of anti-inflammation activity.

Chlorella powder was extracted by dichloromethanol (1:20) three times and then evaporated by a rotary vacuum evaporator up to dryness. Indomethacin (0.25 mM) was used as a positive control. RAW 264.7 cells were stimulated in the presence of LPS (1 μg/ml) with or without the extracts. NO production was measured as nitrite (using Griess reagent), iNOS protein and mRNA were also investigated using western blotting and RT-PCR.

In the concentration ranges that were devoid of cytotoxicity, LEC produced a dose dependent (between 0.25 and 0.0315 mg/mL) inhibition on LPS-induced NO production. Protein and mRNA expressions of iNOS were also blocked by 0.25 mg/mL of LEC. This study shows LEC effectively block LPS-induced NO production, is through blockade of expression of iNOS mRNA.

P198 Functional Foods

Efficacy and safety of rice fortified with calcium among children in school lunch program

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Objective: To assess the efficacy and safety of rice fortified with calcium in school lunch program.

Design: A cost-benefit analysis of calcium fortification food which is dependent on the cost of the product and the efficiency of its absorption. To compare the bioavailability of calcium compounds by paper review and assess the costs-benefit of the calcium supplements...
(n = 28), calcium fortification foods (n = 29) and calcium fortification rice (n = 3). To analysis the maximum quantity of calcium intake of regular food consumption, including dietary supplement by 24-hour dietary recall and 3-day food records.

**Setting/Participants:** Twenty-seven boys and twenty-seven girls at age of 9–11 years schoolchildren in Taipei were involved.

**Results:** Calcium fortification rice is less expensive and calorie food. By 24-hour dietary recall, the mean calcium intake of boy is 403 mg/day (n = 27), girl 333 mg/day (n = 27) without any calcium supplement or fortification food. A cup of 80 g calcium fortified rice can provide 304 mg calcium. This resulted in the calcium maximum intake rose calcium intake to 1223 mg/day that may not achieve the tolerable upper intake level (UL: 2500 mg/day).

**Conclusions:** Rice fortified with calcium would be a relatively effective and safe way to increase the calcium intake for children in school lunch.

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**P199 Functional Foods**

**Optimizing salt and saturated fat levels in good-tasting foods**

*P.J. Rijken et al.*

DSM Food Specialties, Delft, The Netherlands

Nutritional profiles of foods are becoming increasingly important. High salt intakes, associated with elevated blood pressure, have been the basis for the salt reduction program in the UK. The new European legislation will be enabling the use of health claims only for those foods that meet certain nutritional profiles, e.g. in salt and saturated fat levels.

A recently developed natural yeast extract containing a unique and patented mix of peptides, carbohydrates and nucleotides with a clean taste and odor, supports the production of healthier and tastier foods.

In bakery, reductions in sodium of ~25% compared to standard food can be achieved with 0.1% of this ingredient. In bread specifically, reductions of ~50% in salt levels are possible whilst maintaining a good taste. In certain low fat dairy products, e.g. cream cheese, low ingredient levels (0.01%) can lead to significant taste improvements.

This presentation will clarify that application of this ingredient:

- can support better consumer acceptance of healthier low salt or low fat alternatives, relative to the higher salt or saturated fat original products.
- is relevant to human health as indicated by the observation that if the salt content of bread in e.g. the UK was reduced through it’s use, up to several thousand lives may be saved each year (extrapolated from Feng J He and Graham A MacGregor: How far should salt intake be reduced? Hypertension. 2003;42:1093–1099).

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**P200 Functional Foods**

**Role of peptides in sports nutrition**

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Sports drinks have been studied for decades, in line with their ever-increasing popularity amongst professional and recreational athletes. Various benefits have been described, but significant debate remains over the optimal beverage composition.

We have recently studied the benefits of the presence of peptides in several placebo-controlled human trials.

The results indicate that sports drinks containing low peptide concentrations can significantly improve endurance, compared to non-peptide containing control drinks: a 1.2% peptide mix (w/w) significantly improved time to exhaustion (p < 0.05), following extensive running, cycling and subsequent running to exhaustion. Additional studies indicated that peptide mixes can significantly reduce muscle soreness, as observed in placebo-controlled human trial settings.

In this presentation we provide evidence that relatively low concentrations of peptides can result in improved endurance, performance and recovery, demonstrating the potential benefits of applying peptides in sports beverages.

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**P201 Gut Microbiomics and Nutrition**

**Apple polyphenols and fibers modify the fecal microbiota of human microbiota-associated mice**

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Apples represent a major proportion of the fruit supply in Western countries and contribute significantly to polyphenol and fiber intakes. Apple polyphenols and fibers explain in part the anti-oxidative and lipid-lowering properties of apples. These effects are influenced by the intestinal microbiota. Indeed while their consumption affects the microbiota profile, some of the bacteria metabolize them into various derivatives, some having biological activities.

As part of a program aiming at determining the influence of apple constituents on metabolic parameters linked to cardiovascular risk, we studied the effects of apple polyphenols and fibers on the human intestinal microbiota. Three groups of C57BL/6J-ApoE−/− germ-free mice were associated with the same human gut microbiota and received, during four weeks, a control diet, the same diet supplemented with apple polyphenols (3 g/kg diet), or with apple soluble fibers (150 g/kg diet).

Fecal microbiota were analyzed before and after consuming each of the three experimental diets, by Temporal Temperature Gradient gel Electrophoresis (TTGE) and Fluorescent in situ Hybridization (FISH)
coupled with flow cytometry. Principal component analysis of the TTGE data showed an impact of both polyphenol and fiber supplementation on the dominant bacterial community and the emergence of specific bacterial species whose identification is in progress. FISH analysis revealed that apple polyphenols did not affect the proportions of specific bacterial species whose identification is in progress. FISH

**P202** Gut Microbiomics and Nutrition

**Epithelial cells prime the immune response to an array of gut-derived commensals towards a tolerogenic phenotype through the distinct action of thymic stromal lymphopoietin and transforming growth factor beta**

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Humans and other mammals coexist with a diverse array of microbes that colonize the intestine, termed the microflora. The relationship is symbiotic and cooperative, with the microbes benefiting from a stable environment and nutrient supply, and the host gaining competitive exclusion of pathogens but also a continuously maintenance of the gut immune homeostasis. Here we report novel crosstalk mechanism between Caco2 cells and underlying dendritic cells (DC) in a transwell model where lactic acid bacteria (LAB) prevent Toll-like receptor (TLR) 4-dependent E. coli-induced semi-maturation in a TLR2-dependent fashion. These findings add to our understanding of the hypo-responsiveness towards the microflora characteristic of the epithelium. Gut DC posses a more tolerogenic phenotype compared to conventional DC. Here we show that Caco2 spent medium (SM) induces tolerogenic DC with lower expression of maturation markers, interleukin (IL)-12p70, and tumour necrosis factor (TNF)-alpha when matured with Gram-positive (G1) and Gram-negative (G-) commensals. Caco2 SM enhances IL-10 production in DC upon encountering G-bacteria. The Caco2 SM-induced tolerogenic phenotype is also seen in DC priming of naive T cells with elevated levels of transforming growth factor (TGF)-beta and markedly reduced levels of bacteria-induced interferon (IFN)-gamma production. Thymic stromal lymphopoietin and TGF-beta cooperate in inducing the tolerogenic DC phenotype but other mediators might be involved.

**P203** Infant and Children Nutrition

**Anaemia and iron deficiency among Iranian children under 6 years**

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Anaemia is one of the major nutritional problems in developing countries, mainly due to iron deficiency. In the National Integrated Micronutrient Survey (NIMS), conducted in 2001, the prevalence of anaemia and iron deficiency (ID) was evaluated.

**Aim:** To determine the prevalence of anaemia, and ID in Iranian 6 year-old children.

**Methodology:** The whole country was divided in 11 regions based on socio-economic and ecological similarities. Children 15–23 months and 6 years old were studied. 400 samples were taken in each region, divided equally among urban and rural population. So, 4400 children 15–23 months and 4400 children 6 years old, totally 8800 were selected by random cluster sampling. Blood samples were gathered and questionnaires were filled. Haemoglobin (Hb) was adjusted and Serum Ferritin (SF) was gathered.

**Results:** 38% and 18% of children 15–23 months and 6 years old were anemic. Iron depletion was found among 33% and 25.5% of children 15–23 months and 6 years old respectively. There were no significant differences for anaemia and ID between rural and urban areas. Anaemia and ID among boys were higher and the differences were significant.

**Conclusion:** Anaemia and ID are major nutritional problems among Iranian children. Iron supplementation for children under 2 years through PHC system seems is not an efficient strategy. A holistic approach is needed.

**P204** Infant and Children Nutrition

**Analysis of the somatic parameters of girls following various food patterns**

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**Introduction:** The precise analysis of the characteristic nutrition features creating food patterns enables the complex evaluation and facilitates studying the relationship between nutrition and health.

**Aim:** This study analyses the somatic parameters of girls with three different food patterns, with a different frequency of consuming alcohols, legumes, fish and beef and margarine.
Material and Methods: One hundred and seventy-eight girls aged 15–18, living in the North-Eastern region of Poland, were included in the study. Earlier, the factor analysis was applied to identify 8 food patterns of youth. Three selected food patterns were further analysed: alcohols (pattern II), legumes, fish and beef (pattern V) and margarine (pattern VII). Then, in following quintiles of products intake frequency, the girls’ somatic parameters were compared.

Results: The following quintiles had the increase in the intake frequency of alcohols and legumes, fish and beef not significantly connected with girls’ nutritional status. Margarine intake frequency increase was connected to a significant (p < 0.05) increase in the subscapular skinfold thickness (by 3.3 mm) and the Z-score of the subscapular skinfold thickness (form 0.43 to 1.40) and the tendency (p < 0.1) to the increase of such parameters as: body mass (by 2.7 kg), fat mass (by 2.1 kg), upper arm fat tissue area (by 354 mm²) and the Z-score of the upper arm fat tissue area (from −0.63 to −0.02).

Conclusion: The margarine intake frequency increase was consecutive to increased fattening of the girls’ body. Alcohols, legumes, fish and beef intake frequency increase was not significantly connected to girls’ nutritional status. This findings needs an explantation in relation to girls’ diets nutrition values.

P205 Infant and Children Nutrition
Assessment of the nutritional status of primary school children (6–10 years) at Dzolo-Kpuita and surrounding towns in the Ho district
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Background: Nutritional status is the state of health as influenced by the intake and utilization of nutrients. Dzolo-Kpuita and its neighboring towns are typical under-developed rural communities in the Ho District of the Volta region of Ghana. Some school children in these communities walk long distances to school with little or no breakfast. The absence of any baseline data on the nutritional health of the school age children in these communities necessitated this study.

Objective: To collect baseline data on the nutritional status of selected primary school children (6–10 years); at Dzolo-Kpuita, and its neighboring towns: Akome-Gbogame, Dzolo, Akome-Agate, and Kpedze.

Design: Anthropometric data (weight, height, mid-upper arm circumference) and age were collected on 327 (157 males and 170 females) school-age children using a structured questionnaire. Data were analysed using EPI Info (version 6) and the Statistical Package for Social Sciences (SPSS) to determine the baseline prevalence of stunting, wasting, and underweight among the primary school children.

Result: Out of the 327 school children studied, 24.2% males and 14.8% females were wasted (low height-for-age). About 14.6% males and 7.7% females were underweight while 1.9% males and 0.6% female were wasted.
Systematic decreasing consumption of milk since several years influences on inadequate level of calcium in food rations for various population groups in Poland. It is particularly undesirable in relation to osteoporosis growth level (ca 4 million of habitants in Poland in 2002) qualifying this phenomenon as a public disease. The way to improve this situation might be ‘Milk School’ programme not only for now, but also for the future esp. through introducing habits among children for systematic consumption of milk products.

This work was undertaken in order to justify the need of introduce national programme for promotion of milk products consumption. In this studies carried out among 296 children (9–11 year old) from Mazovian-Region calcium intake (24 hrs interview method), milk products consumption frequency (FFQ method) and radius bone mineral density (DEXA method) were evaluated.

Daily rations were not covering of calcium RDA (av. 56% of RDA). Every day milk products were consumed only approximately by 40% the pupils.

Bones condition was satisfactory. Only 6% of children showed lower than an average BMD among control group. It was not stated the relationships between calcium intake and bone mineral density (BMD), after considering models in body size, age and physical activities.

The adverse reaction to milk can be divided into food allergies and intolerance. Food allergies are characterized by reactions provoked by the immunological system, which are triggered by the consumption of allergenic protein. In the market, there are formulae of modified cow’s milk or of soybeans, as substitutes, but these are not easily affordable by the population of lower income.

Objectives: Developing and characterizing a formula with chicken hydrolysates for 0–12 month-old children who show adverse reaction to milk; and verifying its microbiological safety.

Methods: Obtention of the hydrolysate based on the methodology developed by PINTO e SILVA (1999). Development of the children’s formula (FIHF): All the tests were carried out three times. Humidity, protein, ashes, lipids and carbohydrates were evaluated by the methodology recommended by Instituto Adolfo Lutz and fibers according to Prosky et al., 1988. Microbiological analyses, research of indicator microorganisms: Mesophilic bacteria, thermotolerant coliforms, Staphylococcus spp., Salmonella, and fungi and yeast. Results. FIHF resulted in a combination of chicken hydrolysates, glucose, sucrose, rice cream, soybean oil, pork fat and calcium carbonate. The results of the centesimal composition show that in 100 g of the FIHF there are 3.12 g of total lipids, 1.32 g of protein, 0.23 g of ashes, 6.53 g of carbohydrates. As for food safety, no presence of any microorganisms above the levels allowed by legislation was detected.

Conclusion: The developed preparation consists of a good alternative source for feeding children with adverse reactions to milk in terms of its nutritional characteristics and food safety.
Collagen influences on bone remodelling in prepubertal children after a nutritional intervention

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Analyzing the influence of daily dietary intake of collagen using commercial gelatine (Royal®) on bone remodelling markers in prepubertal children. 71 healthy children (42 boys/29 girls; 9.46 ± 0.47 y; weight: 37.11 ± 9.05 Kg, height: 140.33 ± 9.38 cm, BMI: 18.74 ± 3.26) participated in the randomized-double blind study. 60 completed it. The children were divided in 3 groups depending on the type of gelatine (partially hydrolysed collagen-gelatine Royal®): placebo (G-I), 20 gelatine (G-II) α 22 gelatine + calcium (G-III).

Biochemistry: Total alkaline phosphatase/APt (UI/L)-cholorimetry, BAPi (ng/ml)-RIA, OP (pg/ml)-ELISA; TRAP (UI/L)-ELISA, Crosslaps (ng/ml)-RIA. Ca, P, Vit D-25OH (ng/ml), C IGF-1 (ng/ml)-IRMA; TSH (µUT/mL), FT4 (ng/dl) α PTHi (pg/ml)-ECLIA. Biostatistics: Normality test/General Linear Model for repeated measures. T0 = initial time; T1 = final time. Pearson’s/Spearman’s correlations. Significance: p < 0.05. *: G-I vs G-II; **: G-I vs G-III; α: G-I vs G-III.

Results: Plasma concentrations APt increased (−6.59 ± 32.09**; −0.47 ± 31.86; 0.20 ± 28.68) α Crosslaps decreased (0.069 ± 0.43**; 0.028 ± 0.44α; −0.20 ± 0.25) in G-III respect to G-II and G-I. TRAP concentrations decreased in plasma in G-II vs G-I α in G-III vs G-II (1.56 ± 4.19*; −1.16 ± 4.01α; −1.50 ± 3.43). BAPi showed a significant increase in G-II and less marked decreased in G-III respect to the placebo (−28.60 ± 29.95*; 2.35 ± 42.63, −5.68 ± 31.98). TRAP changes between T0 and T1 in G-III were inversely correlated with OPG increments (r: −0.50, p = 0.018) in G-III α (r: −0.48, p < 0.05) in G-I.

Conclusion: Dietary intakes of collagen could influence on formation mcompound on influence on formation markers (BAPi) and resorption markers (TRAP) α it seems to be a stimulant role on the bone formation. Supported by ‘Krafts Foods Europe’.

Comparison of eating habits between village and city Pomeranian teenagers

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Introduction: The aim of the study was to assess of high school adolescents nutritional habits. Life style and eating pattern are the main factors effecting health of human being. Healthy eating should be formed from early childhood by family and school.

Methods: The research was based on the survey consisting of 19 questions. Statistical date were calculated by Statistica 7 Programm.

Patients: The study was conducted among 308 Pomeranian high school students, including 260 respondents from city and 48 respondents from village.

Results: The village inhabitants in opposition to city dweller more often consumed white bread (66.7% vs 46.5%), lard (8.3% vs 1.5%) and pork (31.3% vs 11.5%), but poultry was eaten more frequently by the city dwellers (81.2% vs 66.7%). High frequency of consumption of soft drinks and fast food was noticed as a new behaviours. More then 40% of total population did not eat breakfast at all and half of respondents ate candies everyday. That was the most interesting obtained result.

Conclusions: City and village environments are different and effect healthy behaviour of inhabitants. Continuous education of young people and their parents and teachers requirement independently of residence is the most important in correct nutrition pattern. Health education is the most profitable, long-term investment in the health of the society; the aim is to help children to make decision concerning their development, health and creating a healthy lifestyle.

Complementary feeding of infants less than two years of age in a developed city of a developing country

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The nutritional practice during infancy can significantly affect the children’s life quality.

Objective: To verify the median for the introduction of complementary feeding in the dietary intake of newborns in Campinas, São Paulo, Brazil.

Methods: A cross-sectional survey of a randomized sample of newborns during 2004 and 2005 was carried out where 2857 mothers of infants less than two years of age were interviewed in order to obtain information on socioeconomic status, practice of breastfeeding and complementary foods. The determination of the sample size was based on data of ‘Declaration of Born Alive’ of Campinas (SINASC).
The median for the introduction of complementary feeding was determined by the survival analysis using the Kaplan Meier method and the adjustment of time by Cox multivariate analysis. The significant level adopted was 5%.

Results: The median for the introduction of water (CI 95% 118,6–121,4), tea (CI 95% 113,2–126,8) and powder milk (CI 95% 112,7–127,3) was 120 days; 180 days for salted semi-solid foods (CI 95% 178,6–181,4), for vegetables (CI 95% 179,1–181,0), for fresh vegetables (CI 95% 179,0–181,0) and for meat (CI 95% 179,0–181,0); 360 days for candies and eggs (CI 95% 341,0–379,0). Infants less than one month of age drank water (7,2%), (tea (13,2%), powder milk (23,2%) and whole milk (3,2%).

Conclusions: Campinas presents early introduction of liquids and candies, adequate for salted semi-solid and solid foods and later for eggs.

P214 Infant and Children Nutrition
Decreasing molar ratio of iron:zinc from 6:1 to 3:1, improved iron absorption from Thriposha supplement in Sri Lanka

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Thriposha programme as a community level nutrition intervention has been in existence to combat high prevalence of childhood malnutrition and iron deficiency anaemia in Sri Lanka. The word thriposha means ‘Triple Nutrient’ as it provides energy, protein and micronutrients. It is a pre-cooked ‘ready-to-eat’ cereal legume based food supplement. We have determined the bioavailability of iron from thriposha formula at two molar ratios of iron:zinc with a view to improve iron absorption. Schoolchildren (n = 33) of 6–7 years randomized into two groups (zinc:iron molar ratio 1:6 and 1:3) were given a meal prepared with 25 g of Thriposha containing 4.5 mg of iron as ferrous fumarate and 0.75 mg of zinc as zinc sulphate (group 1); 2.25 mg of iron and 0.75 mg of zinc (group 2). Meals were labelled with 57Fe whereas 58Fe ferrous sulphate was used as the reference dose. There was no differences between the groups in iron absorption (6.6%±4.8 vs. 4.4%±2.6, p = 0.15) or reference dose iron absorption (19.2%±13.4 vs. 17.0%±10.5, p = 0.63). However, when analyzed by ANCOVA with reference dose absorption as a covariate, absorption of 57Fe appeared significantly different between the groups (p = 0.01). When normalized to reference dose absorption of 40%, ferrous fumarate absorption in both groups was good (13.6% vs 9.6%). We conclude that ferrous fumarate is well absorbed from the food, but decreasing the molar ratio of iron:zinc from 6:1 to 3:1 slightly, but significantly, increased iron absorption.

P215 Infant and Children Nutrition
Development and validation of an HPLC method for determination of nucleotides in infant formulas

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Researchers have established that human milk is the only source of nucleotides for infant during first months of life. Dietary nucleotides seem to influence several aspects of neonatal development such as modulate lipoprotein metabolism, modify the composition of the intestinal microflora, improve gastrointestinal tract repair after damage and participate in the immunity response mediated by T-cells. Since, the infant formulas supplemented with nucleotides are developed.

The aim of these investigations was development of the method for determination of 5-AMP, 5-CMP, 5-GMP, 5-UMP and 5-IMP in

P213 Infant and Children Nutrition
Current model of infant feeding in Poland

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Background: The correct feeding practice is one of the most important factors that determine infant development and health.

Aim: The aim of this presentation is to describe the model of infant feeding applied in Poland elaborated according to current recommendations.

Methods: The current recommendations were based on review of research conducted between 2000 and 2005, guidelines elaborated by focus groups of experts and relevant documents by WHO and UE.

Results: The new model of infant feeding was based on the results of monitoring children feeding practices.

The recommendations include:

1. A model for breastfed children:
   a. exclusive breastfeeding on demand for the first 6 months
   b. introducing complementary foods (mashed vegetables with semolina (gluten)) not earlier than in the 5th month of age
   c. after 6 months of age 8211; breastfeeding on demand and introducing complementary foods (2–3 times/day; daily energy intake 310–580 kcal)

2. A model for non-breastfed children:
   a. feeding with starting formula for the first 6 months of age and follow-on formula after 6 months of age
   b. introducing complementary foods in the form of mashed vegetables or fruits not earlier than in the 5th month and the pulp with semolina (gluten) not earlier than in the 6th month
   c. introducing small amounts of cow milk products in a 11–12th month of age
   d. avoiding salt, limited sugar intake
   e. avoiding allergy causing products

Conclusions: New model of infant feeding has been applied since January 2007. The model results from present studies and research review. It diminishes the risk of both coeliac disease and excessive intake of protein and energy substrates.
A method for the determination of 5-AMP, 5-CMP, 5-GMP, 5-UMP and 5-IMP in infant formulas was optimized and its performance evaluated. Method is based on deproteinization of samples and direct analysis by ion-pair HPLC using Supelcosil LC-18-T column, followed by diode-array detection. During validation process the following parameters were examined: selectivity, precision, accuracy, linearity and robustness.

The obtained results are summarized and showed that this method is specific. The precision of the method is evaluated and a coefficient of variation (CV%) is less than 3%. Validation of the proposed method was carried out by standard additions method, with recoveries of 100 ± 3; the relative standard deviation was less than 3. For linearity the correlation coefficient was $r^2 = 0.999$. Solutions are stable during 30 hours and in range of method robustness.

Validation of HPLC method for determination of nucleotides has shown that developed analytical method is acceptable for its intended purpose in defined labor conditions.

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Diabetes mellitus type 1 and eating disorders: A relationship of risk

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The presence of chronic degenerative diseases in adolescence can affect the behavior of adolescents and cause some changes related to the body image, limitations at group activities and difficulties of self-identity development.

Objectives: To investigate, through bibliographic review, the occurrence of comorbidities in patients affected by Diabetes Mellitus type 1 and Eating Disorders.

Methods: A bibliographic review was conducted in the electronic databases (Sciello, Lilacs and Pubmed) from 1999 to 2004 using the following keywords: diabetes mellitus, diabetes mellitus type 1, anorexia nervosa, bulimia nervosa, binge eating and eating disorders. The selected references were found at libraries of Universities located in a city of São Paulo State, Brazil.

Results: Fifty-five references about the subject were selected. 61.81% and 38.19% index-linked in national and international periodicals, respectively. Patients affected by Diabetes Mellitus type 1 can present Eating Disorders and the prevalence of Bulimia Nervosa was higher in this group.

Conclusion: There is a high relationship between Eating Disorders and Diabetes Mellitus type 1 that could increase the risk of clinical complications.
Dietary fibre intakes in Spanish adolescents. Who reaches the recommendations?

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Aim: To evaluate dietary fibre intake in Spanish adolescents against various reference standards based on body weight, age or energy intake and to evaluate how overweight influences fibre intake adequacy.

Methods: Absolute g of fibre and total energy intake was assessed by a 24h recall questionnaire in 2135 Spanish adolescents (mean age: 15.3y, 53% females), from the multicenter study AVENA. Overweight was defined according to IOTF cut-offs for children and adolescents [1]. Recommended dietary fibre intakes in g/day were calculated as per different dietary references for children and adolescents: expressed per energy intake (14 g dietary fibre per 1000 kcal, Institute of Medicine 2002), body weight (0.5 g per kg body weight, AAP 1993) and age (5 g per year of age, Williams et al 1995).

Results: Males had higher absolute fibre intakes (g/day) than females (14.76 (± 9.03) vs. 12.32 (± 7.91), respectively; P < 0.05), while females had higher fibre intakes per 1000kcal. (P < 0.05). Overweight adolescents had lower absolute fibre intakes, compared to normal weight peers (P < 0.01 in both sexes), however, due to lower energy intake in the overweight group, no differences were observed regarding fibre intake per 1000kcal. The prevalence of subjects reaching the recommendations based on energy intake was 4%, body-weight 6% and age 17%.

Conclusion: Dietary fibre intake in Spanish adolescents was very low irrespective of the reference used and needs to be promoted, especially among the overweight.

Acknowledgements

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Reference


Dietary habits and nutrient intake in Swedish children 4, 8 and 11 year old. Riksmaten – children 2003

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Introduction: The Swedish National Food Administration has a mandate to monitor the food habits and the food and nutrient intake. This information is used to draw up food based dietary recommendations, for toxicological risk assessments and as a basis for fortification decisions.

Purpose: Updated information about children’s food habits and nutrient intake and possible socio-economic aspects.

Methods: An open and estimated food diary over four consecutive days and a questionnaire for background data. A representative sample of school classes was recruited. The 4 years old children were sampled individually. Approximately 2500 children in the ages 4 (590), 8 (889) and 11 years (1016) participated with 49,4% girls and 50,6% boys. Older school children filled in their food diaries almost by themselves, younger school children needed substantial help from parents and 4 year old children had parents or caretakers filling in their food diaries. Portion sizes and volumes were shown in a picture book. Participation rate was 64% (4yr), 75% (8yr) and 80% (11 yr).

Summary: The distribution of fat/protein/carbohydrates was adequate (31–32/14–16/53–54 energy per cent). The intake of vitamins and minerals was generally adequate, with a few exceptions.

However, the proportion of saturated fat (14%) and added sucrose and monosaccharides (13–14%) was too large. The salt intake was high (8–9g/10MJ) and the intake of vitamin D (6,2–10,7/10 MJ) and dietary fiber (18g /10 MJ) was low. The proportion of energy from soft drinks, sweets, crisps, ice creams, desserts, cakes and biscuits was too large (25 E%). The intake of fruits and vegetables was half of the recommended amount. 17–23% of the children were overweight or obese.

Dietary modulation of humoral immune response in suckling rats

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Introduction: The study of specific effects of nutrients on immune system has grown in interest. Without doubt, breast milk is the most important and beneficial food during early infancy. In this work the effect of a daily bovine milk derived concentrate (BMC) supplement on humoral immune response has been determined by sera immunoglobulin (Ig) levels and Ig-secreting cells (Ig-SC) quantification in Wistar suckling rats (SR).

Reference

Since the 1st day of life (day of delivery) Wistar rats received a daily supplement of BMC. Additional groups were SR receiving commercial bovine milk (BM) and SR without supplementation (REF). Blood samples from pups aged 4, 7, 14 and 21 days were collected to quantify serum levels of IgG, IgM and IgA by ELISA. Intestine and spleen were also removed. IgG, IgM and IgA secretion of lymphocytes from intestinal lamina propria (LP), spleen and peripheral blood were quantified by ELISPOT.

Sera IgG and IgM levels were detected from the first week and increased until day 21 without reaching adult values. IgA levels rose only during last week of suckling. Supplementation with BMC did not modify any sera Ig isotype in relation to REF group. LP cells showed no IgG-SC or IgA-SC throughout suckling period. On day 21, the number of IgM-SC was similar in all studied groups (50–115 IgM-SC/106 cells). Spleen neonatal cells did not almost secret IgG nor IgA but produced IgM. The number of IgM-SC increased in spleen after the first week of life in BMC and REF groups. Blood IgG-SC number was very low for all Ig isotypes in SR.

Time-course of sera immunoglobulin levels and spontaneous Ig production in BMC supplemented animals exhibited a similar pattern to those pups fed only by dam’s milk.

Acknowledgement

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Effect of antenatal nutrition counseling to reduce low birth weight in Bangladesh

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Background: The incidence of LBW in Bangladesh is considered one of the highest in the world. Maternal malnutrition and poor pregnancy weight gain are the most important causes of LBW and high rates of mortality for the newborn.

Objective: To assess the effect of antenatal nutrition education on birth weight.

Methodology: This longitudinal intervention study was conducted at the Maternal and Child Health Training Institute (MCHTI), Azimpur, Dhaka during 2005. 115 women of 5 months of pregnancy of low socio-economic-status were randomly selected. Intervention group (IG) had 57 and comparison group (CG) had 58 subjects. IG was given detailed nutrition education and CG was observed only from 5 to 9 months of pregnancy. They were given only intervention for 4 months before delivery and after that birth weights were measured within 24 hours. Data were collected through structured questionnaire and were analyzed by SPSS/PC+ (SPSS WIN 12 Inc. USA).

Results: At the baseline both groups were comparable in nutrition and socio-economic status. After 4 months of counseling total body weight gain during 3rd trimester was 46% more in the IG (5.69 kg vs. 4.1 kg, p = 0.000). The birth weight was increased 18% more in the IG (2.86 kg vs. 2.42 kg, p = 0.000). The proportion of LBW babies was 10.5% in IG compared to 48.3% in CG, which indicates 78% reduction in IG (p < 0.001). The pregnant women who gained >4 kg body weight had 20% LBW compared to 44% in the women gained ≤4 kg body weight (p = 0.005). Nutrition education lead to an 88% reduction for LBW (Odds ratio = 0.114, p = 0.001).

Conclusion: Antenatal nutrition education was effective for improving gestational weight gain and for reducing low birth weight. This education should be scaled up for all maternity services in Bangladesh.

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Effect of glutamine supplementation and in vivo infection with Mycobacterium bovis (Bacillus Calmette-Guerin) in the function of peritoneal macrophages in early weaned mice

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Maternal milk is the best example of a food with recognised immunonutritive properties. Additionally, it contains a high concentration of glutamine, which is essential to the function of macrophages. The aim of the present study was to evaluate the effect of glutamine supplementation and in vivo infection with Mycobacterium bovis Bacillus Calmette-Guerin (BCG) on the function of peritoneal macrophages in early weaned mice.

Method: At 14 days of age, mice were weaned and placed on an elemental diet supplemented either with glutamine (+GLN) or an isonitrogenous diet containing nonessential amino acids (−GLN). Maternal milk is the best example of a food with recognised immunonutritive properties. Additionally, it contains a high concentration of glutamine, which is essential to the function of macrophages. The aim of the present study was to evaluate the effect of glutamine supplementation and in vivo infection with Mycobacterium bovis Bacillus Calmette-Guerin (BCG) on the function of peritoneal macrophages in early weaned mice.

Results: At 21 days of age, mice were intraperitoneally injected with BCG (+BCG) or not (−BCG) and killed at 28 days of age.

Results: The chronic supplementation of early weaned animals with glutamine modulates the function of peritoneal macrophages activated with BCG.

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Effects of fast-food consumption on body mass index, waist to hip ratio, energy intake and diet quality among adolescent girls in Iran

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Introduction: Fast-food consumption has increased greatly among children in recent years, in tandem with the obesity epidemic. Fast-food tends to promote a positive energy balance and, for this reason, may result in weight gain.

Objectives: To test the hypothesis that fast-food consumption adversely affects dietary factors linked to obesity risk, body mass index (BMI) and waist to hip ratio (WHR).

Material and Methods: This study included 400 girl students aged 14–17 years in 12 high schools in Lajehn, north of Iran that was chosen with random stratified sampling. Dietary intake was estimated using 24-hour recall and 110-items food frequency questionnaires.

Results: 60% of subjects reported consumption of fast foods 3.5 times per week. Individuals who ate fast-food compared with those who did not, consumed more total energy and fat (p < 0.02), more total carbohydrate (p < 0.05) and less fiber (p < 0.008). Consumption of fats, sugars and snacks with added sugars and fats and sugar sweetened beverages were higher in adolescent girls with higher fast-food consumption (p < 0.02). Significant positive correlations were observed between frequency of fast-foods with BMI and WHR (respectively: r = 0.19, p < 0.0001 and r = 0.10, p < 0.004).

Conclusion: Higher fast-foods intake is associated with increased BMI, WHR and higher fats, sugars and energy intake.

Etiology and primary factors of childhood obesity and related disorders – IDEFICS – A European epidemiological study

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Background: Environmental change resulted in alterations of behaviour, unhealthy dietary habits, and low physical activity of infants and children in Europe over the last decades. Both, dietary and lifestyle factors contribute to the development of overweight/obesity and related comorbid conditions. The IDEFICS study (Identification and prevention of dietary- and lifestyle-induced health effects in children and infants) is a five-year multilevel epidemiological approach within the 6th EU framework to counteract the threatening epidemic of diet- and lifestyle-induced morbidity by evidence-based interventions.

Methods: A population-based cohort of 17,000 children aged 2 to 10 years will be established in nine European countries to investigate the aetiology of the mentioned diseases. Culturally adapted multicomponent intervention strategies, focusing on dietary habits and physical activity, will be developed, implemented and evaluated prospectively.

Results: IDEFICS compares ethnic, regional and sex-specific distributions of the above disorders and their key risk factors in children across Europe. The impact of lifestyle and environmental factors, food preferences and differences in sensory perception and children’s consumer behaviour are elucidated. Guidelines for health promotion and disease prevention are developed and implemented in controlled intervention studies.

Conclusions: Public health actions to prevent diet- and lifestyle related diseases requires an evidence-based set of guidelines, taking into account ethnic and social variations. The IDEFICS study may help to reduce future obesity and related diseases by provision of effective intervention modules.

Feeding of infants and young children in Tsunami affected villages in Pondicherry

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Introduction: Disasters have the greatest effect on the most vulnerable groups, especially children (1). In emergencies, such as the one caused by the December 2004 Tsunami, breastfeeding is of critical importance as it saves babies’ lives. Even in such special situations where artificial feeding is inevitable, the basic resources needed such as clean water and fuel are scarce in emergencies. Artificial feeding in these situations is difficult and increases the risk of diarrhea, malnutrition, infections and infant death. Information related to the feeding of Infants and young children is limited, given the difficulty of data collection during disasters. The post Tsunami situation in Pondicherry was therefore used to study such feeding practices.

Objective: To describe the pre existing feeding practices of infants and young children and to identify the problems related to feeding of children post tsunami in four villages in Pondicherry.

Study Design: Descriptive study and data was collected from 100 randomly chosen families who had an Infant or a Young child below 3 years of age during Tsunami. Informants were the mothers.

Results: In the population studied, 30% mothers did not exclusively breast feed for 6 months; 58% bottle fed their children and 51% fed their infants with commercial formula. The occurrence of diarrhoea was three times higher among children who were fed with free Breast milk substitutes (BMS) than in those who were not fed with the same.
**Conclusion:** Those populations, wherein a pre-existing tradition of artificial feeding is present, infants are at further risk during a crisis situation like Tsunami. Breast feeding practices need strengthening even in routine conditions to tackle a disaster rather than intervention after the disaster.

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**P226 Infant and Children Nutrition**

**Food intake in 7 years-old children: Study in an urban city in a developing country**

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Brazil, facing the nutritional transition, has been dealing with a double burden of disease. While in the North and Northeast of the country malnutrition is still a problem, in the South and Southeast, increasing rates of overweight and obesity are being described. In a previous study in a highly urbanized region, rates as high as 22% of overweight in 7-years-old children were found. The aim of this study was to evaluate the food intake in this population, and variations according to socioeconomic status. Participants were 742 first grade students. The dietary intake was collected by a semi-quantitative Food Frequency Questionnaire developed for children and validated for the study, filled by the mothers or the responsible for the children. The frequency of intake for each food item was transformed into daily intake. The socioeconomic status was evaluated by geographic area and predominant type of residence where the school were localized, closely related with income and access to food market. Four categories were considered: favela (settlement of poorly built shacks, very low economic class), suburb (low economic class); rural (small farmers, subsistence agriculture-difficult access to food marked) and urban (middle class, excellent access to food market). The differences of intake were accessed by ANOVA. It was observed statistically differences in the number of portions consumed for rice and beans, the Brazilian staple food, bread, tomato sauce, banana, apples, pears, orange, dairy products, chocolate, coffee and soft drinks. Intake of sweets were high for all groups (3.3 portions/day). It was observed great intake of energy dense foods for all children, independent of socioeconomic status. Efforts should be taken to improve their diet to promote good health.

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**P227 Infant and Children Nutrition**

**Haemoglobin status of inter-ethnic children in Kakuma refugee camp, Kenya – A human rights dimension**

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The United Nations (UN) propagates human rights approach to human development that include adequate food and health care; that should translate to the right to nutrition security. Rights-based approaches focus on accountability and identifying duty-bearers responsible their realisation. Jonsson (2003) places the realisation of the nutrition-relevant rights to food, health and care on governments. However, in a refugee scenario, governments are non-existent thus the first line duty-bearers (parents) of children cannot, as secondary right-claimants, are primarily dependent on international communities; enshrined in UN and non governmental organizations.

High prevalences; 61.3% and 94.5% of anaemia were reported among children in Kakuma Refugee Camp by Gregory (2002) and Meme and Kogi-Makau (2003) respectively. A cross-sectional study on 300 children, whose purpose was to contribute data for decision-making was thus designed. The object of the study to determine the haemoglobin (hb) status among refugee children, identify risk factors and subsequently analyse the situation in a human rights frame. The children were chosen through stratified systematic random sampling. Their hb levels were determined using the haemocue technique. A pre-tested questionnaire was used to obtain the data that yielded risk factors for low hb. The findings showed that 93% of the children were of low hb status (<11.0 g/dl), that ethnicity, food ration, access to therapeutic feeding, iron supplements and morbidity were key risk factors. The study led to the conclusion that the prevalence of anaemia among refugee children is unacceptably high and that various levels of duty-bearers fail to meet their obligations resulting in unachieved right to nutrition security among refugee children.

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**P228 Infant and Children Nutrition**

**High vs. low energy breakfast and daily diet in school children**

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Current recommendation is to increase the energy content of breakfast, although there is some evidence that do not support this advice.

The aim of the study was to compare daily food and nutrient intakes among schoolchildren having high or low energy breakfast. Subjects (n = 486) were children and adolescents aged 7–18 years. Food frequency questionnaire was used as a dietary assessment method. Anthropometry included body weight, height and percentage of body fat (Tanita Corp., Tokyo, Japan). Food and nutrient intakes were compared between 1st and 4th quartile according to energy intake (kcal) by breakfast.

Energy intake by breakfast was 371.3 and 1176.1 kcal in the 1st and the 4th quartile respectively. Average daily energy intake was significantly higher in high breakfast energy group (106.1 vs. 71.0% RDA, t-test, p < 0.05). Fat intake was above 30% kcal in both groups. Dietary fibre intake was 95.9% of the age + 5 rule in the 4th quartile and 62.1% in the 1st quartile. Cholesterol intake (mg) was significantly higher in the 4th quartile, but not when calculated per energy units: 129.7 and 111.1 mg/1000 kcal in the 1st and 4th quartile respectively. Vitamin and mineral intakes (% DRI) were in general higher in the 4th quartile, although there is some evidence that do not support this advice.
the high energy breakfast group. Nutrient density for micronutrients (per 1000 kcal) was significantly higher in the 1st quartile for vitamins A, D, E, C, B6, folate and selenium. Negative correlation was observed for percentage of body fat and energy intake by breakfast (kcal) in both groups, but reached significance only in the 4th quartile ($r = -0.20; p = 0.028$).

In conclusion, this study showed significant differences in daily diet among schoolchildren having high or low energy breakfast where the most of the results do support advice for high energy breakfast.

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**P229 Infant and Children Nutrition**

**Impact of overweight in the first year of life and breastfeeding on the lipid profile and blood pressure in Brazilian preschoolers: A 4 year follow up study**

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**Introduction:** It has been shown that early growth and nutrition affect health in childhood and later life. It has been suggested that overweight early in life are related to further dyslipidemia and hypertension, and breastfeeding have a protective effect.

**Purpose:** In a longitudinal birth cohort study, we tested whether risk of overweight at 1 y of age and predominant breastfeeding were associated with lipid profile and blood pressure levels in preschool age.

**Methods:** 282 children were followed up to the age of 4 y. The height and weight of the study subjects were measured at 1-year old. As the criteria of risk of overweight, the z-score $\geq 1.5$ SD were used. The blood pressure was measured with a standardized technique. Serum total cholesterol (TC), high-density lipoprotein-cholesterol (HDL), low-density lipoprotein (LDL) -cholesterol and triglyceride concentrations were analyzed at 3 to 4-years old. Student’s t-test was used to compare mean values of independent variables between groups: risk of overweight/eutrophic and predominant breastfeeding $< 4$ months/4 months.

**Results:** The risk of overweight at 1 y of age was associated with higher systolic and diastolic pressure levels ($p = 0.043$ and $p = 0.009$, respectively) and lower HDL mean value ($p = 0.017$). Predominant breastfeeding for more than 4 months was associated with higher HDL levels at 4 y of age ($p = 0.022$). There were no differences between TC, LDL and triglyceride values and nutritional status at age 1 y or breastfeeding.

**Conclusions:** The results suggest that overweight at 1 y of age predicts lower HDL and higher blood pressure levels at 4 y of age and predominant breastfeeding for more than 4 months is associated with higher HDL level in preschool age.

**Acknowledgement**

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**P230 Infant and Children Nutrition**

**Improving a dietary assessment method for use in day cares**

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**Introduction:** Danish preschool children spend up to 10 hours a day in day care programs. The currently implemented assessment method for dietary intake of infants and young children in Denmark is based on records obtained by the parents. Therefore the assessment of dietary intake in daycares has several methodological challenges and would benefit from optimisation. Developing a valid method for assessing the dietary intake in daycares is essential to get a true estimate of the groups diet.

**Objective:** To optimise a dietary assessment method for use in day care programs, applicable to future studies.

**Methods:** Sections of day cares ($n = 17$), recruited from the area around Copenhagen, were randomly assigned to receive either an adjusted method including new assessment tools (intervention group, IG) or the currently used method (control group, KG). An observer was present at meal times in the day cares, weighing all ingested foods and drinks, while the day care staff registered the diet according to the randomized method. A 3-day dietary registration was completed for 30 children at 9 different day cares.

**Results and Conclusion:** The results yet to be analysed will assess the validity of the two methods against the weighed registration, considered as the golden standard. The adjusted method should prove more valid and detailed than the currently used and we hope to apply it in an upcoming larger scale national study.

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**P231 Infant and Children Nutrition**

**In vitro supplementation with glutamine reverts the impairment that precocious weaning has on the kinetics of cytokine production by peritoneal macrophages in mice**

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In macrophages, glutamine (GLN) is essential for the synthesis of cytokines. Infants have a high demand for GLN, which is supplied by the ingestion of mother’s milk.

**Objective:** To verify the effect of precocious weaning and subsequent in vitro supplementation with GLN on the kinetics of cytokine synthesis (Tumour Necrosis Factor-α (TNF-α), Interleukin (IL)-1β, IL-6, and IL-10) in vitro in a culture of peritoneal macrophages.

**Method:** Mice were either weaned on the 21st day of life (W-21, n = 8) and precociously on the 14th day of life (W-14, n = 8). The
Infant nutrition, iron fortified formula and iron status in 1-year old Icelandic children

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Background: Previous research in Iceland showed that cow’s milk consumption in infancy is associated with poor iron status of 1-year old children. The consequences of iron deficiency and anaemia are serious. Official Icelandic recommendations for infant nutrition were changed in 2002 and recommend now exclusive breast feeding for a period of 6 months and thereafter the use of iron fortified infant formula, which is made from Icelandic cow’s milk, was introduced in Iceland also in 2002. Formerly, cow’s milk was recommended after 6 months of age.

Objective: To investigate nutrition of Icelandic infants 2005–2006, growth, and iron status and blood lipid levels at the age of 12 months. Effects of a diet and formula use were evaluated.

Methods: Icelandic infants (N = 300) were randomly selected and information on pregnancy, birth variables, infants’ diet and growth in the first year were collected. Blood samples at 12 months of age were analysed for iron status and blood lipids.

Results and Conclusion: New knowledge about the influence of new recommendations in infant nutrition, the effects of iron fortified follow up formula and longer exclusive breast feeding on iron status and blood lipids in 1-year old children is provided. The results show that rapid implementation of new scientific knowledge in a small community can positively affect public health issues.

Acknowledgment

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Reference

Fifteen years after the 1990 Innocenti Declaration, remarkable improvements have been made worldwide in feeding infants and young children. However, inappropriate feeding practices including artificial feeding, poor breastfeeding practices and inadequate complementary feeding remain the greatest threat to child health and survival globally and have long term effects on the physical, intellectual and emotional health of all populations.

The Convention on the Rights of the Child and other human rights instruments obligated all State parties to enable mothers, families and other caregivers to practise optimal infant and young child feeding – exclusive breastfeeding for six months, and the introduction of appropriate complementary feeding while continuing breastfeeding for two years or longer. Such an environment would provide the skilled practical and emotional support needed to enable mothers achieve the highest attainable standard of health and development for their infants and young children. The challenges presented by the HIV epidemic, emergencies, poverty, economic, globalization, environmental contamination, inadequate attention to prevention in health systems, gender inequities and women’s increasing employment outside the home, including in the non-formal sector, must be addressed if our vision is to become a reality for all children and for the achievement of the Millennium Declaration and related goals.

Innocenti Declaration, there was a call for action for all parties, governments, manufacturers and distributors, multilateral and bilateral organizations and international financial institutions to renew their commitments to achieve the nine targets of the Global Strategy for Infants and Young Children.

Objective: To describe the introduction of complementary foods in relation to age and bodyweight at birth, and associations to the duration of breastfeeding.

Methods: Parents of more than 600 infants (6–12 months of age) will complete a personal interview in relation to the National dietary survey. The interview includes questions about weight at birth, about time for introduction of selected foods and drinks in first year of life, and about duration of exclusively breastfeeding. The associations are explored by the multivariate data analyses Principal Component Analysis (PCA), and further, the associations will be analysed for significance.

Summary of the Results: The preliminary results of PCA, including data from about 420 infants indicate weak association between birth weight and introduction time for solid food, and positive association between duration of exclusively breastfeeding and introduction time for porridge and mashed potatoes and vegetables, and to a lesser degree introduction of potatoes, meat and fish etc.

Conclusion: Analyses of the final data set will show if these associations will be preserved and significant.

Introduction of complementary foods to Danish infants

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Introduction: In Denmark exclusively breastfeeding is recommended up to 6 month of age, when introduction of porridge and mashed vegetables should start. However it is also recommended to start the introduction earlier (not before 4 month of age), if the child shows physiologically readiness to eat solid food and no longer show satiety by breastfeeding or infant formula alone. Very little is known about the dietary intake of Danish infants and young children. The data collection of the National survey, from April 2006 to April 2007, will remedy this. The method combines a personal interview, and parent-administered 7-days diet records.

Objective: To describe the introduction of complementary foods in relation to age and bodyweight at birth, and associations to the duration of breastfeeding.

Methods: Parents of more than 600 infants (6–12 months of age) will complete a personal interview in relation to the National dietary survey. The interview includes questions about weight at birth, about time for introduction of selected foods and drinks in first year of life, and about duration of exclusively breastfeeding. The associations are explored by the multivariate data analyses Principal Component Analysis (PCA), and further, the associations will be analysed for significance.

Summary of the Results: The preliminary results of PCA, including data from about 420 infants indicate weak association between birth weight and introduction time for solid food, and positive association between duration of exclusively breastfeeding and introduction time for porridge and mashed potatoes and vegetables, and to a lesser degree introduction of potatoes, meat and fish etc.

Conclusion: Analyses of the final data set will show if these associations will be preserved and significant.

Long chain polyunsaturated fatty acids in breast milk and early weight and length gain of breastfed infants

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Introduction: Early weight and length gain might be affected by the long chain polyunsaturated fatty acids (LCPUFAs) content of the infants’ diet. Trials on supplementation of formula feeding with n-3 or n-6 LCPUFAs suggested an association between the presence of LCPUFAs in the diet and weight and length gain.

Objective: We studied the natural linoleic (LA), alpha-linolenic and their long chain derivatives, n-3 and n-6 LCPUFAs, content of breast milk of Dutch women in relation to weight, length, and BMI gain of their breastfed infants in the first year of life.

Methods: The children in this study were enrolled in the Prevention and Incidence of Mite Allergy (PIAMA) birth cohort study and were born in 1996/1997 in the Netherlands. Parents reported weight, length and breastfeeding duration in a questionnaire. Of a subgroup of the total study population breast milk samples were collected (n = 244). The fatty acid composition of breast milk was determined by gas liquid chromatography and expressed as weight percentages. Linear regression was used for data analysis.

Results: Mean (SD) birth weight and birth length was 3555 (490) grams and 51.3 (2.3) cm. Mean (SD) gain in weight, length and BMI per week from birth to 1 year was 119.5 (16.1) grams, 0.48 (0.05) cm
and 0.06 (0.03) kg/m². The inverse association between a high n-6 LCPUFA content and weight and BMI gain was not significant. N-3 LCPUFAs were not associated with gain in weight, length or BMI. A low and a high LA content was significantly associated with a lower weight and BMI gain compared to an intermediate LA content in the adjusted analyses (on average 5.0 grams lower weight gain per week).

Conclusion: The LCPUFAs content of breast milk does not affect weight, length, or BMI gain from birth to 1 year of age.

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Macro-Micronutrient composition of breast milk and estimated nutrient intake by Indian infants (0–6 months) belonging to different socio-economic group families

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To ameliorate early malnutrition, it is important to make precise estimates of infant's nutrient to screen for growth faltering and identify 'critical intervention points'.

Aim: to analyze macro and micronutrient composition of breast milk; and study the infant’s estimated nutrient intake.

Methods: The study was conducted on 87 mothers (15–45 yrs) and infants (0–6m). At 1st, 4th and 6th month post partum, 10mL breast milk was collected and analyzed for protein, fat, vitamin A, calcium, zinc and quantity of breast milk ingested (n = 26) estimated by 24hr infant test-weighing.

Results: Data indicate mean breast milk nutrient concentration: protein–1.2 + 0.2 g/DL (1m), 1.15 + 0.3 g/DL (4m), 1.16 + 0.5 g/DL (6m); fat– 2.7 + 0.9 g/DL (1m), 2.7 + 0.7 g/DL (4m), 2.7 + 1.1 g/DL (6m); Vitamin A–57.2 + 23.1 µg/dL (1m), 46.0 + 24.1 µg/dL (4m), 44.0 + 28.8 µg/dL (6m); Calcium–23.2 + 6.2 mg/dL (1m), 25.9 + 6.2 mg/dL (4m), 24.0 + 10.1 mg/dL (6m); and Zinc–3.4 + 1.5 µg/dL (1m), 3.0 + 1.8 µg/dL (4m), 1.5 + 1.0 µg/dL (6m).

At 1, 4 and 6m, the infants consumed 707.5 + 175.1 g/d (1m; n = 25), 689.2 + 204.1 g/d (4m; n = 21), 733.3 + 361.2 g/d (6m; n = 19) of breast milk. Compared to Indian RDA, estimated nutrient intake by Indian infants (0–6 months) belonging to different socio-economic group families was 707.5 g/d (1m), 689.2 g/d (4m), and 733.3 g/d (6m).

Conclusions: Mothers need to optimize their child care practices to stimulate the infant to consume greater volumes of breast milk, avert nutrient deficiencies and lay a proper foundation for growth and development.

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Markers of polyunsaturated fatty acid oxidation in human milk remain as traces after storage

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Breastfeeding mothers who express their milk often preserve it a few hours at room temperature or less than a week in the fridge. This does not alter the bacteriological quality of own mother's milk but information about lipid oxidation is scarce.

We assessed the impact of breastmilk storage at positive temperatures on n-6 and n-3 fatty acid oxidation, measured by the 4-hydroxynonenal (4-HNE) and 4-hydroxyhexenal (4-HHE) content.

Milk samples from four mothers were stored both 1 day at 20°C and 1 week at 4°C. Fatty acid (FA) profile was obtained by GC after transmethylation. The 4-HHE and 4-HHE contents were measured by GC-MS after derivatization using O-PFB and BSTFA. Vitamin E content was assessed by HPLC. Four infant formula were also tested. Results are means ± SEM, analyzed by a paired Student’s t-test.

Fresh human milk samples contained 29.5 ± 6.6 mg/mL of total FA (n-6 FA: 9.8 ± 0.7%; n-3 FA: 20.0 ± 0.3%), 1.14 ± 0.26 µg/mL of vitamin E and 10.6 ± 6.1 µM of thiobarbituric acid reactive species that did not increase upon storage. The 4-HHE/n-3 FA ratio remained stable: 0.19 ± 0.01 µg/g in fresh milk, 0.16 ± 0.07 µg/g after 1 day at 20°C and 0.18 ± 0.03 µg/g after 1 week at 4°C. The 4-HNE/n-6 FA ratio was 0.004 ± 0.000 µg/g in fresh milk vs 0.03 ± 0.01 µg/g after 1 day at 20°C and 0.03 ± 0.01 µg/g after 1 week at 4°C (P < 0.1). The latter trace levels depended on vitamin E content. In infant formula the 4-HHE/n-3 ratio was 6.4 ± 2.2 µg/g and the 4-HNE/n-6 ratio was 1.2 ± 0.6 µg/g.

The trace levels of markers of polyunsaturated FA oxidation in human milk were not affected by common storage conditions at positive temperatures. Higher contents were found in infant formula. Whether a threshold level of 4-HHE and 4-HNE would be of health concern remains to be elucidated.

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Mature intestinal NK cells are increased by milk-derived concentrate supplementation in rotavirus infected neonatal rats

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In previous studies we have developed a rotavirus infection model in suckling rats and established the protective role of a bovine milk concentrate (BMC) supplement administered daily in Lewis neonatal suckling rats. The present study was designed to establish the effect...
of BMC on intestinal intraepithelial lymphocytes (IEL), as mucosal effector cells, during a rotavirus-induced diarrhoea in suckling rats.

Lewis neonatal rats were daily supplemented with BMC. Other two groups without supplementation (RV and REF groups) were considered. After heterologous simian rotavirus SA-11 inoculation in BMC and RV groups, infection was evaluated by clinical indexes. Intestine was removed from pups, 1 and 3 days post-infection (DPI), and IEL were isolated. IEL phenotype was determined by three colours staining with fluorochrom conjugated monoclonal antibodies and later analysis by flow cytometry.

Main changes in IEL phenotype were found on 3 DPI, coinciding with the maximum diarrhoea peak in inoculated animals. Natural killer (NK) cell proportion (NKR-P1A+ TCRalpha(α)beta(β)) increased in infected rats, mainly due to the NK CD8+ cell subset which is the most characteristic phenotype during early age. However, the NK cell proportion increase, induced by the infection, found in BMC group was also due to a higher percentage of CD8- NK cells, which is a more mature phenotype of NK cells.

In addition to the BMC effect controlling the diarrhoea process induced by rotavirus infection, here we found changes in IEL composition of these treated animals, which are reflected by an increase in more mature NK cells. Thus, these cells could efficiently contribute to fight against virus and control the gastro-enteritis process.

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P240 Infant and Children Nutrition
Measurement of household food security in a birth cohort Brazilian study
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Introduction: Food security is an essential dimension of health and well-being. Measurement of food insecurity is an important part of understanding and assessing nutritional problems. Food insecurity is a complex multidimensional phenomenon defined as limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

Purpose: To determine the prevalence of food insecurity and association with nutritional status among low income children.

Methods: A birth cohort study nested in a randomized trial was carried out to investigate the prevalence of food insecurity and risk factors among 310 children between 37 and 58 months from the city of São Leopoldo, Rio Grande do Sul, Brazil. The food insecurity was measured by a Brazilian Food Insecurity Scale (EBIA). The risk of overweight criteria used was the z-score >1.5 SD. For stunting and low weight for high was used <−1.5 SD.

Results: The prevalence of food insecurity was 44.8%, risk of overweight, undernutrition and stunting was 11.1%, 2.9% and 7.0%, respectively. After adjusting for socioeconomic variables, risk of overweight (RR: 0.84; CI95% 0.38–1.84), stunting (RR: 1.73; CI95% 0.70–4.23) and undernutrition (RR: 1.38; CI95% 0.35–5.44) wasn’t associated with the food insecurity.

Conclusion: The results showed a high food insecurity prevalence. However, this condition wasn’t enough to affect the children nutritional status in this period of life.

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P241 Infant and Children Nutrition
Milk fortified with iron and zinc improves physical growth of Mexican toddlers, quantitatively and qualitatively
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This study evaluate the effectiveness of a nation-wide program distributing milk fortified with 10 mg of iron (gluconate), 10 mg zinc (oxide), vitamin C and other micronutrients on the linear growth and body composition of 1084 Mexican toddlers 12–30 mo of age. Children were randomly assigned to receive daily either 500 mL of fortified milk for 2 years (FM2Y) or non-fortified milk for one year followed by fortified milk the second years (FM1Y), under the normal operation conditions of the program. A comparable third group that never received fortified milk was assembled the second year (C) selected from the same communities. Body height and weight were measured 0 and 2 years after initiation of the intervention, Fat-free mass (FFM) by impedanciometry, physical activity by accelerometry were measured after two years. Means from linear regression models, adjusting for baseline measurements of the variables, age, sex, socioeconomic status and nesting within the communities were calculated. Prevalences were compared by X2. Means height (FM2Y = 99.8 ± 3.2 cm, FM1Y = 99.3 ± 3.3 cm vs C group = 97.1 ± 3.1 cm, p < 0.001); FFM (FM2Y = 10.4 ± 0.87 kg, FM1Y = 10.3 ± 0.87 kg vs 9.7 ± 0.91 kg C, p < 0.001); AF (FM2Y = 288 ± 115 kcal, FM1Y = 321 ± 115 kcal and C = 241 ± 109 kcal, p < 0.001) were higher in the FM2Y and FM1Y than in the C group. The basal prevalence of stunting lessened from 11.5% to 6.3% FM2Y, 8.3% FM1Y and 11.9% in the C group.

This program distributing milk fortified with iron and zinc to 5 million children demonstrated to be effective to improve the quantity and quality of growth.
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Nutritional status and related factors in 4/5 months – old infant in Kashan city

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Background: Considering the adverse effects due to formula feeding and early commencement of supplemental diet and also different reports from their status, this study was conducted to investigate the nutritional status and related factors in 4/5 month-old infants referred to health care centers in Kashan in 2002.

Materials and Methods: This cross-sectional study was performed on 350 infants in 4/5 months – old. The sampling was done randomly in several phases. The information about kinds of diet, age, education and occupational status of mothers, infant sex and birth’s order, the commencement time of first feeding and supplemental diet, exclusive breast feeding period were collected. The weight and height of infants were measured. Then collected data was analyzed.

Findings: Non exclusive breast feeding was observed in 17.7% of infants and in 3.7% of infants supplemental diet had begun earlier than 4 months. Exclusive breast feeding period in 82.3% of infant was more than 4 months. There was a statistically significant correlation between kinds of diet and maternal age (P<0.002), occupational status (p<0.001) and the commencement time of first feeding (p<0.0005). Infant weight in exclusive breastfeeding group (N1 = 288) was 7243 ± 792.1 gr and in non exclusive breast feeding group (N2 = 62) was 6891 ± 1059 gr (P<0.002). Their height was respectively 62.63 ± 2.9 cm and 62.25 ± 3.1 cm (P<0.1)

Conclusion: Early beginning of breast feeding in postpartum period, paying further attention to old mothers and employment mothers have an important role in exclusive breastfeeding promotion and prevention of infant mortality.

P244 Infant and Children Nutrition

Nutritional status in a sample of French children: comparison with the new WHO growth standards

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Aim: New WHO Growth Standards for children up to 5y of age from the Multicentre Growth Reference Study (MGRS) were recently released(1). They describe child growth in a population whose care practices approximated health recommendations. Our objective was to compare WHO standards with French data.

Method: ELANCE prospective study (1985–2005): 156 children were recruited in health centres (10 mo, 2 and 4 y) and followed up to 20 y (2). Measurements of length/height, weight and BMI were converted into Z-scores (SDS) and compared with the French reference study (FRS) (1955–1979) (3) using the ‘WHO anthro 2005’ software.

Results: Birth measurements were similar in the 3 studies (MGRS, ELANCE, FRS). 1) Length/height: French children were shorter than MGRS children. After 9 mo of age, mean difference was lower in ELANCE (~0.18 SDS) and higher in the FRS (~0.56 SDS). 2) Weight and BMI: both followed similar patterns. BMI in French children was higher than in the MGRS, with a difference reaching 0.43 SDS at 10 mo in ELANCE and 0.84 SDS at 15 mo in the FRS. Thereafter, the difference decreased to 0.22 SDS at 4 y in ELANCE and to 0.07 SDS at 5 y in FRS, approaching MGRS values. In general, girls and boys followed similar trends.

Conclusion: Generally, French children were shorter and had a greater BMI than those from the MGRS. These differences can be due to secular trends or to variation in population characteristics. Using WHO rather than FRS cut-offs will lead to an increased number of children reported as being short or overweight. It is therefore important to be aware of these differences.
This research was partially supported by NIH (R01-HD30880) and the International Obesity Task Force references were used to define overweight and obesity. The results showed that overweight and obesity were rare in 1982 (1.7%), but had higher rate in 1992 (5.3%) and much higher rate in 2004 (15.6%). Prevalence of overweight and obesity in urban areas was considerably higher than in rural areas (14.1% vs. 6.8%) in last decade, but it increased rapidly in rural areas. In urban areas, the largest increases in BMI were at the upper ends of the distribution. In the last 22 years, the prevalence rate increased by .64 each year with a faster increase recently. Regression analyses were used to examine more rigorously the population composition and behavioral causes of this increase.

Acknowledgement
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References
1 www.who.int/childgrowth.
More public health measures are required to revert the situation in Madeira.

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**P248 Infant and Children Nutrition**

**Prebiotics increase bacterial translocation in an animal model of preterm infants**

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**Introduction:** Prebiotics are thought to reinforce the intestinal barrier function of adults, a vital but immature function in the preterm infant. The aim of the present study was to assess the impact of a mixture of galacto- and fructo-oligosaccharides (GOS/FOS) on the intestinal barrier function of artificially reared rats, an animal model of preterm infants.

**Methods:** Newborn rats were non invasively gastrostomised 5 days after birth (D5), and pups were artificially fed rat milk replacer with (G/F, n = 12) or without (CTL, n = 12) GOS/FOS until D18 (prior to weaning). At this age, trophicity (mass and surface area), FITC-Dextran (4KDa) permeability measured in Ussing Chamber and fermentation products were analysed in the 3 segments of the large intestine. Bacterial translocation toward the spleen was quantified.

**Results:** The total luminal content in short-chain fatty acids, mainly acetate (>90%), was increased in the G/F group compared to the CTL group (11.2 vs. 6.4 μmol respectively, p = 0.028). The weight (W) and surface area (SA) of the large intestine were increased in the G/F group (W: 0.36 vs. 0.44 g, p = 0.004; SA: 5.2 vs. 6.7 cm², p = 0.005), with no difference in permeability to Dextran, in the 3 ceco-colonic segments. Interestingly, a higher incidence of translocation of aerobic and anaerobic bacteria (25 vs. 67%, p = 0.04 and 50 vs. 83%, p = 0.09) was observed in GOS/FOS fed pups. The eventual over-proliferation of the microflora that could explain such a result is currently being assessed.

**Conclusion:** As bacterial translocation is thought to be deleterious, especially for preterm infants, this finding suggests that GOS/FOS supplementation may not be beneficial for infants with a highly immature intestine.

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**P250 Infant and Children Nutrition**

**Prevalence of Iranian children obesity based on 3 different reference data**

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**Objective:** Prevalence of childhood obesity has been reported to be increasing for last several years world-wide. In recent years, the child body mass index (BMI) percentiles have been used for obesity determination and national BMI reference data have used to identify obese children in many countries. Since Iranian national BMI reference data was only available from 1999, many previous investigations have used other countries as well as US center for disease control (CDC) or international obesity task force (IOTF) references, to calculate the prevalence of Iranian childhood obesity. On the other hand, calculating childhood obesity prevalence based on IOTF helps childhood obesity comparison world-wide. The present study aimed to...
estimate the prevalence of childhood obesity in 5 different Iranian cities, based on 3 different reference data.

Materials and Methods: Using two stage cluster sampling from 5 Iranian cities (Ahwaz, Kerman, Kazeroun, Yazd α Urmia), 17719 primary school pupils were studied. Those who had a BMI greater than the Iranian and/or CDC2000 age α sex 95th percentile, or had a BMI greater than of the IOTF value, were identified as obese.

Results: Analyzed data indicated that 6.2% of boys and 4.7% of girls were obese using Iran reference data and the differences were statistically significant. In addition, 4.0% and 3.5% of these boys and girls were identified as obese using IOTF references respectively. About 6.1% and 4.6% of boys and girls were assumed as obese using CDC reference data respectively and these differences were significant.

Conclusion: The present study results suggest childhood obesity is slightly higher than expected between many Iranian children and boys are more likely to be obese.

P251 Infant and Children Nutrition

Prevalence of optimal breast feeding practices in Shoa Robit town, North Shoa, Ethiopia

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The morbidity and mortality of the infants who are not optimally breast fed, especially in the first few months of life is higher than those who are breast fed. A community based cross-sectional survey was conducted among 320 households with the aim of assessing the prevalence of optimal breast-feeding practice and factors affecting the practice among mothers who have at least one under 24 month of age children in Shoa Robit Town, Northern Ethiopia. The data were collected using interviewer administered structured questionnaire and fed to computer and analyzed using SPSS for windows version 11.5.

The result showed that, 120 (37.5%) of the mothers were in the age group 20–24 yrs, 294 (91.9%) of the respondents were married and 227 (70.9%) of them were Orthodox Christians. Thirty seven point five percent of the mothers were illiterate and almost half of them had monthly income below 200 Ethiopian Birr (equivalent to about 18 Euros). Fifty percent of the index children were in the age group above 12 months. Of the index children, 52 (16.6%) of the mothers initiated breast feeding with in the 1st hour after delivery. Seventy seven (30%) of index children were exclusively breast fed till six month of age, 102 (32.5%) of children breast fed 8–12 times per day and only 51 (15.9%) of the mothers took additional food during breast feeding. Overall, all less than 24 months of children were not optimally breast fed. Therefore, there should be a clear guide line and strong behavior change communication on the importance of optimal breastfeeding practices, and reorientation of health professionals at all levels on promotion of breast feeding practice is recommended.

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Prevalence of zinc deficiency in 6 year-old children

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Background: Zinc deficiency is one of the most prevalent micronutrient deficiencies in developing countries, Iran included. Zinc deficiency primarily affects tissues with high turnover (e.g. gastrointestinal mucosa, skin and blood cells), but disorders in physical growth and sexual development are among the most known consequences in chronic zinc deficiency. This study was carried out to determine the prevalence of zinc deficiency in 6 year-old children in order to assist policy makers.

Methods: A cross-sectional study was carried out in 4374 healthy 6 year-old children (5 years and 11 months to 6 years and 11 months and 29 days). The children were randomly selected from normal Iranian families nation-wide. The country was divided into 11 regions (about 400 samples in each region) and the study was carried out from May 25th to June 3rd 2001. Cluster sampling was the selection method used, in which the clusters were not equal in the number of families but equal in the number of 6 year-old children. The serum zinc concentration was measured 5 ml blood taken from the selected children using atomic absorption technology. The cut off point for zinc deficiency was set at a serum zinc level of 70 μg/dl.

Results: The prevalence of zinc deficiency was estimated to be around 31% ranging from 29.2–32.8% (CI = 95%). The highest prevalence was seen in the region covering Sistan and Baluchistan, South Khorasan and Southeast of Kerman and the lowest in the region of Boushehr, Hormozgan and South Khozestan. The prevalence of zinc deficiency was significantly higher in rural areas compared to urban (27.2–34.1%).

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Production of n-6 and n-3 polyunsaturated fatty acids (PUFA) metabolites – leukotriens (LT) 4 and 5 series in children with asthma: possible effects of anti-inflammatory therapy

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Introduction: Metabolites of arachidonic acid (n-6 PUFA)-leukotriens (LT) 4 series – are potent mediators of allergic inflammation. Metabolites of eicosapentaenoic acid (n-3 PUFA) – LT 5 series – are less active ones. Shift from LT 4 series to LT 5 series release induced by n-3 PUFA feeding may possibly decrease allergic inflammation in asthma. The data on clinical efficiency of n-3 PUFA addition to children diet in asthma are rather contradictory because of possible influence of anti inflammatory therapy on their effects. So the aim was to study the effect of cromoglycates and inhaled corticosteroids on series LT 4 and 5 level in children with asthma.
Methods: LTB4, C4, D4, E4, B5, D5 release from peripheral blood leukocytes was determined by HPLC in 8 healthy children aged 7–12 years old and in 63 children of the same age with asthma which included untreated patients and children treated by cromoglycates and inhaled corticosteroids.

Results: Cromoglycates and inhaled corticosteroids treatment of children decreased LTC4 level (p = 0.0004) that was increased in untreated children. The decrease of LTC4 release was accompanied by increase of its metabolites LTD4 and especially LTE4. Changes of cysteinyl LT production led to decrease of LTB4 level and the ratio LTB4/LTB5 from 6:1 in healthy and untreated children to 3.5:1 and 2:1 in children treated with cromoglycates and inhaled corticosteroids respectively and increased of LTD4/LTD5 ratio 3–11 times compared to healthy children and 1.3–3 times compared to untreated children.

Conclusion: Anti inflammatory therapy partly suppresses production of LT 4 series but do not prevent their excessive production compared to LT 5 series. So it may be reasonable to combine asthma therapy with diet enrichment of n-3 PUFA.

**P254** Infant and Children Nutrition

*Retrospective investigation of infant growth and feeding records as a basis for monitoring and surveillance at a local community level*

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Growth monitoring is an important component of infant, child and adolescent health surveillance at state, national and global levels. Infant Growth Monitoring (IGM) serves a number of functions at a community or population level, including identify factors or determinants associated with abnormal infant growth, identification of infant growth trends and intervention needs, and evaluation of community level interventions relating to infant nutrition and health. IGM systems require three phases to be effective as a health information and promotion system. These include measurement and recording, analysis and reporting. This study aimed to analyse information collected and recorded in Community Child Health Service infant health records from a local Health Service District, in order to progress the development of a cost efficient District level infant growth monitoring system. Infant records were systematically sampled based on proportional selection of charts from alphabetic clusters of files by surname (strata), to ensure equal probability of chart selection. Retrospective analysis of 1053 infant records over the 2001–2005 period inclusive, was conducted to assess the prevalence of abnormal infant growth (under and over weight/length) and explore the relationship between abnormal growth and a range of infant health and maternal socio-demographic variables. The socio-demographic attributes of the sample population were not significantly different from that expected of the local population sample frame, indicating low risk of sampling bias. The results of this analysis indicate breastfeeding duration rates and associated determinants similar to other sub-national population studies and the prevalence of at-risk growth trajectories in less than 5%.

**P255** Infant and Children Nutrition

*Risk factors associated to intrauterine growth deficit in term new born. 1990 and 2004 cohort analysis*

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Introduction: Intrauterine growth deficit (IUGD) has been associated with an increase in later risks of chronic diseases during adulthood.


Methods: From National birth registry databases (n1990 = 292145; n2004 = 230352), information containing birth weight and birth length of the new born and socio-demographic and educational level of the parents were obtained. Rohrer’s Index (Weight (Kg)/Height (cm)) was built and each child was classified as IUGD or normal. Logistic regression models to assess the relationship between IUGD and parents educational level and maternal age, were run.

Results: In 1990 cohort, 3.8% of term (37weeks) new born presented IUGD. Low level of schooling (secondary) of the father (OR: 1,1 95%CI: 1.01–1.20), illiteracy of the father (OR: 1,28 95%CI: 1.01–1.62), low educational level of the mother (secondary) (OR: 1,19 95%CI: 1.086– 1.31) and adolescence of the mother (18 years old) (OR: 1,39 95%CI: 1.29–1.49) were the main risk factors. In 2004, 2.5% of the new born were IUGD. The main risk factors associated with this diagnosis are: Illiteracy of the father (OR: 2,25 95%CI: 1.36–3.71) and the adolescence of the mother (OR: 1,28 95%CI: 1.16–1.41).

Conclusions: In 1990, main risk factors are associated to educational level of the parents and they lose importance in 2004, except fathers illiteracy. On the other hand, maternal adolescence remains as an important risk factor.

**P256** Infant and Children Nutrition

*Risk for pediatric overweight in Mexican school children living in the Mexico/US border*

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Pediatric overweight is a growing public health problem in Mexico. The purpose of this study was to assess risks of pediatric overweight in the Mexico/California border population and the lifestyles associated with increased risk of overweight. Convenience sampling methods were used to recruit a cross-sectional sample of 4th, 5th and 6th grade children and their parents at Tijuana and Tecate.
Public Schools. Children and parents weight and height were measured. Children food intakes were measured by food frequency questionnaires.

Interviews were conducted to 123 children and their parents. Most of parents (60%) were migrant from different Mexican states. The mean age of the children was 10.14 ± 0.96 (8.6–13.7) years. Forty-nine per cent of children were at risk or overweight. Child BMI percentile was 73.6 ± 25.2 and mean adult body mass index (BMI) kg/m² was 28.8 ± 5.7. Children with obese parents (BMI > 30) had greater odds of being overweight compared with normal weight children, OR 4.9 (95% CI 1.2–19, p = 0.03). The risk for children with overweight parents (25–30 kg/m²) did not differ those with normal weight parents, OR 3.06 (95% 0.8–10.9, p = 0.15). Children reporting greater consumption of spaghetti, pizza and French fries had higher risk of overweight, OR 2.5 (1.1–5.69, p = 0.04) and abdominal obesity, OR 2.9 (1.29–6.67, p < 0.05). High consumption of white bread, rolls and muffins were associated with higher risk of overweight, OR 2.55 (1.09–5.98). Eating various foods frequently consumed in Mexico, television viewing and playing videogames were not associated with overweight. We found that parents obesity and higher consumption of products with high content of carbohydrates (pizza, French fries, spagetti, and white bread) were the main risk of overweight.

**P257 Infant and Children Nutrition**  
**Strategies to prevent children’s obesity**  
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**Introduction:** The Spanish Society of Community Nutrition (SENC) has been develop, in conjunction with the Education and Health Departments of the Autonomous Government of Catalonia, an educational activity focused on the prevention of children’s obesity.

**Objectives:** To get the eating habits of schoolchildren closer to Mediterranean diet patterns.

– To promote the participation of children and adolescents in their own nutritional process through coordinated action between the family and the school.

– To propose strategies tending to reduce children’s obesity.

**Methodology:** A selection was made of health-oriented school centres in the European network involving Catalan students in their primary-fifth cycle – up to a total of 400 students. The selected school centres developed a series of activities connected with nutrition and physical activity. The students of each school centre produced a ‘Decalogue’ (or ten basic principles) incorporating the views expressed by all of them and presented them at the Working Conference in which the various centres involved participated.

**Results:** Based on the various ‘decalogues’ obtained, a single ‘Decalogue’ was produced. It contains the most relevant points agreed on by the various participants. These include such items as – the need of a good breakfast, a rational organisation of daily meals (which should include fish), the need of active games and of an interaction with the parents as far as good shopping practices are concerned as well as increased awareness of nutritional issues in the world today.

**Conclusions:** The strategies proposed on nutrition and physical activity to prevent children’s obesity are based on the results thus obtained.

**P258 Infant and Children Nutrition**  
**Supplementation with glutamine reverts the alteration of macrophage function induced by precocious weaning in mice**  
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The functionality of macrophages is dependent on the extracellular concentration and metabolism of glutamine. Infants present an increased demand for glutamine (GLN), which is supplied by the ingestion of mother’s milk.

**Objective:** To verify the effect of precocious weaning and subsequent in vitro supplementation with GLN on functionality of peritoneal macrophages of mice.

**Methods:** Mice were either weaned on the 21st day of life (W-21, n = 8) and precociously on the 14th day of life (W-14, n = 8). The W-14 group was fed a glutamine-free diet between the 14th and 21st days of life. Both groups were sacrificed on the 21st day of life. Peritoneal macrophages obtained from the mice of the W-21 group were cultivated in a glutamine-free culture medium, whilst those obtained from mice of the W-14 group were cultivated in media containing 0, 0.5, 0.58, 1 and 2 mmol/L of GLN. The functionality of peritoneal macrophages was determined by their capacity of adhesion, spreading, phagocytosis and fungicidal capacity as well as by evaluating the synthesis of nitric oxide and hydrogen peroxide. The concentration of GLN in the plasma was also determined.

**Results:** The W-14 group presented a decrease in the plasma concentration of GLN, in adhesion, spreading, phagocytosis, fungicidal capacity and synthesis of nitric oxide and hydrogen peroxide of peritoneal macrophages (p < 0.05) compared to the W-21 group. With the exception of fungicidal activity, the in vitro supplementation with glutamine was able to revert the effect produced by precocious weaning (p < 0.05).

**Conclusion:** The functionality of peritoneal macrophages in mice is dependent on glutamine during the breast feeding period.

**Acknowledgment**

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The aim of this study was to assess the preference for sweetness and sourness among male and female school students in Tehran, the capital of Iran. In addition, the study assessed whether sweet and/or sour taste preference was associated with sex, overweight, obesity and BMI. In this analytical study a sample of 706 school students (331 boys, 375 girls) aged between 5 to 12 years were randomly selected using a multistage cluster sampling method from all 19 educational districts in Tehran. Weight and height were measured according to WHO recommendation by trained nutritionists and data on taste preference were collected verbally. Students were asked to answer if they prefer sweet, sour, salty, bitter or spicy tastes. Only sweet and sour tastes are reported, because frequency of sour and sweet tastes were considerably higher than other tastes. Overweight and obesity were evaluated using body mass index [BMI] centiles for age and sex. Obesity was defined as BMI \( \geq 95\% \) percentile and overweight was \( > 85 \) to \( < 95\% \) percentile of sex-specific BMI-for-age growth charts of CDC, 2,000. Obese and/or overweight students preferred sweet taste more than other students. However, this difference was not statistically significant. Male students preferred sour taste \((p < 0.000)\). The student who preferred sour taste had higher average of BMI compared with those who preferred sweet taste \((p = 0.003)\). The data indicate that sex and weight status may influence taste preference among school children.

Objective: To determine the prevalence of breastfeeding associated with socioeconomic status and the growth of infants.

Methods: A cross-sectional survey of a randomized sample of newborns during 2004 and 2005 was carried out in Campinas, São Paulo, Brazil, where 2857 mothers of infants less than two years of age were interviewed in order to obtain information on socioeconomic status and practice of breastfeeding. Weight and length of newborns were measured at the end of the interviews. The determination of the sample size was based on data of ‘Declaration of Born Alive’ of Campinas (SINASC). Z-scores \((-2\) and \(+2\)\) were used to classify weight and length. The significant level adopted was 5%. The survival analysis of the Kaplan Meier method, the Log Rank test and the multiple linear regression were used.

Results: The median of exclusive breastfeeding (EB) was 90 days \((CI 95\%: 87.6–92.4)\); the predominant breastfeeding (PB) was 120 days \((CI 95\%: 117.7–122.3)\) and for the full breastfeeding (FB) was 120 days \((CI 95\%: 116.9–123.1)\). In relation to maternal schooling, newborns of mothers who had studied during nine and eleven years presented a lower weight \((p = 0.020)\). In relation to maternal occupation, males of unemployed mothers presented a lower weight when compared to mothers of a technical level \((p = 0.007)\); females who were predominant breastfed over 120 days presented a lower weight \((p = 0.047)\). Females of mothers of univeristarian level presented a lower weight when compared to mothers of a technical level \((p = 0.034)\) in relation to EB.

Conclusion: The breastfeeding duration associated with school- ing and maternal occupation interfered at the growth.

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the study revealed that children stood below the NCHS standards. The girls from LSE not only had lower attained weight, height, skin fold thickness at triceps and mid arm circumference but also had a significant difference (< 0.05) in menarche age (14.5) as compared to girls from HSE (12.2). Although social class differences delayed the occurrence of the events by chronological age, the time between peak weight velocity and onset of menarche remained similar (1.5 yrs) irrespective of social class. The mean age at menarche, at group level (but not at individual level) was 36 kg in both socio economic classes irrespective of age at onset.
The relationship between nutritional factors and atypical coeliac disease in children from a risk group

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Clinical course of coeliac disease (CD) changed during last 20 years into atypical, without manifestation from the gastrointestinal tract. The CD may coexist with another diseases, like autism, epilepsy, attention-deficit/hyperactivity disorder (ADHD) etc. On the other hand, breast feeding and later time of gluten introduction into the diet are considered as a protective factors against CD.

The aim of the study was to estimate of role of breast feeding and time of gluten introduction into the diet in CD development in children from the risk groups.

Study was performed in 766 children (aged 2–18 y) patients of Children’s Health Centre Memorial Institute from groups of risk: ADHD (116), autism (71), epilepsy (83), short stature and low weight (128), irritable bowel syndrome – IBS (268) and other symptoms (100), without manifestation from the gastrointestinal tract. In all patients the anti-(EmA) and anti-(tTG) tests were performed. In patients with positive results of tests the biopsy of small bowel was done. Period of breast feeding and time of gluten introduction were estimated on the basis of questionnaire.

Clinically confirmed CD was diagnosed in 13 children (aged 4–16 y) including IBS (7), short stature and low weight (3), ADHD (2), anaemia (1). The mean period of breast feeding in CD group was 13 months (6 in the control group). Mean time of gluten introduction was at 10th month in both groups. Gluten was introduced during the breast feeding in 6 children from CD group and in 2 from the control.

There were no differences in time of gluten introduction to the diet between the CD and control groups. We didn’t observe the protective role of breast feeding; perhaps it is the necessary to continue the observation in larger group of patients.

Reference

The study of n-3 PUFA clinical efficiency in chronic gastroduodenitis and duodenal ulcer treatment of school children

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N-3 polyunsaturated fatty acids (PUFA) are used now in treatment of many diseases but mainly in adults. However their possible effects in children with chronic gastroduodenitis (CGD) and duodenal ulcer (DU) were not studied. At the same time it was shown the influence of n-3 PUFA on some cytokines participating in the development of CGD and DU.

Aim: To study possible effects of n-3 PUFA supplements to usual diet of children with CGD and DU on clinical signs of disease.

Methods: 133 children aged 9–17 years of both sexes were enrolled in the study. Children were randomly assigned to receive n-3 PUFA supplement additionally to usual therapy (fish oil capsules, 0.3 g, containing 25% n-3 PUFA)-fish oil group (FO group), n = 63 or only usual therapy (control group), n = 70. Children of FO group were given FO supplement during 12 + 4,3 days; 22 children of this group continued to receive supplement during 78 + 18 days. All children in both group were examined on 15,60 and 240 day of FO feeding, including evaluating of clinical signs.

Results: On 15th day of study abdominal pain registered in 4.7% of FO group and in 3.8% of control group, heartburn—in 6.2% and in 6.4%, constipation in 10.2% and in 18.2%. Similar data have been observed on 60th day. However, examination on 240th day demonstrated significant difference of clinical signs frequency in groups: abdominal pain relapsed in 9% children of FO group against 11.9% in control group (p < 0.05), constipation in 10.1% against 36.5%, resp. (p < 0.05) and frequency of heartburn was 4.5% and 6.7%, resp.

Conclusion: Additional intake of FO containing n-3 long chain PUFA decrease the frequency of abdominal pain and constipation relapse in children with CGD and DU; these effects may be seen only after rather long fish oil intake (2,5 months).

Urinary excretion of retinol and retinol binding protein 4 in preterm neonates is related to kidney maturation

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Retinol (ROH) is an essential factor in early embryonic development and later maturation of the kidney and the lung. Under physiological conditions, ROH is associated in blood with its specific binding protein, the retinol binding protein 4 (RBP4) and transthyretin (TTR).
Since renal cells are not fully differentiated at birth and kidney function is still reduced, the renal excretion of ROH and RBP4 can influence vitamin A metabolism especially the homeostatic control in blood plasma.

To document the relationship between kidney function and ROH/RBP4 excretion, the renal excretion of creatinine, total protein, ROH, RBP4, TTR were determined and the UPUC (ratio between urinary protein to urinary creatinine) was calculated for urine samples from 15 preterm neonates (4f, 11m) with a median birth weight of 914 g (range 534–1550 g) and a median gestational age of 27 weeks (24–32 weeks) collected at the first day postpartum. In urine, significant amounts of ROH (median: 234 (0–1316) nmol/g creatinine, RBP (371 (median: 39.9–1339) nmol/g creatinine), TTR (median: 13.2 (1.13–176) nmol/g creatinine), creatinine and total protein were found at the first day of life. A significant correlation existed between urinary ROH and urinary RBP (0.93; p < 0.001), between the UP/UC-ratio and the renal excretion of ROH (0.55; p < 0.05), RBP (0.70; p < 0.001) and TTR (0.81; p < 0.001). In conclusion, results show that the renal excretion of ROH and its carrier proteins RBP and TTR is related to the renal protein excretion and thus associated with kidney maturity. Because the kidney maturity has not been completed, substantial losses of RBP, ROH and TTR in the urine are the consequences which substantial contribute to an increased vitamin A demand during this vulnerable period of tissues.

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Waist circumference in 6 to 10 years-old children of autonomous region of Madeira, Portugal

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Introduction: Waist circumference (WC) is an extremely important parameter to evaluate the health condition and essential in the prognosis of the risk of disease.

Objectives: To determine the distribution of WC for age and sex in 6 to 10 yrs old children in Madeira and to compare this distribution with reference data and to investigate possible associations with other anthropometric measurements and indices.

Material and Methods: The data was collected cross-sectionally and includes 2384 children, 1126 girls and 1258 boys. WC and others anthropometric variables were measured using standardized procedures and body mass index (BMI) (Kg/m2) was calculated. To categorize WC we used the British reference (2001) and for BMI the Centers for Disease Control and Prevention reference (2000). Based on BMI for age we considered overweight between the 85th and 95th percentile and obesity >95th percentile.

Results: For WC, the prevalence of children below the 90th percentile was 40.2%, between the 90th and 95th percentile 12.1%, and >95th percentile <47.7%. The percentage of girls >90th percentile (64.4%) was higher than boys (55.7%), and the age at which the highest prevalence of children with >90th percentile were found was 9 years (65%). 42.2% of children classified between the 5th and 85th percentile for BMI are categorized <90th percentile for WC. As the British reference was developed in the 1980’s and probably is not the most adequate one for the present times with this research we also aim to build local anthropometric references.

Conclusions: The percentage of children at or above the 90th percentile for WC is very high, which reflects the secular tendency verified in this parameter and indicates the extent of obesity also in this age group.

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Cross-sectional reference values for mid-upper arm circumference, triceps skinfold and arm fat area of Turkish children and adolescents

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Determination of fat and fat-free mass is of considerable interest in the evaluation of nutritional status. Mid-upper arm circumference (MUAC), triceps skinfold (TSF) or arm fat area (AFA) which is calculated from MUAC and TSF are recommended to measure child fatness in the field. The aim of this study was to establish cross-sectional reference values for MUAC, TSF and AFA of Turkish children and adolescents aged 6–17 years old. This is a cross-sectional study conducted in two of the central and ten outlying districts of Kayseri Province. Samples were collected by a multistage sampling method from primary and secondary schools which represent the city centre and districts. A total of 5,553 students (2,843 girls, 2,710 boys) were selected to construct a reference curve. MUAC and TSF were measured and AFA was calculated. The LMS method was employed to calculate the MUAC, TSF and AFA curve parameters. Reference curves for MUAC, TSF and AFA in Turkish children and adolescents were estimated by a generalised additive model. MUAC, TSF and AFA in each age group were significantly higher in females than in males (p < 0.05). In boys, TSF 50th percentile ranged from 7.6 at 17 years to 9.0 mm at 11 years; and in girls, ranged from 9.4 at 6 years to 14.6 mm at 17 years. MUAC 50th percentile ranged from 17.0 to 23.6 cm in boys; ranged from 15.6 to 20.9 cm in girls. AFA 50th percentile ranged from 4.5 cm² at 6 years to 5.8 cm² at 12–14 years in boys; ranged from 7.2 cm² at 6 years to 14.82 at 17 years. The percentile distribution was more disperse towards higher TSF and AFA values in males when compared with females. We established TSF, MUAC and AFA reference values for Turkish children and adolescents aged from 6 to 17 years old.
**P270 Infant and Children Nutrition**

**Height and weight of urban pre-school children in relation to their mothers’ educational levels and employment status in Rasht city, northern Iran**

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**Aim:** This study determined the relationship between anthropometric status of 3–5 year urban children and their mothers’ educational levels and employment status in Rasht city, Northern Iran.

**Design:** A total of 1319 children (638 girls and 681 boys) between the ages of 3 and 6 years in all day care centers in Rasht city were studied using a cross sectional design. Height and weight of the children were measured and data on mothers’ educational levels, employment status, and duration of breast-feeding were collected. Height for age, weight for age and weight for height of the children were compared to NCHS reference population and Z-score values $\leq -2$ were considered as stunted, underweight and wasted, respectively.

**Results:** The data showed that prevalence of stunting, wasting and underweight were 8.6, 8.0 and 7.1%, respectively. Our findings indicated that children of both less educated mothers ($<5$ years of schooling OR = 2.54; 95%CI: 1.54–4.87) and college educated mothers ($>12$ years schooling, OR = 1.87; 95%CI: 1.08–2.4) had more relative risk for overweight than children of mothers with an intermediate level of education (5 to 12 years schooling). Children of mothers with college education were also more at risk for development of stunting (OR = 1.41; 95%CI: 1.14–4.22). In addition, children of employed mothers were more likely to be underweight (OR = 1.52; 95%CI: 1.05–2.31), stunted (OR = 2.42; 95%CI: 1.21–6.35) and wasted (OR = 3.35; 95%CI: 1.21–5.58) than children of non-employed mothers.

**Conclusion:** The relative risk for under-nutrition was higher in the children of both less and highly educated mothers than children from mothers with an intermediate level of education. Mothers’ employment was also negatively related to nutritional status of these child.

**P271 Infant and Children Nutrition**

**In-school snacking habit of normal and overweight high school girls: a study in urban and rural areas in Guilan, northern Iran**

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**Objective:** This study aimed to investigate snacking habit of Iranian high school girls during school hours by their weight status in urban and rural areas in Guilan province-Iran.

**Subjects:** A representative sample of 2,302 school girls (1,106 in Rasht City and 1,196 in rural areas) were studied using a multi-stage cluster sampling method. Data on age, mothers’ education, frequency of breakfast skipping per week, snacking habit at school and sleep time at night were collected using self administered questionnaire; and body weights and heights were measured. Overweight and obesity were defined as $>Y$ the 85th and 95th centiles of the International obesity task force (IOTF) charts, respectively.

**Results:** Overall prevalence of overweight/obesity was relatively similar in urban and (22.0% (19.2–25.4) and rural areas 23.8% (19.8–26.3) p < 0.05). Results showed that skipping breakfast was common among both urban (55.5%) and rural (52.3%) girls. Prevalence of overweight/obesity was significantly higher in those used to skip their breakfast than others both in urban and rural residents. Consumption of junk foods as snack during school day, especially in rural areas was notable in this population. The studied high school girls in rural areas were used to buy junk foods from school buffets more frequently than urban female students (82.2% vs. 59.6% p < 0.0001).

**Conclusion:** School environment may contribute to the high prevalence of overweight/obesity observed among studied adolescents and Iranian government has to take this matter seriously. Students should be encouraged to eat breakfast and take nutritious snacks during school day.
Determinant factors of anemia in children under 5 years old in Sofia city
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Introduction: Anemia constitutes significant nutritional problem for some population groups in Bulgaria, and children under 5 years old represent one of the highest risk population group. Information on determinant factors for iron deficiency is a basis for adequate and effective intervention measures to decrease risk for iron deficiency anemia among young children.

Design and Methods: A representative sample for Sofia city of 800 children under 5 years has was studied. Dietary intake was investigated by two 24-hour recalls for inconsecutive days. By questionnaires an information was collected on: breastfeeding and complementary feeding, birth weight, morbidity of children, mother’s pregnancy, socio-economic status of the household, knowledge and skills of parents in infant/child nutrition, family childrearing practices, access to health services. Weight and height (length) of children were measured. Hemoglobin level in capillary blood was analyzed by portable photometer. Hb, Er, Hct, MCV, Fe, TIBC, Ferritin, Transferrin-receptors and CRP were analyzed in venous blood of 200 children aged 1–4 years.

Results: Multi-factorial analysis revealed that breastfeeding, early and inadequate introduction of complementary foods, low-iron diet of children and low availability of dietary iron are important factors for the occurrence of iron deficiency and anemia. Socio-economic status of the household (income, employment and education of parents) and child health care practice and access have significant impact. Nutrition skills of mothers have been associated to the prevalence of iron deficiency and anemia in children.

Conclusion: Multiple causes of anemia among children under 5 years old require the implementation of multiple strategies that can be effective in combating the problem.

Calcium, magnesium, Zinc and Selenium intakes of 3 months Senegalese infants
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In developing countries where growth faltering is a common phenomenon among infants, breast milk quantity and/or composition are always questioned. Paradoxically, studies on both quantity and quality of breast milk were limited or have used inappropriate methods, but are still needed in order to determine exact intakes of breastfed infants. To evaluate the extent to which breast milk meet nutritional requirements of Senegalese 3 months-aged infants, one hundred twenty nine (129) 3-month lactating women living in the suburbs of Dakar were recruited to take part to the study. The deuterium dose-to-the-mother method was used to quantify breast milk output, and breast milk magnesium, calcium, selenium and zinc concentrations were determined by reference methods. Infant intakes of these nutrients were obtained by multiplying breast milk intakes and concentrations. Intakes were compared to the FAO/WHO recommendations. Calcium, magnesium, zinc and selenium daily intakes were 222 ± 35 mg, 29 ± 6 mg, 1.4 ± 0.6 mg, and 13 ± 4 μg, respectively. Intakes of magnesium, zinc and selenium over fit current recommendations, particularly for selenium which is 2 times higher than recommended value for 3-months-breastfed infants. However, breast milk calcium met only 74% of the recommended intake. The study suggested that low calcium intake from breast-milk might increase risk of adverse effects on bone health, and then might compromised the child linear growth in developing countries.
Changes in maternal energy flux predict human twinning rates in seasonal environments

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Introduction: Twinning remains an unresolved enigma of human reproduction. Dizygotic twinning shows geographic diversity, genetic linkage, and an association with maternal age indicating that it is an adaptive process under complex control.

Purpose of Study: To examine seasonal influences on twinning rates.

Methods and Results: We used 2,006 twin deliveries from a demographic study of 170,801 births in rural Bangladesh and demonstrated a strong seasonal increase in the proportion of twin births (from 0.90% to 1.68%, P < 0.000). The peak in twin frequency significantly preceded an equally strong peak in singleton births (monthly births ranging from 6.3% to 12.2% of annual births, P < 0.000). To retest this finding we pooled data from three studies in Senegal, a region of similar seasonality. Analysis of 613 twin deliveries (from 43,519 total births) revealed a remarkably similar pattern with a two-fold variation in twinning (from 1.09% to 2.08%, P < 0.000) significantly in advance of a variation in singleton births (monthly births ranging from 6.7% to 10.5% of annual births, P < 0.000).

Conclusions: In each environment the sudden increase in twin pregnancies coincided with conception at the end of the hungry season suggesting a nutritional etiology related either to super-ovulation, or enhanced survival of twin fetuses. Evidence from other studies suggests that the likely mechanism is food-induced super-ovulation caused by hypersensitivity of the hypothalamic–pituitary–ovarian (HPO) axis following a period of quiescence secondary to maternal weight loss. This effect, termed "flushing", is well known in animal husbandry. A physiological capacity to target twin conceptions to take early advantage of improved energy supply might help explain the adaptive value of human twinning.

Assessment of prevalence of malnutrition at admission and discharge in internal, surgical and intensive care ward of Taleghani teaching hospital, 2004–5

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Background: Protein-energy malnutrition is an important factor affecting recovering and long of stay. This study conducted to determine and compare prevalence of malnutrition in internal, surgery and intensive care wards of Taleghani hospitalized patients at admission and discharge.

Material and Methods: One hundred and twenty patients (19–85 years of age) who were admitted in internal, surgical and intensive care ward were selected. Anthropometric (include height, weight, Body mass index, percentages of Fat Free Mass, Fat Mass and body water), biochemical (serum albumin), hematological (WBC, RBC, Hct) and immunological (TLC) indices and amount of energy and macronutrients, intake were measured and compared during the first hrs of admission and discharge of hospital and their mean changes and also malnutrition were compared on basis indices NRI, BMI and TLC in cross-section 2.

Results: In the first 24 hrs, mean anthropometry indices (except of fat percentage) were significantly decreased, compared to discharge, while body fat percentage was significantly increased. Comparison of percentage of prevalence of malnutrition on basis of NRI and TLC, contrast BMI, showed significant difference in cross-section 2. Mean of hematological and immunological indices were significantly lowered at discharge, with compared at admission. But serum albumin showed no significant difference. In discharge, mean of energy and macronutrients intake was significantly decreased, as compared admission.

Conclusion: The results to suggest progress in malnutrition in hospitalized patients and reinforce the need for quality nutrition care in our hospital.

Application of the nutritional risk screening (NRS 2002): An analysis in three hundred hospitalized patients in São Paulo, Brazil

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Malnutrition is a common recurring problem in sick and hospitalized patients, with a reported prevalence ranging between 20 to 60% of hospitalized patients in the world. In Brazil, hospital malnutrition has been described as particularly high. An effective nutritional status assessment of an individual is vital to patient’s overall clinical management in order to identify malnourished patients and those at nutritional risk to treat and prevent malnutrition.

Objective: To assess a screening nutritional tool in hospitalized patients.

Patients and Methods: In this cross-sectional study, three hundred patients randomly selected in age from 18 to 65 years were screened at hospital admission. Survey performed in January to December of 2004 in university hospital in São Paulo, Brazil. Were evaluated with a full nutritional assessment included a detailed clinical features, anthropometrics measurements, biochemical and clinical indicators and a dietary history. The NRS 2002 (Nutritional Risk Screening) is a method based on an analysis of controlled clinical trials and was proposed to ESPEN (European Society for Parenteral and Enteral Nutrition).
Results: Malnutrition was present in 60.7% of the patients and 65.3% were rated as with malnutrition risk using NRS 2002. The concordance analysis between the full nutritional assessment and NRS 2002 was adequate and stronger (kappa = 0.75).

Conclusion: Malnutrition was highly prevalent and a nutritional screening could be used for the identification of patients with risk of malnutrition and an early nutritional care would provide a better prognosis, improving the mortality and morbidity rates. The screening system NRS 2002 appears to be able identify patients at nutritional risk.

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Case of a bottom-up approach for reducing malnutrition in the Bukoba Rural, Kagera region, Republic of Tanzania

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Introduction: The first Tanzania Mainland Nutrition Survey on children under five and mothers of child-bearing age (Tanzania Food and Nutrition Center (TFNC), 2006) reports high severity of malnutrition, and its statistics place the Kagera region in the Bukoba rural district as one of eleven districts classified as having a high severity of malnutrition, according to the criteria established by the World Health Organization (WHO).

Purpose: This project addresses the problem of malnutrition, and proposes a pilot project that uses existing land and farming skills-set of women to grow soybean to improve diets and create economic sustainability among women in the region.

Methods: Initially (June 2006), focus group of 220 members of the Bukoba Women’s Empowerment Association (BUWEA) was conducted to share the TFNC survey findings to assess local diet and nutritional knowledge of commonly consumed foods. The focus group’s outcome led to a bottom-up solution: creating an infrastructure to cultivate soybean to improve the quality of the existing diet and create economic sustainability among the members of the cooperative.

Results: BUWEA members were provided financial resources and technical expertise (horticultural and nutrition extension officers) to grow soybean on 10 acres. After harvesting the first crop, the group will attend 4 days of workshops and demonstrations on several related topics such as the benefits and uses of soy in local diets; seek the local market for the harvested crops and planning the next crop; and increase knowledge, confidence, and continuity of the project.

Conclusions: The soybean cultivation pilot project presents a need-based, bottom-up approach to the problem of malnutrition in the rural areas, with replicability and continuity.

P280 Malnutrition, Undernutrition

Edentulism and nutritional status in diabetic patients

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Background: Nutritional status is influenced by numerous factors such as dentition and neuropsychological problems. Diabetes is one of the most common diseases of the modern times and one of the most frequent systemic disorders that can be connected with the development of periodontal disease.

Material and Methods: A total of 96 patients – 52 men (54.2%) and 44 women (45.8%), with an average age 54.27 ± 6.04 years, edentulous (completely and partially) were included into the study.
The data were collected with a structured questionnaire that was divided into two parts: first, Mini-Nutritional Assessment question (MNA); and second, information about diet and eating problems (we used a modified food-frequency questionnaire). Patients were assigned to one of four groups, according to number of teeth. HbA1c was measured for each patient.

Results: The mean MNA was 23.3 ± 3.4 (19.25 ± 3 for patients completely edentulous, 21.39 ± 2.88 for patients with 1–12 teeth, 24.11 ± 2.91 for patients with 13–27 teeth, 25.13 ± 2.82 for patients with 28–32 teeth); patients completely edentulous and those with 1–12 teeth were at risk of malnutrition. The questions concerning diet showed that 83.3% did not eat adequate amount of fruits and vegetables, and 60% did not eat protein products every day. Most of patients had least one problem associated with eating and digestion; the most frequent problem is chewing and swallowing (n = 64, 66.6%). HbA1c was better in patients with 28–32 teeth: 8.04 ± 1.2% vs. 9.6 ± 2 in completely edentulous patients.

Conclusion: In this study, degree of edentulous was correlated with MNA score. It is important to counsel these patients because maintaining good oral health influence both dentition status and nutritional status and, also quality of life.

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Effect of nutrition education at the initiation of dialysis on nutritional status and dietary habits in hemodialysis (HD) patients

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Protein-calorie malnutrition is highly prevalent in patients with chronic renal failure and on chronic dialysis therapy. Malnutrition is one of the important factors influencing morbidity and mortality in hemodialysis patient. This study was conducted to evaluate the effect of nutrition education at the initiation of dialysis on nutritional status and dietary habits in 68 Korean HD patients (mean age: 52.9 ± 14.5 years, men: 38, women: 30).

Anthropometric indices, nutritional status, biochemical blood indices and food habit indices were compared at 6 months after initiation of HD with non-educated 111 Korean HD patients (mean age: 51.8 ± 14.4 years, men: 58, women: 53).

Between non-educated and educated patients anthropometric indices such as percent ideal body weight (102.9 ± 13.9 vs 106.1 ± 16.9%), body mass index (24.2 ± 4.2 vs 23.2 ± 3.6 kg/m²) were not significantly different.

Data by using subjective and objective nutritional assessment showed a higher incidence of malnutrition in non-educated patients (97.3%) than educated patients (89.2%) (p<0.05).

The serum concentrations of albumin, hemoglobin and calcium were higher and serum concentration of potassium was lower in educated patients than those in non-educated patients (p<0.05).

Food habit indices were higher in educated patients than were in non-educated patients (p<0.001). Also there was a significantly positive correlation with nutrition education (r = 0.725, p<0.01).

These findings suggest that nutrition education at the initiation of dialysis can be helpful for nutritional status, food habits and improvements in blood indices in HD patients.

P282 Malnutrition, Undernutrition

Evaluating malnutrition and its relationship to educational progress in primary school students

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Introduction: Nutrition is a key to success of students both in physical and mental aspects. This study was performed to show the relationship between malnutrition and educational progress.

Materials and Methods: In this descriptive study, samples were chosen from the body of students in all primary schools. After filling out the questionnaires, physical characteristics of each student (WG for HT and HT for age) and students’ marks in math, science, dictation and their total average marks (T.A.M) were recorded. Students’ growth curves were drawn using standard WG for HT and HT for age and their malnutrition status was determined. Then, the data and correlation coefficient variance were analyzed, using SPSS 12.

Results: Eight hundred and twenty three primary school students (WG of 29.1 ± 8.81 kg) (HT of 131.63 ± 12.31 cm) (6.7% stunting, 4.3% underweight) that is (4.3% stunting) (2.4% thinness). Sex had no sig difference in stunting or thinness. (20.2% fatness (16.7% fatness). Sex had no sig difference in fatness or HT. No sig relation was found between the T.A.M. T.A.M, marks for math, science and dictation with malnutrition based on indices for WG for HT, HT for age, as no correlation was found between WG with T.A.M and T.A.M, marks for math, science, dictation (r = 0.008). Likewise, there was no sig correlation between HT with the T.A.M. T.A.M, marks for math, science, dictation (r = 0.03), marks (r = 0.04), science (r = 0.02) and dictation. Gender and being from villages or cities did not create sig differences between T.A.M with malnutrition for indices such as WG for HT and HT for age.

Conclusion: Although the results of this study were not statistically sig, it is suggested that a healthy diet be taught in all educational levels and a similar research be carried out in areas with high prevalence of malnutrition.
P283 Malnutrition, Undernutrition
Evaluation of energy requirement of patients on synthetic diets in intensive care
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Introduction: The aim of the study was to compare calculated and measured energy requirement in critically ill patients.

Methods: Energy expenditure (EE) was measured using non-invasive Actiheart (Cambridge Neurotechnology Ltd) apparatus. Harris-Benedict equation and stress factors were used for EE calculation; energy intake was calculated with the Atwater factors. Also, routine laboratory parameters: in serum: proteins, albumins, CRP, Mg, Na, P; lipids profile; and creatinine, phosphates and urea were measured in 24-hour urine collection.

Patients: The study was performed on 10 patients (4 M, 6 F; mean age 51 ± 19; BMI-27 ± 6). The synthetic diets were from the companies: Braun, Baxter, Fresenius Kabi and Nutricia. The Actiheart apparatus registered patients’ 24-hour energy expenditure.

Results: Resting EE (REE: 1,619 ± 369 kcal/d) was higher than calculated basic EE (BEE: 1,347 ± 320 kcal/d; p = 0.005). Measured total EE (TEE: 1,954 ± 545 kcal/d) was lower than calculated (cTEE: 2,383 ± 697 kcal/d; p = 0.01). Measured catabolic EE was at the level of 335 ± 267 kcal/d. Calculated energy intake was at the level of 1727 ± 500 kcal/d. Calculated total energy expenditure (cTEE) was by 20% higher than measured value (TEE). Catabolic factors do not correlate exactly to the clinical condition and probably are responsible for the overestimation of calculated TEE. Only about 20% of measured total energy expenditure was related to catabolic stress in this group of critically ill patients; the values ranged from 5 to 711 kcal/d and depended on patients’ clinical status. There was no statistical difference between measured TEE and calculated energy intake (p = 0.4).

Conclusions: The obtained results prove that patients in intensive care unit require very precise monitoring of energy balance using all non-invasive methods.

P284 Malnutrition, Undernutrition
New combinations of processes to prepare high density energy gruels
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In many developing countries, traditional cereal-based gruels are used as complementary foods for the young children. The ability of amylolytic lactic acid bacteria (ALAB) to modify the rheological characteristics of cereal-based slurries, provided appropriate pretreatment disrupting starch granule are applied, is being currently investigated to develop new bioprocesses to prepare high energy density (HED) gruels. Gelatinisation combined to fermentation with Lactobacillus plantarum A6 was previously successfully used on a rice/soybean blend to prepare semi-liquid fermented gruels with a high dry-matter content.

As an alternative pre-treatment to the gelatinisation, before fermentation by ALAB, high pressure homogenisation (HPH) applied alone or after a mild pre-heating treatment of the rice/soybean flour blend (22% dry matter DM content) in hot water (70°C) was investigated. Chemical changes (total and damaged starch and sugars) and texture of the slurries (apparent viscosity and consistency) were characterized.

Slurries obtained after HPH pre-treatment and fermentation kept a stiff consistency during the fermentation with minor changes of the starch damage rate, indicating a very poor starch hydrolysis by bacteria. HPH failed to substitute to gelatinisation. On the contrary, the starch damage rate of the blend raised from 26.1% before pre-treatment to 82.2% after heating the slurry at 57°C. This pre-treatment allowed an efficient starch degradation by L. plantarum A6 resulting in a strong decrease of the viscosity of the gruel.

Mild pre-heating of the rice/soybean slurry combined to HPH treatment is an alternative to gelatinization to prepare semi-liquid HED gruels allowing to implement the starch hydrolysing ability of ALAB.

P285 Malnutrition, Undernutrition
Nutritional evaluation of boys and girls assisting to a rural children’s school in Caracas city
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In developing countries, malnutrition is frequently seen among low income children and it is associated with infantile mortality. In these countries, malnourished children show poor growth and higher mortality and morbidity rates. Both conditions are interrelated and they are the result of the lower capacity of malnourished children to protect themselves from infectious disease. Accordingly, in this study, the nutritional status of school children from a rural area located in the proximity of the Universidad Simón Bolivar in Caracas City was evaluated. The sample included 40 children (23 boys and 17 girls) with ages ranging from 4 to 13 years. In these children, body weight, height, left arm circumference as well as triceps and sub scapular skin fold thickness were measured. On the same day, a fasting blood sample was taken by venipuncture, using vacutainers. On this blood sample total haematology, as well as blood chemistries were determined. The results of the anthropometric measurements showed that 19% and 25% of the children had body weight and height below normal values and this was even more apparent among the males. Also, a small fraction of these children had low fat and lean areas as determined from the left arm skin fold thickness measurements. In addition, 5.3% of the children had anaemia and 8.3% had hipoalbuminemia.
Lipid profiles measured in this children showed total cholesterol and LDL cholesterol within the normal range but 19% and 64% had low triglycerides and HDL cholesterol respectively. In general, this study showed that an important fraction of the children studied had signs of malnutrition, indicating that supervision of their dietary habits as well as supplementation of their daily food consumption is needed.

The purpose of this investigation was to evaluate the prognostic power of nutritional protein to predict mortality in severely malnourished children at admission for nutrition rehabilitation in the University Hospital Centre Hassan II, Fez, Morocco.

**Results:** The mortality rate was 15.66%. There is no significant difference in height, weight, Z-score (Height/Age, Weight/Age and Weight/Height) between died and recovered group. Data show that, while level of Transferring, Albumin, Retinol Binding Protein (RBP) and Fibronectin don’t differ significantly between dead and recovered group, children who died have significantly lower levels of Transthyretin (0.142 ± 0.055 vs 0.108 ± 0.032 g/l) than recovered children. The receiver operating characteristic curves for Transferrin, Transthyretin (0.142 vs 0.108), Albumin, Fibronectin (0.644) and Fibronectin (0.634); (0.611), (0.682) and (0.519), respectively.

**Conclusion:** We conclude that lower plasma level of Albumin, Transthyretin and Transferrin may be useful to identify children at risk of death. Transthyretin revealed the best performance of all markers.

**Methods:** Nutritional investigations were conducted on 232 children, 2–16 years age, using a questionnaire incorporating a 24 hour dietary recall, supported by observation, case histories and interaction with parents/caregivers. Disability groups in the study covered mental retardation, autism, cerebral palsy, physical handicap, speech and hearing and visual impairment. Anthropometric measurements included weight, height, MUAC, tricep and subcapular skinfolds. Proxy measures used for height for children unable to stand/stand erect were knee height (KH), arm span and arm length.

**Results:** Feeding difficulties were observed in 88% children, with impaired vegetative function, mealtime stress and poor appetite being predominant. Dietary analysis indicated unbalanced diets with low intake of most food groups and an overall 50% nutritional adequacy. Anthropometry revealed over 1/3 children underweight or stunted. Weight and height for age, MUAC, BMI, TSF and arm fat area (AFA) emerged equally effective in screening undernutrition. KH gave an accurate prediction for height, using linear regression. Feeding problems and poor nutritional status were highest in children with cerebral palsy, followed by mental retardation and physical handicap.

**Conclusion:** The high prevalence of undernutrition in children with disability highlights the need for a comprehensive database on feeding and nutritional assessment of these children, to plan nutritional intervention strategies, for their effective rehabilitation.

**P288 Malnutrition, Undernutrition**

**Prevalence of iron deficiency as measured by soluble transferrin receptor in rural senegalese women with a high prevalence of anaemia and infection**

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Determining iron deficiency (ID) and iron deficiency anaemia (IDA) remain difficult in developing countries. Usually, true prevalences are underestimated because haemoglobin is used as a proxy and iron status indexes could be influenced by infection. The aim of the study was to analyze the prevalence of ID among rural women using 3 iron-status indexes: zinc protoporphyrin (ZnPP), serum ferritin (sF) and soluble transferrin receptor (sTfR) in wet and dry season. Among the women (aged 15–45 years), randomly selected with a two-stage cluster sample method within 30 villages (779 and 782 in the wet and dry season, respectively), the prevalence of anaemia was very high (74 and 64%, respectively). The combination of two indexes (ZnPP > 3 mg/gHb and sF < 12 mg/L) showed a prevalence of ID of 21 and 17% in the wet and dry season, respectively. In contrast, sTfR at a cutoff of > 8.5 mg/L (Ramco kits) indicated that the prevalence of ID was 52% in the wet season and 27% in the dry season. Moreover, significant correlations were found between acute phase proteins (C-reactive protein and a-1 acid glycoprotein) and sF, showing the confounding effects of infection on this parameter. ROC curves indicated that ZnPP had a higher discriminant power than sTfR in screening ID during the wet season. However, ZnPP underestimated the prevalence of ID compared to sTfR. Our findings indicated that sTfR is
more reliable than sF and ZnPP in diagnosing ID in areas with high prevalence of infection.

P289 Malnutrition, Undernutrition

Protein consumption and energy sources of nutrient estimated from food frequency questionnaire among children under 5 years, Savojboulagh (2002–2003)

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Background: Food and nutrition is one of the community basic prospects of life. Health and welfare. Quality and quantity of food consumption and nutritional status of the individual is major axis and determinant of moving toward human centred actions. The aim of this study to determine protein consumption and energy sources of nutrient with the use of Food frequency questionnaire among children under the age of 5 yrs.

Methods: A descriptive cross-sectional study was Conducted between oct 2002 to feb 2003 in Savojboulagh sampling was based on 20% prevalence of malnutrition, 95% CI, design effect of 1.8, and d = 0.03 By employing random cluster sampling technique, 1243 samples were chosen (632 rural samples and 603 urban samples).

Data was collected by means of food frequency questionnaire.

Results: The most important findings in this study were as follows. There was a significant correlation between malnutrition and calori of diet (P < 0.028) in 3–4 age group.

This study also showed a significant correlation between low weight for height and age for low protein in children’s diet (P < 0.01) (1–2 and 2–3 age groups).

Conclusion: According to the findings of this study children were suffering from the mild malnutrition.

P290 Malnutrition, Undernutrition

Relationship between maternal BMI and nutritional status of 0–5 year-old rural children in Tehran

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Introduction: The nutritional status of <5 years old children is an important key factor in public health. Child malnutrition and maternal obesity is known as a rapid process of nutritional transition in the developing countries.

Purpose: This study is aimed to find the relationship between maternal BMI (Body Mass Index) and nutritional status of <5 years old children in rural areas in Tehran.

Methods: The retrospective study started in winter of 2006 by attending to the health centers of two rural areas. 153 children were randomly selected from all family health records available in studied rural areas. Height (cm) and weight(Kg) of children and mother’s BMI (Kg/m2) were determined and analyzed by SPSS. Nutritional status of children known as stunting (Height for Age < –2SD), underweight (Weight for Age < –2SD) and wasting (Weight for Height < –2SD) was screened. Overweight and obese mothers were known as BMI > 25.

Results: Results are suggested that 39.2% of children have Height for Age <= –1SD, 25.3% Weight for Age <= –1 SD and 10.1% Weight for Height <= –1SD. 41.8% of mothers showed BMI above 25. Statistical analysis showed that 26.3% of stunting in studied children is due to the mothers with BMI above 25 (p = 0.001).

Conclusion: Therefore it has been concluded that there is a relation between child malnutrition and maternal BMI.

P291 Malnutrition, Undernutrition

Reproducibility of indirect calorimetry in malnourished patients with severe chronic obstructive pulmonary disease (COPD)

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Introduction: Malnutrition and weight loss are common findings in COPD. Nutritional intervention is an important part in the rehabilitation of these patients. Since many patients have an increased resting metabolic rate (RMR) determination of energy requirement is complicated. Indirect calorimetry is used to measure RMR and RMR can also be assessed by prediction equations. The primary aim of this study was to examine the reproducibility of RMR measured by indirect calorimetry and the secondary aim was to validate existing RMR prediction equations.

Methods: RMR was measured at interval of 2 days in 40 malnourished patients with severe COPD, in stable condition, without any clinical sign of infection. Results were compared to prediction equations from WHO, Harris-Benedict, Moore-Angelillo and Westerterp et al.

Results: Mean difference (SD) between measurement one and two was small, 100 (285) kJ, but statistically significant (p = 0.036). The individual difference between measurements one and two varied from −544 to +711 kJ. Prediction equations overestimated the RMR. The equations from Westerterp et al and Harris-Benedict resulted in predicted RMR closest to the measured RMR, mean difference (2SD) was −138 (896) and −142 (925) kJ, respectively.

Conclusion: Since the statistically significant difference in RMR between the measurements was of limited clinical significance and there was no indication that RMR was systematically smaller at measurement two, we conclude that it is not necessary to perform more than one measurement of RMR in malnourished patients with severe COPD. None of the prediction equations used could correctly assess
Adequate nutritional and health status are necessary for socioeconomical development of the population. Social environmental is a conditioning factor of nutritional status, particularly in vulnerable groups. Malnutrition is a health problem in underdeveloped countries. According to WHO, during 2000–2002, there were 815 million malnourished people in underdeveloped countries. The purpose of this study was to evaluate the nutritional status of 370 children under 15 years of age and the socioeconomical condition of their families in a rural setting, San Antonio de Guache, Lara State, Venezuela. Socio-economical stratification of the families was measured with specific tools (Unsatisfied Basic Needs and Graffar methods). Nutritional status was measured using weight for age (W/A), height for age (H/A) and weight for height (W/H). Undernutrition was found in 54% of the population according to W/A, 65% according to H/A and 13% using W/H. In children under two years, present malnutrition was 47% while chronic malnutrition was 27%. In change, chronic malnutrition was 72% and present malnutrition was only 10% in children over two years of age. According to Graffar’s method score, all families belonged to the lowest social classes (12% in stratum IV and 88% in stratum V) and according to the Unsatisfied Basic Needs survey all the families were in extreme poverty. The 80% of all mothers were illiterate, 18% knew how to read and write and only 0.7% had in completo high school studies. All these families are devoid of any kind of cultural benefit as a consequence of poor diets and the lack of access to educational and health systems and surely this high nutritional risk and biologic vulnerability compromises their growth, neuropsychological development and ultimately school performance.

Objectives: To study the effect of zinc supplementation on improvement of growth in stunted 12–24 month infants in Delphan city.

Materials and Methods: In a randomized placebo-controlled, double blind trial conducted in town of Delphan of Lorestan Province, 61 stunted infants aged 12–24 month were randomly assigned to receive either 10 mg zinc supplement or placebo daily for 4 month. Nutrition and socioeconomic questionnaires were completed. Weight, height, and other anthropometric indicators were measured monthly.

Results: Zinc produced highly significant and positive responses in height and weight increments, with effects X ± SD (weight – for-age Z score 1.3 ± 0.69 versus −1.7 ± 0.52, p = 0.011) and (height – for-age Z score −1.48 ± 0.42 versus −2.57 ± 0.44, p = 0.0001). There were no significant effects of zinc supplementation on weight-for-height values.

Conclusions: Zinc supplementation improved stunting and increased height in infants in present study. Intervention strategy, as such, to improve children’s zinc nutriture in populations at risk of zinc deficiency in whom there are elevated rates of underweight or stunting, may be considered and recommended to health authorities.

The prevalence of under and overweight among preschool children in private and low middle socio-economic family levels were studied. Height and weight of 131 preschool children (69 girls and 62 boys) aged 2 to 6 years old were measured in the private and local nursery schools in northern part of Tehran. Overweight was defined as a BMI > 85th Percentile value and underweight as a W/H < 5th centiles for age and sex specific
reference data from NCHS. Physical activity and dietary food habits were asked from their mothers by trained nutritionist using a questionnaire including dietary intake and their pattern of activities. Data were analysed using independent t test and regression analysis by SPSS software. The results showed that the prevalence of overweight and obesity were 22.6% in private and 3.4% in local schools. Prevalence of underweight were 7.0% and 6.7% in private and local nurseries respectively. 62.5% of the girls and 37.5% of the boys in private nursery were overweight and obese, $P < 0.05$. There were no sex differences in local school. 60% boys and 40% girls in private and 75% boys and 25% girls in local nurseries were under weight. The peak age of obese children was 4 to 5 years old. The obese children showed high appetite and willing to eat more foods. They liked to eat more high fat high carbohydrate diet mainly as fast foods. They disliked eating vegetables especially raw materials. They spent more time to watch TV.

P295 Malnutrition, Undernutrition
The nutritional status assessment of newly hospitalized patients at three units of governmental hospitals of Orumia, Iran, 2005
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The nutritional status of the hospitalized patients (basically protein-energy status) affects strongly on drugs turn over, surgery outcome and convalescence period of their disease. Most of the patients suffer from malnutrition at along period of time before affecting the diseases. Therefore this study was conducted to assessing the protein-energy and status of newly hospitalized patients. Ninety one patients (52 female and 39 male persons) were selected randomly through recently hospitalized patients at the internal diseases, surgery and gynecic diseases unit of two governmental hospitals (Imam Khomeini and Kousar) located at Orumia (one of the large cities of IRAN). Age, sex, type of their diseases, weight, height, Body mass index (BMI), ideal body weight (IBW), usual body weight (UBW), IBW%, UBW%, serum albumin, serum prealbumin and serum transferrin of each of patients were measured. A mini nutritional assessment (MNA) questionnaire was completed for each of patients selected. Finally we determined nutritional status of the patients. Findings revealed that based on MNA questionnaire 63.7 percent of patients (n = 58) were at risk of malnutrition and 57.1 percent of them (n = 52) were malnourished. Prevalence of malnutrition was significantly higher in malignancies that other patients ($P < 0.05$). Thirty three (36.3 percent) patients were encountered with deficiency of serum albumin. These figures about serum prealbumin and serum transferrin were 41.7 percent (n = 38) and 58.2 percent (n = 53) respectively. Based on UBW% and IBW%, 15.4 percent (n = 14) of the samples were underweight and 50.6 percent (n = 46) were overweight and/or obese. It was concluded that nutritional rehabilitation at the first stage of hospitalization could strengthen other recovery process of the patients.

P296 Malnutrition, Undernutrition
Prevalence of malnutrition among patients in a pediatric hospital on admission
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The limited amount of documented information relating to nutrition at outpatient visits and on admission to hospital highlights the continued problem of lack of awareness of nutrition. The aim of the work was to clinically examine the diseased children on admission to hospital to identify their major medical problem and test for evidence of any accompanying malnutrition. 150 patients of those admitted to one of the medical departments of Cairo University Children's Hospital were included in the study. 106 were males and 44 were females. Their ages ranged from birth to 12 years. They were subjected to a full history taking which included the medical problem for which patient was seeking advice, dietary history, past history of any related disease and the socio economic status. They were subjected to clinical examination and anthropometric measurements (weight, length/height, skinfold thickness and mid-upper arm circumference). Admissions were classified as either acute, in which the patients had an urgent medical problem that necessitated immediate medical therapy or chronic where an underlying medical problem had an exacerbation. The study showed that underweight (weight for age) below the 5th percentile was in 58% of the patients while 19.3% fell between the 6th to 24th percentile. Stunting – chronic protein energy malnutrition PEM (height for age ) below the 5th percentile was in 68.7% of the children, while 20% fell between the 6th to 24th percentile. Using Waterlow classification the prevalence of severe and moderate undernutrition was 36.6%. Chronic PEM in acute admissions was 66.7% and in chronic admissions was 92.2% denoting that much of the growth failure (stunting) was the result of malnutrition rather than the disease.

P297 Malnutrition, Undernutrition
Dietary intervention and modification improves health and nutritional status of children with protein energy malnutrition
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Protein energy malnutrition (PEM) is common in young children in developing countries and constitute a major public health problem. This study aimed to improve the nutritional status of infants and children with PEM. A sample of 40 infants and young children with PEM and admitted the Shebin El-Kom University Hospital for treatment were enrolled in the current study. The children were classified into equall four groups; 1st control group (CG) in whom children were received the regular hospital diet without any modification; 2nd
modified diet group (MDG) in whom children fed the modified diet from admission till leaving; 3rd double protein group (DPG) in whom children fed the hospital diet after modifying it and multiplying the amount of protein from admission till leaving; 4th formula group (FG) in whom children fed the hospital menu besides high protein formula. Each group receives the menu for at least 14 consecutive days. The results showed that by comparing regular hospital diet served for treatment of PEM was very low in energy, iron, vitamin C, vitamin A. The results showed that dietary intervention resulted in significant increase in body weight among CG and DPG groups. On the other hand the dietary intervention resulted in significant improvement of other blood parameters and we concluded that modifying hospital diet could improve health and nutritional status of children with PEM.

**P298 Nutrient Bioavailability**

**Determinants for low-birth weight in marginally nourished rural women in Bangladesh**

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**Background:** Low birth weight (LBW), or birth weight less than 2.5 kg, is one of the principal contributors to neonatal morbidity and mortality worldwide. Poor nutrition is a known cause of LBW, especially in developing countries. However, there is very little information about the determinants of low birth weight across all administrative divisions of Bangladesh.

**Objectives:** To determine the major contributing factors of low birth weight of newborn babies.

**Methodology:** The NNP Baseline survey listed households with pregnant women in 708 clusters, each of about 300 households, in 113 upazilas in six divisions in 2004. A sample of 1,414 pregnant women in 5–6 months of gestation, covering 279 clusters in 91 upazilas were selected to record birth-weight within 48 hours after birth, and finally came up with birth weight of 692 newborns. NNP baseline survey recorded background characteristics of the pregnant women.

**Results:** Incidence of LBW was higher among mothers aged below 18 years (27.6%). Nutritional indicators of mothers are major contributing factors for the incidence of LBW. Short stature (height < 145 cm) women have 2.16 times higher risk of having a LBW baby and thin (BMI < 18.5) women had 63% higher risk of having low birth weight baby compared to the mothers with BMI 18.5–19.9. Compared to the first pregnancy, the second or the third pregnancy, had only one-third risk of delivering low-birth weight babies. Similarly, compared to premature birth (37 weeks), risk of LBW was less than 30% among women who delivered after completion of 40 weeks of pregnancy. There was, however, no difference in the incidence of LBW by nature of food intake during pregnancy.

**Conclusion:** Prematurity, and maternal nutrition are the major contributing factors of incidence of LBW babies.

**P299 Nutrient Bioavailability**

**Iron absorption from a maize flour based fortified food product in Sri Lanka**

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Thriposha programme as a community level nutrition intervention has been in existence to combat high prevalence of childhood malnutrition and iron deficiency anaemia in Sri Lanka. The word thriposha means ‘Triple Nutrient’ as it provides energy, protein and micronutrients. It is a pre-cooked ‘ready-to-eat’ maize flour based food. We have determined the bioavailability of iron from thriposha formula at two molar ratios of iron:zinc with a view to improve iron absorption. Schoolchildren (n = 33) of 6–7 years were randomized into two groups (zinc:iron molar ratio 1:6 and 1:3) were given a meal prepared with 25 g of Thriposha containing 4.5 mg of iron as ferrous fumarate and 0.75 mg of zinc as zinc sulphate (group 1); 2.25 mg of iron and 0.75 mg of zinc (group 2). Meals were labelled with 57Fe whereas 58Fe ferrous sulphate was used as the reference dose. There was no differences between the groups in iron absorption (6.6% ± 4.8 vs. 4.4% ± 2.6, p = 0.15) or reference dose iron absorption (19.2% ± 13.4 vs. 17.0% ± 10.5, p = 0.63). However, when analyzed by ANCOVA with reference dose absorption as a covariate, absorption of 57Fe appeared significantly different between the groups (p = 0.01). When normalized to reference dose absorption of 40%, ferrous fumarate absorption in both groups was good (13.6% vs 9.6%). We conclude that ferrous fumarate is well absorbed from the food, but increasing the molar ratio of iron : zinc from 3:1 to 6:1 slightly, but significantly, reduced iron absorption.
parent compound and alpha-tocopherol. Most interestingly, in all base line samples (before supplementation) alpha-tocopherol phosphate was present. After a single dose of alpha-tocopherol phosphate (8001U), no increase in tocopherol phosphate plasma levels was found. The compound was not detectable in chylomicrons, however, free vitamin E was determined in this lipoprotein fraction. Following long-term supplementation, the levels of parent tocopherol phosphate and free tocopherol increased during the course of the study. The data suggest that tocopherol phosphate is a natural metabolite of vitamin E in humans and applied as a supplement is a suitable precursor for vitamin E. It remains to be elucidated if increased levels of tocopherol phosphate after supplementation are due to the absorption of intact ester or related to an increased endogenous phosphorylation of the newly delivered alpha-tocopherol.

P301 Nutrient Bioavailability

A new kinetic model for bone calcium turnover

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Presently available techniques for studying the effects of nutrition on bone health require long term studies and do not provide sufficient information on the bone calcium turnover itself. To increase the insight in bone calcium turnover, a kinetic model has been built describing the intestinal uptake, bone absorption and resorption and excretion of calcium including the physiological processes involved in calcium homeostasis. By using available literature data, the basic elements for the calcium turnover were defined and described in the kinetic model which were coded and solved in Advanced Continuous Simulation Language (ACSL). In order to complete and evaluate the kinetic model, an experiment with 15OVX Sprague Dawley rats was performed. To obtain differences in calcium balance, three diets with a low (0.2%), normal (0.5%) or high (0.8%) calcium content were given to each group of five individually housed rats. A 48-h complete calcium balance was measured at the end of a four week intake period. In addition, markers for bone absorption (osteocalcin) and bone resorption (deoxypyridinoline) were included to evaluate the bone balance as predicted by the kinetic model. Results showed different calcium balances for the low, normal and high calcium treatment, respectively. Plasma osteocalcin was not different between the treatment groups. Urinary deoxypyridinoline, however, was significantly higher in the low calcium group indicating an enhanced bone resorption. These in vivo data were used to complete and evaluate the predictive power of the kinetic model on the effects of nutrition on bone calcium turnover in rats. It is concluded that kinetic modelling of calcium balance might be an useful tool in the development of foods positively contributing to bone health.

P302 Nutrient Bioavailability

Absorption of Zn as Zn sulfate and Zn gluconate when consumed with food assessed by the double stable isotope tracer ratio (DITR) method

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Introduction: Zinc (Zn) is a very important essential trace element for humans and animals. Products fortified with Zn include infant foods, foods for clinical and performance nutrition and nutritional supplements. Surprisingly little information is available in humans concerning the true fractional Zn absorption from Zn fortification compounds when consumed with food.

Objectives: To compare in healthy adults Zn absorption efficiency from intrinsically labelled Zn gluconate to Zn sulphate when consumed with a light meal.

Design: Sixteen healthy subjects (5 women/11 men) aged 20–44 years participated in the study. True fractional Zn absorption was determined using the double stable isotope method (70Zn iv, 67Zn oral) and urine monitoring in a two-period two treatments cross over study design. Zn fortification compounds were given to the subjects together with a light breakfast meal to obtain absorption values, which are representative for Zn absorption from fortified food.

Results: For the first time data in humans for true fractional absorption of Zn sulphate and Zn gluconate from food have been established. Zn absorption (mean ± SEM) from Zn gluconate and Zn sulphate was 18.31 ± 1.30% and 17.32 ± 1.10 (n = 16), respectively. Zn absorption was determined with remarkable precision showing clearly the superiority of the recently validated dual tracer technique for Zn compared to the much more tedious faecal excretion technique. The treatment effect was 0.99 ± 1.47% indicating that there was no significant difference in absorption for the two compounds.

Conclusions: As both compounds are equally well absorbed when consumed with food, choice of fortification of products can be made based on cost and technological requirements.

P303 Nutrient Bioavailability

Antioxidant capacity of selected plants in vitro and in vivo

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Introduction: Phenolic compounds from plants and herbs have attracted interest because of their potential health-promoting effects as antioxidants. Filipendula ulmaria, Crataegus monogyna, Polygonum

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anicular, Potentilla anserine and Pelargonium Purpureum are among the plants used in Mediterranean diets. These plants were examined for their phenolic composition and antioxidant capacity.

Methodology: Reversed phase HPLC was employed for the identification and quantification of phenolic compounds. The phenolic substances were identified and quantified after comparison with reference compounds. Gas chromatography-mass spectrometry (GC-MS) was also used for identification of phenolic compounds after silylation. The antioxidant capacity of the extracts and of the isolated phenols compounds were determined with the FRAP assay and the DPPH assay. Pelargonium Purpureum was further tested in vivo in mice. Twenty five mice were divided randomly into 5 groups of 5 mice each. An infusion of dried leaves from this plant or green tea or white tea or water or catechin was given by gavage to mice for 5 consecutive days. On the fifth day, blood, heart, liver and spleen tissue samples were taken for analysis of antioxidant capacity by the FRAP and TRAP assays.

Results: Catechin, ferulic acid and quercetin were determined in all plants as the main phenolic compounds. All plants and isolated compounds exhibited antioxidant capacity, but Pelargonium Purpureum exhibited the highest. Pelargonium Purpureum exhibited antioxidiant properties in vivo in mice.

Conclusion: Pelargonium Purpureum exhibited antioxidant properties. Further research on the nutritional significance of these plants may provide information of great importance to both scientists and consumers.

P304 Nutrient Bioavailability
Bioavailability of carotenoids from fruit juices in the presence of absorption modifiers: In vitro and in vivo assessment

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Objective: To assess in vitro and in vivo the bioavailability of carotenoids from fruit juices in the presence of absorption modifiers (caseinphosphopeptides (CPPs), and iron).

Subjects and Methods: Thirty two young women (20–30 y) participated in a three-period (21 days each) supplementation study with 2-weeks wash-out in between. Subjects consumed 2×250 ml/day juices supplied as fruit juice, fruit juice containing milk (11% final product, CPPs) and fruit juice containing CPPs and iron (sulphate, 3 mg/100 ml). Blood samples were collected before and after each supplementation period. A static gastrointestinal model was also applied to assess the in vitro bioaccessibility of carotenoids in these juices. Carotenoid analysis in serum and digestion phases was performed by HPLC. Quality control of the analytical method was contrasted by participating in the Fat-Soluble Quality Assurance Programme conducted by NIST (MD, USA).

Results: In vitro study shows that, compared to fruit juices, in the presence of milk and milk plus iron the extent of xanthophylls (i.e. b-cryptoxanthin, zeaxanthin) ester hydrolysis and transfer efficiency into micellar phase is increased. In vivo, dose-adjusted concentrations of b-cryptoxanthin in serum were also higher when subjects consumed juices with milk and milk + iron, although differences did not reach statistical significance.

Conclusion: The presence of CPPs or CPPs plus iron may improve the bioavailability of carotenoids from fruit juices.

Acknowledgments
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P305 Nutrient Bioavailability
Bioavailability of LC-PUFA incorporated in a food matrix vs ω3 and ω6 precursors in rats: Improving inflammatory and oxidative status

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Introduction: The incorporation of specific fatty acids (FA)’s in food products has raised the question of the bioavailability of these components in such matrices. The aim of this study was to evaluate the bioavailability of essential and long-chain (LC) polyunsaturated FA’s, incorporated in a spread.

Methods: Thirty Wistar male rats were fed either a n-6, a n-3 or a LCn-3 FA-rich diet for 6 weeks (n-6 group: 950 mg/d linoleic acid (LA); n-3 group: 450 mg/d LA, 100 mg/d alpha-linolenic acid (ALA); LCn-3 group: 300 mg/d LA, 100 mg/d ALA, 90 mg/d EPA + DHA). After the 6 weeks feeding period, the FA profiles of erythrocyte membranes, body fat and blood lipid fractions were analysed. In addition, the oxidative status of the rats was evaluated by measurement of vitamin E and TBARs plasma contents.

Results: The LCn-3 diet caused a significant decrease of the cell membrane arachidonic acid (ARA) content compared to the n-6 and n-3 groups, from 31.7 and 32.5 to 26% of total FA’s (p<0.01%), while EPA was more efficiently incorporated when provided by the diet: 5.4% of total FA’s vs 0.03 and 0.6% in the n-6 and n-3 groups, respectively (p<0.01%). Finally, TBARs levels were found to be significantly lower in the plasma of the LCn-3 group rats (p<0.01%).

Conclusion: Feeding LCn-3 FA’s results in partial replacement of ARA in cell membranes by EPA. This leads to decreased production of inflammatory ARA-derived mediators, through mechanisms including decreased availability of ARA and competition for cyclooxygenase and lipoxygenase enzymes. Furthermore, the oxidative status of the LCn-3 group rats was improved. Knowing that oxidation and inflammation are both implicated in atherosclerosis, a food product containing LCn-3 FA’s might participate to the prevention of this disease.
P307 Nutrient Bioavailability

Comparative effect of hesperidin (flavonoid of citrus fruit) and its metabolite hesperetin-7-glucoside on bone metabolism in adult rats

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We have previously reported that hesperidin, the main flavanone of orange fruit, could affect bone mass and strength in intact and ovariectomized rats. The aim of this work was to compare the effect of two hesperetin conjugates: hesperidin (Hp) and hesperetin-7-glucoside (Hp7 glc, obtained by alpha-rhamnosidase digestion) on (1) bone metabolism (2) bioavailability and metabolism of the two compounds by identification of circulating conjugates.

Orange juice was either enriched with Hp or Hp7 glc. Effects of feeding two doses of each freeze-dried extract (corresponding to 0.25% and 0.5% of pure aglycone, respectively) were evaluated, after 3 months, on six month-old female ovariectomized rats (OVX), compared with control diet groups (sham-operated, SHc and ovariectomized, OVXc). Bone parameters, plasma and urine analyses were performed.

Bone mineral density was increased in OVX rats receiving 0.5% Hp (7% vs OVXc, p<0.05) but not with 0.25% Hp. The same bone-sparing effect was achieved with Hp7 glc but with both doses (6.9% and 6.1% vs OVXc respectively, p<0.05). Furthermore, plasma hesperetin levels measured in 0.25% Hp7 glc group were equal to those observed with 0.5% Hp animals, while relative urinary excretion was significantly enhanced in both Hp7 glc groups. Analysis by LC-MS/MS allowed detection of predominantly hesperetin-7-glucuronide.

We confirmed that Hp, given in orange juice, inhibited OVX-induced femoral bone loss in adult rats. Hp7 glc appeared more efficient than the native molecule since a similar bone-sparing effect was obtained with 0.25% Hp7 glc and 0.5% Hp supplementation. These results could be partly explained by a better absorption of Hp7 glc as shown by relative urinary excretion.

Acknowledgment

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Reference

Comparing antioxidant capacity of different rice strains of Thailand and the effect of cooking by photochemiluminescence assay

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Introduction: Rice is a significant source of food containing calories, protein, and certain vitamins and minerals, particularly in developing countries including Thailand.

Objectives: The aims of this study were to determine antioxidant capacity of 41 different rice strains, and to determine the effect of cooking by rice cooker on antioxidant capacity of selected rice strains as polished rice and brown rice. These genotypes were developed at the Center of Excellence on Rice Molecular Breeding and Product Development, Kasetsart University, Bangkok, Thailand (CERMBPD) to increase the amount of bioavailable Fe.

Method: ACW (antioxidant capacity of water soluble substances) and ACL (antioxidant capacity of lipid soluble substances) were analyzed by using Photochemiluminescence (PCL) assay.

Results: Among different rice strains of brown rice, white color (n = 17 strains), strains SPR*BT 59–32 and black color (n = 24), strains BT have the highest mean values of ACW whereas white color, strains SPR*BT 60–12 and black color, strains SPR*BT 89–1 have the highest mean values of ACL. Data also showed that brown rice with black color had mean values of both ACW and ACL significantly higher than with white color. It was found that after cooking, cooked brown rice strain BT (Hom Nin) still have higher antioxidant capacity of hydrophilic compounds (ACW) than unextracted orange juice (strain Sai Nam Peong).

Conclusion: It seems likely that cooked brown rice BT, BT*KDML 1000–11–2–26 and 313–19–1–1 have the potential to promote human health because they contain antioxidative compounds that might covered daily requirements.

Nutrient Bioavailability

Comparison of meat protein from different species on iron availability. Meat of animal and mackerel but not lean haddock increase in vitro non-haem iron availability

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Limited iron bioavailability is regarded as one of the most confounding factors responsible for the high prevalence of iron deficiency worldwide. It is widely recognized that haem iron represents a highly bioavailable iron source and that animal muscles, in addition, are supposed to facilitate the absorption of non-haem iron. However, it remains still inadequate described which species that may be included in the category of iron enhancing products. The present study aims at investigating and comparing the effects of pork, beef, lamb, haddock and mackerel on in vitro iron availability in an attempt to categorize these dietary sources as iron enhancing or non-enhancing products. In vitro iron availability is measured as Fe(II)-dialysability by combining in vitro digestion and dialysis (IVPD-dialysis). The IVPD-dialysis is a highly simplified imitation of the conditions present in the duodenum (pepsin digestion) and in the proximal jejunum (pepsin/pancreatin digestion). The results show that the major effects on in vitro non-haem iron availability are achieved during duodenal conditions after pepsin digestion in agreement with the major site for non-haem iron absorption in man. The beef and lamb product resulted in the highest in vitro non-haem iron availability with approximately 40% Fe(II)-dialysability. The pork and mackerel products resulted in 20% Fe(II)-dialysability whereas haddock resulted in approximately no dialysable Fe(II). In conclusion, the animal meat sources e.g. pork, beef and lamb all qualified as iron enhancing products by IVPD-dialysis. In addition, the fatty fish, mackerel showed iron enhancing properties in vitro whereas the lean fish, haddock showed no iron enhancing properties.

Effects of supplementation with mixed tocopherols on alpha-, gamma- and delta-tocopherol concentrations in plasma and at the cellular level

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Background: Little is known about the effects of supplementation with different forms of vitamin E (alpha-, beta-, gamma-, delta-tocopherol; AT, BT, GT, DT) on plasma and buccal mucosal cell (BMC) concentrations.

Study Purpose: A double-blind placebo-controlled trial was conducted to compare the effects of supplementation with mixed tocopherols (MT; containing 60% GT, 24% DT, 14% AT, and 2% BT) and AT alone on vitamin E concentrations in plasma and BMC.

Methods: Healthy male subjects, n = 81, 18–45 yrs, were randomly assigned to take increasing doses (36.8, 73.5, 147 or 294 mg/d) of MT or 294 mg/d AT or placebo for 4 weeks. Vitamin E concentrations were determined before and after supplementation.
Results: (1) AT group: In BMC, AT concentrations increased 1.5-fold (P < 0.001), while GT decreased 4-fold (P < 0.001) and DT did not change. (2) MT groups: BMC GT concentrations increased 1.3 to 2-fold in the 73.5, 147 and 294 mg/d MT groups (P = 0.03, P < 0.001, P = 0.002, resp.), while BMC AT and DT increased only in the 147 mg MT group (P = 0.006, P = 0.02, resp.). Similar results were found for plasma concentrations of AT, GT and DT. There were no changes in the placebo group. BMC concentrations correlated significantly with plasma concentrations both before and after supplementation (all supplementation groups combined): AT (before, r = 0.23, P = 0.04; after, r = 0.26, P = 0.02) and GT (before, r = 0.51, P < 0.001; after, r = 0.71, P < 0.001). DT correlated only after supplementation (r = 0.36, P < 0.001).

Conclusions: This is the first study showing BMC and plasma concentrations of AT, GT and DT in response to MT as compared to AT supplementation. Because of increasing evidence of health promoting effects of GT, depletion of GT at the cellular level as a consequence of AT supplementation should be avoided.

P311 Nutrient Bioavailability
Effects of the addition of beta-glucan fiber to polenta on post-prandial metabolic parameters and glucose kinetics in overweight subjects
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Background: In overweight subjects, some metabolic disorders such as elevated post-prandial glycaemia and insulinemia represent a high risk to develop diabetes. Several studies showed that this risk is inversely correlated with the intake of high fiber diet.

Objective: The aim was to compare the post-prandial bioavailability and kinetics (using stable isotopes) of the carbohydrates from meals containing polenta with or without beta-glucan fiber in overweight subjects.

Research Design and Methods: Twelve overweight subjects (BMI 27.5 kg/m²) consumed two test meals in a blinded randomised crossover design. The two isocaloric meals contained polenta (80 g eq glucose) with 5 g of beta-glucan (Pol+BG meal) or without (Pol meal).

Results: During the first 120 minutes, glycaemia tend to be reduced with the Pol+BG meal but insulinemia was not modified. After t = 120 min, glucose response was prolonged (p < 0.05) after the Pol+BG meal as well as insulinemia response (p < 0.0001) with a second insulinemic peak at t = 150 min. Less total and exogenous glucose appeared in plasma during the first 120 minutes after the Pol+BG meal (total: 48.11 2.44 g versus 58.86 2.40, exogenous: 44.10 2.88 g versus 53.98 2.02 g, p < 0.0001) and the phenomenon was inversely between 120 and 360 min (total: 43.05 1.51 g versus 23.42 1.52 g, exogenous: 37.49 2.37 g versus 15.70 1.09 g, p < 0.0001). Endogenous glucose production was significantly lower with the Pol+BG meal over the 360 min (10.02 1.10 g versus 13.76 1.15 g, p < 0.01). More exogenous glucose was oxidized after Pol+BG meal (57.52 1.79 g versus 42.34 1.29, p < 0.01).

Conclusion: The addition of beta-glucan to polenta slowed plasmatic glucose appearance, reduced endogenous glucose production and thus modulate post-prandial glycaemic and insulinemic responses.

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P312 Nutrient Bioavailability
Evaluating serum levels of vitamin B12 and folic acid in diabetic patients on Metformin
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Introduction: Diabetes has a high prevalence and biguanids play an important role in its treatment. Based on reports on the onset of megaloblastic anemia in diabetic patients taking metformin, this study was undertaken to evaluate serum levels of vit B12 and folic acid in diabetic patients.

Materials and Methods: This clinical trial study was performed on 172 diabetic patients. None of them were on antacids or any other interfering medications with the study, vit B12 suppl or folic acid. The case group (86 subjects), was put on Metformin and the control group (87 subjects), were not taking Metformin. After 14 hr of fasting, serum levels of vit B12 and folic acid were checked, using radioimmunoassay method and the results were calculated by using ÷², t and Fisher’s exact tests, and analyzed by using SPSS 12.

Results: Out of 172 patients, (84.31% male) and (15.69% female), mean age (52.21 ± 12.7 years), mean period of the disease (9.1 ± 5.42 years) and BMI (27.7 ± 4.7 kg/m²). There was no significant correlation between sex, age and period of disease with serum levels of vit B12 and folic acid.

The average serum levels of vitB12 were 525.23 ± 27.57 pg/ml in the case and control groups respectively. For folic acid, serum levels were 8.53 ± 0.76 pg/ml in the case and 8.12 ± 0.76 pg/ml in the control group (t = 1.71). For folic acid, serum levels were 8.53 ± 0.76 pg/ml and 8.12 ± 0.76 pg/ml in the case and control groups respectively.

Conclusion: Although in this study no significant differences were not found between serum levels of vit B12 and folic acid in
Our understanding of bioavailability of almond nutrients and phytochemicals is incomplete. However, it may have important implications for the prevention and management of obesity and cardiovascular disease. Lipid is the main storage component in almond seeds; it is located as intracellular oil bodies and makes up approximately 55% of the total weight. Proteins constitute about 25% of the seeds, while 9–11% is represented by fibre, the balance being water, starch, sugars and ash. Almonds are also known to be among the richest food sources of vitamin E.

The objective of the study was to quantify the release of lipid, protein and vitamin E from almond seeds during in vitro and in vivo digestion and to determine the role played by cell walls in the bioaccessibility of intracellular lipid.

Our results showed the finely ground almonds were the most digestible, with the highest extent of lipolysis (39%) and proteolysis (43%), while whole raw almond cubes and blanched cubes gave less digestible lipid (10 and 12%, respectively) and protein (13 and 14%, respectively). Duodenal digestion only caused a slight increase in nutrient release over that observed in the gastric environment. Consistent with mass losses, higher percentages of lipid and protein release were observed during in vivo digestion and nearly 50% of vitamin E was absorbed. Cell walls remaining largely intact during digestion, thus reducing lipid bioaccessibility.

The effects of low protein and lipid bioavailability on the large intestine metabolism are currently being investigated.

Acknowledgment

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P315 Nutrient Bioavailability

Influence of ethnicity on bioavailability of isoflavones in human: Caucasian vs Asian

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The current interest in soy isoflavones (IF), genistein and daidzein, has resulted in a significant number of studies on their potential efficacy to improve human well-being. Soy, traditionally used in Asian diet, leading to high IF intake, positively correlated with health protective effects. Consequently, in Western countries, soy-based products know a large success to mimic health effects described in Asia. However, demonstrating the efficacy of IF requires knowledge of their bioavailability and to date there is limited information on how this varies among subjects. The current clinical trial investigates whether the ethnicity influences IF bioavailability after a single and a short-term chronic intake of soy. 24 healthy volunteers (12 Caucasians and 12 Asians) were recruited in a parallel controlled study and consumed 45 mg of IF for a 10-day period associated with an occidental diet. The IF pharmacokinetic parameters were determined at D0 and D10 of experiment. Following the single ingestion of soy, the differences of the AUC of daidzein for Asians tended to be higher (p = 0.09) and statistical differences in Cmax for both IF were observed between the ethnic groups (p = 0.006 and p = 0.005 for daidzein and genistein respectively), leading to conclude that IF are more bioavailable in Asians after a single oral intake. Furthermore differences in Cmax for both IF were also observed (p = 0.03 and p = 0.05) following a 10-day chronic ingestion of soy. A greater understanding of IF pharmacokinetics that may differ between ethnic groups could help to explain at least part of the result heterogeneity among the large number of trials testing the effects of IF and help to determine the amounts of IF to intake for the best health outcomes.

P316 Nutrient Bioavailability

Influence of food matrix on bioavailability of isoflavones after a single ingestion in human

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Soy isoflavones, genistein and daidzein, are the focus of numerous studies, but their potential effects on health remain controversial. Numerous soy products are freely sold on the market, either as soy-based supplements or as soy-based foods. A prerogative to their efficacy is their bioavailability. Consequently, it is crucial to increase our knowledge on the bioavailability of isoflavones as a function of the intake of soy derivative products. First, this study aimed at assessing the isoflavone content on 69 European soy derivative products, sold on the French market. Furthermore, this study also focused on the bioavailability of isoflavones according to the food matrix. Twelve healthy volunteers were recruited in a randomized double-blind two-way crossover trial. They received 35 mg of isoflavones, equivalent aglycone, contained in two soy-based products differing in their matrices: a soy-based supplement and a soy-based cheese. An ELISA method was used to assess the plasma and urinary concentrations of isoflavones, allowing the pharmacokinetic parameters to be determined, which were then normalized to one mg of each isoflavone ingested. Results showed that the normalized Cmax of daidzein from soy-based capsules was higher than that from soy-based cheese (p = 0.002). Similarly, the normalized AUC0®¥ and Cmax of genistein were higher for capsules than those measured for cheese (p = 0.002). This work is in line with existing studies on isoflavone bioavailability. In conclusion, it brings to light new data concerning isoflavone concentrations in soy derivative products and shows that isoflavones contained in capsules are more bioavailable than those contained in cheese.
The bran resulting from milling cereal grains has a high concentration of both dietary fiber and essential nutrients. However, there is concern regarding the availability of the nutrients present in these brans. Accordingly, the availability of iron (Fe) in wheat (WB), corn (CB) and rice (RB) bran was determined in growing Sprague Dawley rats. There were 8 groups of rats with 7 rats per group which were offered the following diets: Control (C), WB, CB and (RB) diets. Each diet was prepared with an AIN 1993 mineral mix or an identical mix with no Fe added. Thus, there were diets with (+Fe) and without (-Fe) iron in the control and the bran diets. The control diets had no fiber but bran diets included sufficient bran to reach 19% total dietary fiber from WB, CB or RB. The results showed that the C + Fe and C-Fe diets had 3.5 and 0.6 (mgFe/100 g diet) respectively. The bran -Fe diets had 4.5, 3.5 and 4.4 (mgFe/100 g diet) for WB, CB and RB respectively whereas the same diets + Fe had similar amounts but with the contribution of the Fe present in the C + Fe diet (3.5mgFe/100g diet). The rats on the bran diets, in general, ate and grew slightly more than the controls and the smallest rats were in the group assigned to the C–Fe diet. Iron balance was low in the C–Fe rats but in the rats on the bran -Fe diets, this balance increased to the level seen in the C + Fe group. In the rats on the bran diets +Fe this balance was twice as high as that seen in the C + Fe rats. After 30 days on these diets, the C–Fe rats developed anaemia, had enlarged hearts and very low serum and liver iron. This was not seen in any of the bran consuming rats. Since all the cereal brans corrected signs of Fe deficiency, this study shows that the iron present in WB, RB and CB is available to the growing rat.

Food matrix affects carotenoids bioavailability. Thus, matrix disruption during chewing may increase carotenoids availability for intestinal absorption. The aim of this work was to explore the role of the completion of the masticatory process on the release of carotenoids from the food matrix. Carrot disruption and carotenoids release were simultaneously analysed in the food bolus collected either after complete mastication or after mastication stopped at different times. Ten young subjects in a good dental health were asked to chew 8 samples of raw carrot and spit out the resulting bolus. Seven samples were incompletely masticated. For these samples, the bolus was collected after a given number of cycles (after the 1st cycle, 3 cycles, the fourth part, half, 5/8th, 6/8th or 7/8th of the sequence). The 8th bolus was collected after complete mastication just before swallowing. In each bolus, particle size distribution was analysed by sieving, the quantity of total carotenoids in the liquid phase by spectrophotometry (450 nm) and specific isomers by HPLC methods. As the chewing progressed, the proportion of large particles decreased in the bolus when the number of small ones increased. Simultaneously, as the food disruption progressed, the quantity of released carotenoids increased in the liquid phase of the bolus. Therefore, the mechanical disruption of cellular architecture of the carrot by mastication has measurable effects on the bioaccessibility of carotenoids. These results suggest that subjects presenting a bad dental state and/or a masticatory deficiency, as currently observed in elderly, badly prepare the carotenoids absorption/bioavailability during this oral step which is the first stage of digestion.

Introduction: Milk proteins, during digestion, produce a range of biologically active peptides. Among those are peptides that may enhance iron absorption. These need to be further exploited because they are highly promising for the development of milk products that provide bioavailable iron. The objective of this project was to investigate the effect of isolated milk peptides on iron absorption.

Methods: Cow’s milk, 0% fat, was subjected to a modified in vitro digestion process. The milk digest was further fractionated by gel filtration. All fractions eluted as well as laboratory synthesised peptides of b-casein were subsequently tested for iron uptake by Caco-2 cells.

Results: The most important finding of the present study was that fractions of milk digests obtained through gel filtration had a significant effect on iron uptake in Caco-2 cells compared to the effect of non-fractionated milk digests. Some fractions enhanced iron bioavailability while others had no effect. One of the laboratory synthesised peptides of b-casein enhanced iron uptake in Caco-2 cells, while the other had no effect. It is of interest to investigate the potential beneficial effect of milk peptides, particularly because selected milk peptides have recently been associated with bioactivity in various physiological functions.

Conclusions: This study shows that selected milk peptides may enhance iron absorption. In this study milk peptides that exhibited an enhancing effect on iron uptake were formed during the in vitro digestion of milk and isolated by gel filtration.
Phaseolus vulgaris bean cultivar expressing different phaseolin types influence protein hydrolysis in vitro but no in vivo

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Common bean (Phaseolus vulgaris) is a staple food for vegetarians and populations in developing countries. Phaseolin accounts for 40–50% of bean storage protein. Genetic variants differing in subunit patterns exist but consequences of this variability on digestibility of bean protein are unknown. This work aimed at studying a same bean cultivar genetically selected to express different phaseolin types (S, T or I). Beans from S, T and I lines were heat-treated (soaked-cooked 121°C/20min) prior to in vitro and in vivo studies. An in vitro sequential hydrolysis (2h pepsin + 4h pancreatin) was carried out. Samples were taken at different times for analysing N soluble in TCA 7.5% and SDS-PAGE. Rats (6/group) were fed for 10 d with diets containing casein or one of the S, T or I bean lines as the only source of protein. They were euthanized and ileal digesta taken for N digestibility determination. In both studies, the control casein diet had higher N hydrolysis/digestibility values than bean lines (P<0.05). Differences in the degree of hydrolysis were seen after 30 min of pepsin hydrolysis, lines S and T being less susceptible than line I (P<0.05). After 240 min, the degree of hydrolysis was lower (P<0.05) for line S than lines T and I (47, 55 and 61%, respectively). This was confirmed by visible bands of intact phaseolin S on SDS-PAGE gels. In contrast, no difference was seen in the in vivo ileal true N digestibility between lines expressing phaseolin S, T or I (68 ± 2.5%). In conclusion, susceptibility of protein from a common bean cultivar to in vitro hydrolysis depended on the type of expressed phaseolin. Since this was not seen at the ileal level in rats, future work should investigate a broader phaseolin sample for improving bean nutritional value for humans.

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Potency of vitamin D sources

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Dietary intake of vitamin D derives from the content of vitamin D3 (vitD3), 25-hydroxyvitamin D3 (25OHD3) and vitamin D2 (vitD2) in food and supplements. 25OHD3 is regarded to have the potency of 5 compared to vitD3, while the potencies of vitD3 and vitD2 are considered to be equal. However, the documentation for these values is rather limited.

Purpose of the studies was to assess the relative potency between vitD3, 25OHD3, and vitD2 by using the biomarker for vitamin D status, serum 25-hydroxyvitamin D3 (serum 25OHD3) as the endpoint, and for vitD3 and 25OHD3 the association between the content in the meat and the content in the feed.

A controlled feeding trial was conducted with Danish slaughter-pigs (n = 3225) divided into 3 feeding groups fed a feed containing vitD3, 25OHD3 or vitD3 and 25OHD3. In a sub-group of 8 pigs analysis for serum 25OHD3 and vitD3, 25OHD3 and fat in the loin was performed. At the moment a cross-over study is being conducted in humans (n = 12) with supplements (10 µg vitD3, vitD2, and 25OHD3). Analysis for vitamin D status, PTH, serum calcium and VDR genotype is included.

In the feeding trial, no significant difference on serum 25OHD3 was shown between the feeds containing vitD3 and 25OHD3. Contents of 25OHD3 in the loin correlated significantly with the sum on these parameters. trans-Resveratrol dissolved in cyclodextrin was administered at the single doses of 15 mg/kg intravenously (iv) and of 2, 10 and 20 mg/kg orally (po) to male rats (n = 120). A sparse sampling design was used with groups of 30 rats per route and dose, employing 5–6 rats per time point. Blood samples were drawn by saphenous vein at 0, 1, 5, 15, 30, 60, 90, 120, 180, 240, 360, 480 and 720 min. Plasma samples were processed by HPLC as we previously reported (Anal Chem 71:747–50, 1999). A population PK analysis using the non linear mixed effects modelling was performed with NONMEM V. The PK of trans-resveratrol was best described by a two compartment open model with elimination from the central compartment. The PK parameters were: absorption rate of 0.433 1/h; clearance of 0.067 x body weight (L/h); intercompartmental clearance of 0.180/L/h and central and peripheral distribution volumes of 0.238/L and 0.964/L, respectively. The bioavailability at the doses of 2 and 10 mg/kg was 0.475, and at 20 mg/kg was 0.145. In conclusion, the population model established gives a complementary knowledge of trans-resveratrol PK and provides valuable information for prediction and better design of future preclinical pharmacokinetic/pharmacodynamic studies.

Acknowledgement

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of vitD3 and 25OHD3 in the feed, while the content of vitD3 correlated with the content of vitD3 in the feed.

Potency of vitD3 was equal to 25OHD3 in regard to raising serum 25OHD3 and the incorporated 25OHD3 in loin. However, contents of vitD3 in the loin depended only on vitD3 in the feed.

Results from the human intervention study and a calculation of the influence of the assessed potency on the estimation of dietary intake of vitamin D will also be presented at the conference.

**P323 Nutrient Bioavailability**

**Raw but not heated phaseolin purified from Phaseolus vulgaris increases ileal mucin concentration in rats**

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Common bean (Phaseolus vulgaris) is a staple food for vegetarians and populations in developing countries. Phaseolin accounts for 40–50% of bean storage protein and is poorly digested in the raw form. Genetic variants differing in subunit patterns exist but consequences of this variability on digestion are scarce and controversial. Acute feeding experiments suggest that raw phaseolin stimulates intestinal mucin production but no data is available for chronic feeding. This work aimed at evaluating in a 3 factorial trial the effect of the type (S, T, I) of purified phaseolin and heat treatment on ileal glycoprotein mucin concentration in rats (5/group). They were fed balanced diets with casein alone (control) or a mixture of phaseolin and casein (1:1) as the only protein sources for 10 d. Then the rats were euthanized. Ileal digesta were collected and analyzed by SDS-PAGE. Gels were stained for protein (Coomassie blue) and mucin (periodic acid-Schiff), and immunoblotted for phaseolin identification. Bands were quantified by densitometry. Proteins of MW 18–24 kDa identified as phaseolin appeared with no intensity difference among unheated phaseolin types. These bands vanished after heat treatment (P < 0.001). Ileal mucin was located at the top of gels (MW > 100 kDa). Its band intensity, corrected for undigested phaseolin contribution to protein amounts spotted on gels, revealed no difference between phaseolin types but it was twice higher with the diets containing unheated, as compared to heated phaseolins (P < 0.001). In conclusion, unheated phaseolins, regardless of subunit type increased ileal mucin concentration in rats. Heat treatment increased phaseolin digestion and decreased mucin level, both potentially contributing to improve bean nutritional value for humans.

**P324 Nutrient Bioavailability**

**Relationships between consumption of different types of fruits and vegetables and plasma concentrations of antioxidant vitamins**

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**Aim:** To assess the relationship between fruit and vegetable consumption and vitamin plasma antioxidant concentrations. The importance of specific groups of fruits and vegetables is evaluated.

**Method:** A total of 3,521 subjects (1,487 men and 2,034 women), aged 35–60 years, who participated in the SU.VI.MAX cohort were included in this study. Blood samples of volunteers were analysed for beta-carotene, vitamin C, alpha-tocopherol and retinol. Each subject had completed at least 6 dietary records during the first 2 years of the study.

**Results:** Women had higher mean beta-carotene and vitamin C plasma concentrations than men, but lower alpha-tocopherol and retinol plasma levels. Plasma beta-carotene and vitamin C concentrations were correlated with consumption of vegetables + fruits + juices, with vegetables alone and with fruits alone, as well as with most of the food groups tested. These relationships persist after adjustment for confounding factors. Regression analysis showed a linear dose response relationship.

**Conclusion:** In our study population, plasma concentrations of beta-carotene and vitamin C were associated with fruit and vegetable intake whereas alpha-tocopherol and retinol were not. Root vegetables and citrus fruits were shown to be specifically associated with a-carotene plasma status as were citrus fruits with vitamin C plasma status.

**P325 Nutrient Bioavailability**

**Retinol secretion at the basolateral side of Caco-2 cells is saturable: Possible ABCA1 implication**

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Retinol (ROL) absorption was clearly reported as a facilitated process, however the transporter(s) involved is (are) still to be identified. The present study was thus conducted to understand better the mechanisms implied in the intestinal ROL transport using Caco-2 cells as model. In ‘postprandial conditions’ (taurocholate/oleic acid supplementation) used, differentiated Caco-2 cell monolayers on membranes are able to assemble and secrete chylomicrons (CM). After 16h-incubation with varying ROL concentrations (0.5–110 uM),
kinetics of ROL efflux into basolateral medium (BM) revealed two processes: saturation at concentrations <10uM, implying mediated transport, and linearity with higher concentrations, implying passive diffusion. From total ROL passing through cells (16%), 1/2 was found as free ROL in the non lipoprotein fraction and 1/3 as total ROL in the CM fractions, indicating that the portal circulation could play a major role for in vivo ROL delivery to tissues. The washout experiment, for which ROL-loaded cells were then maintained on ROL-free medium for 5 days, resulted in the release of free ROL, but not of RE, suggesting that only newly-synthesized RE can be incorporated into CM and secreted. Glyburide, inhibitor of ABC proteins, e.g. ABCA1, did not affect ROL in cells, but decreased ROL in BM (P < 0.05). By using siRNA technique, the down-expression of ABCA1 protein, but not that of SR-B1 or NPC1L1 proteins, decreased ROL transport. Thus, the present data suggest that 1) free ROL enters in intestinal cells by simple diffusion, 2) ROL secretion at the basolateral side is partly mediated by an epithelial transporter, and 3) ABCA1 could be involved in that process. More work is necessary to confirm the participation of ABCA1 in intestinal ROL transport.

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**P326 Nutrient Bioavailability**

*Retinol uptake and secretion in Caco-2 cells: Possible role of ABCA1*

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The purpose of this study was to characterize retinol (ROL) transport through intestinal cells in relation to its metabolism. In presence of taurocholate and oleic acid (‘postprandial conditions’), differentiated Caco-2 cell monolayers on membranes produce and secrete chylomicrons (CM). After 16h-incubation with varying ROL concentrations (0.5–110uM), kinetics of ROL efflux into the basolateral medium (BM) revealed two processes: saturation at concentrations <10uM, implying mediated transport, and linearity with higher concentrations, implying passive diffusion. From total retinoid passing through cells (16%), 1/2 was found as free ROL in the non lipoprotein fraction and 1/3 as retinyl esters (RE) in CM fractions, indicating that the portal circulation could play a major role for in vivo ROL delivery to tissues. A washout experiment in ‘postprandial conditions’, in which ROL-loaded cells were then maintained on ROL-free medium for 5 days, resulted in the release of free ROL, but not of REs, suggesting that preformed REs in cells cannot be used for CM assembly. In the presence of glyburide (an inhibitor of ABC proteins, e.g. ABCA1), cellular ROL was unchanged, while ROL level in BM was significantly decreased. By using siRNA technique, the down-expression of ABCA1 protein, but not that of SR-B1 or NPC1L1 protein transporters, resulted in a reduced ROL transport through Caco-2 cells. Thus, the present data suggest that 1) free ROL enters in intestinal cells by simple diffusion, 2) ROL secretion at the basolateral side is partly mediated by an epithelial transporter, 3) ABCA1 is likely involved in that process, and 4) only newly-synthesized REs can be incorporated into CM and secreted. More work will be required to confirm ABCA1 participation in intestinal ROL transport.
**P328 Nutrient Bioavailability**

**Viable, lyophilized lactobacilli do not increase iron absorption from a lactic acid fermented meal in healthy young women, and no iron absorption occurs in the distal intestine**

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**Background:** Lactic acid fermented foods have been shown to increase iron absorption in humans, possibly by lowering pH, activation of phytases, production of organic acids, or due to the active lactic acid bacteria.

**Objective:** To examine the specific effect of viable lactic acid bacteria added to a heat-inactivated lactic acid fermented oat gruel on non-haem iron absorption in humans. Furthermore, any putative iron absorption in the distal intestine was investigated.

**Design:** In a randomized, double-blinded crossover trial 18 healthy young women (22 ± 3 y) with low iron status (serum ferritin < 30 μg/L) were served the heat-inactivated lactic acid fermented oat gruel with or without added viable, lyophilized Lactobacillus plantarum 299v. The gruels were extrinsically labelled with 59Fe and served with 2 enterocoated capsules (containing 55Fe(II) and 55Fe(III), respectively) designed to disintegrate in the ileum. The meals were consumed on 2 consecutive days, e.g. in the order AA followed by BB in a second period. Non-haem iron absorption was determined from 59Fe whole-body retention and isotope activities in blood samples.

**Results:** The concentrations of iron, lactate, phytate, and polyphenols, and the pH were similar in the heat-inactivated lactic acid fermented oat gruels with and without added viable, lyophilized Lactobacillus plantarum 299v, and no difference in iron absorption was observed (1.4 and 1.3%, respectively). Furthermore, no absorption of iron in the distal intestine was observed.

**Conclusion:** Addition of viable, lyophilized lactobacillus to a heat-inactivated lactic acid fermented oat gruel does not affect iron absorption, and no absorption occurs in the distal part of the intestine from low iron bioavailability meals with lactic acid bacteria in these women.

**Acknowledgements**

CNPq, Clariant, Cargill and Cardinal.

**P329 Nutrient Bioavailability**

**Intestinal iron absorption and liver iron concentration in rats fed fish-oil and soy-oil rich diets supplemented with inulin-type fructans**

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Changes in the dietary lipid composition have been related to alterations in the Fe homeostasis. In the present study, Fe apparent absorption and liver retention were evaluated in healthy growing rats fed fructans, which are known to influence mineral bioavailability. Male Wistar rats (n = 24; 4 wk old) were fed one of four diets (15% soy oil (n-6:n-3 = 12) or a 1:0.3 mixture of fish and soy oils (n-6:n-3 = 0.5), supplemented or not with 10% fructans (Raftilose® Synergy 1®) for 15 days. Total Fe was measured in faeces (collected on the 11th – 15th days of experiment) and liver by atomic absorption spectrophotometry. The cecum was removed and weighed and cecal tissue was collected for histological analysis. Cecal content pH was determined in situ. Fructan feeding resulted in increases (P < 0.05) in cecal wall and content weights and in number of cells in the cecal crypts, as well as in a decrease in the cecal pH. These effects probably contributed to a higher apparent absorption of Fe (cecal wall weight vs. Fe absorption, r = 0.68; cecal pH vs. Fe absorption, r = −0.68; number of cells/crypt vs. Fe absorption, r = 0.54; P < 0.05). On the other hand, a decrease in liver Fe stores (−45%; P < 0.05) in rats fed a fish + soy oil diet was observed, considering that the fructan consumption returned to levels similar to the soy-oil control group. As a conclusion, these results indicate that dietary fructan supplementation positively influences Fe absorption and recovers the liver Fe stores in fish-oil fed rats.

**Acknowledgements**

CNPq, Clariant, Cargill and Cardinal.

**P330 Nutrient Bioavailability**

**Acute effects of mono- and polyphosphates on mineral metabolism in healthy young women**

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A high phosphorus intake together with low calcium intake has been shown to elevate serum parathyroid hormone concentration which causes bone resorption and increased bone turnover. Phosphate salts are commonly used as additives in food industry. Effects of
mono- and polyphosphates on calcium metabolism may differ. We compared the acute effects of monophosphate (MP) and polyphosphate (PP), on calcium and bone metabolism in 14 healthy female volunteers. Each subject participated in the study at three separate 24-h sessions, one session being a control session with placebo. The diet at each session was exactly the same containing 340 mg of calcium (Ca) and 500 mg of phosphorus (P). P intake from MP and PP supplements was 1500 mg. The supplements and placebo were given in three doses during a day (at 0800, 1200 and 1600) and the order of the days was randomized.

Mineral metabolism was monitored by measuring the concentrations of serum ionized calcium (S-ica), serum phosphate (S-P) and serum intact parathyroid hormone (S-PTH). The excretions of urinary phosphate (U-P) and urinary calcium (U-Ca) were also measured.

Compared with the control session, both supplements increased S-P (p = 0.0001) and U-P (p = 0.0001). U-P increased more at the MP session than at the PP session (p = 0.019). MP decreased S-ica (p = 0.045), and PP U-Ca (p = 0.002) relative to the control session. U-Ca was lower at the PP than at the MP session (p = 0.005). Both MP (p = 0.02) and PP (p = 0.005) increased S-PTH.

In conclusion, both MP and PP absorbed well, and increased S-PTH. Based on U-P and S-P, MP may have absorbed slightly better than PP. U-Ca decreased more at the MP session than at the MP session, which could be due to PP binding Ca in intestine.

P331 Nutrient Deficiencies
Assessment of iodine deficiency prophylaxis in Poland
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A national programme of obligatory iodination of household salt has been introduced in Poland in 1997. Household salt should contain potassium iodide (30±10 mg KI/kg salt) or potassium iodate (39 ± 13 mg/kg salt). The aim of the study was to assess iodine content in daily diet and quality of iodized salt in Poland.

Iodine intake was assessed on the basis of the Household Food Consumption and Anthropometric Survey conducted in 2000 in Poland among 1191 men (including 629 boys) and 2222 women (including 612 girls) with the use of 24 hour recall. The quality analysis of iodized salt was made at the National Food and Nutrition Institute on the basis of data concerning iodine content in salt, collected by the State Sanitary Inspection in 2000-2005.

Daily average iodine intake in studied population was 133 µg. The lowest intake was recorded in the group of girls aged 10–12 years (68% RDA), and the highest – among men aged 19–25 years (136% RDA). Iodine consumption was lower than recommended level in groups of girls 7–18 years (68%-87% RDA), adult women (79–85% RDA), and boys aged 7–12 years (79–86% RDA). The quality control of iodized salt in Poland revealed that in 2000–80% of the examined salt samples had the appropriate iodine content, in 2001 – 86%, in 2002 – 79%, in 2004 – 93% and in 2005 – 92% of the samples.

Household salt was the main source of iodine in daily diets. The quality of iodized salt improved during last years. Current model of iodine prophylaxis based on iodized household salt is highly effective. There is still a need for ongoing monitoring of the quality of iodized salt in Poland.

P332 Nutrient Deficiencies
B vitamins and the risk of ischemic stroke and TIA in the EPIC-Potsdam study
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Background: Data from prospective studies on the associations between B vitamin plasma levels and the risk of stroke are limited. We investigated the individual and the combined effects of plasma folate, vitamin B12, and pyridoxal-5-phosphate (PLP) levels on the risk of ischemic stroke and transient ischemic attack (TIA) in a large prospective German cohort.

Methods: Incident cases of ischemic stroke or TIA were identified among 26226 participants (aged 35–65) of the European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam study over 6.0 ± 1.5 years of follow-up. The present analysis is based on a case-cohort study comprising 779 subjects free from cardiovascular disease and 188 incident cases of cerebral ischemia (ischemic stroke or TIA). Multivariable Cox proportional hazard models were applied to evaluate the association between B vitamin levels and risk of cerebral ischemia.

Results: Participants in the lowest tertile of vitamin B12 were at increased risk of cerebral ischemia compared with subjects in the highest tertile, while this relationship was not observed for folate or PLP. In subgroup analyses the RRs were similar in magnitude for stroke and TIA. When various combinations of B vitamin tertile levels were analysed, only low vitamin B12 levels alone (relative risk (RR):1.63, 95% confidence interval (CI):1.01–2.63) and combined low folate and vitamin B12 levels (RR: 1.94, 95% CI:1.09–3.45) were significantly related to an increased risk of cerebrovascular ischemia.

Conclusion: Our data suggest that low vitamin B12 plasma levels either alone or in combination with low folate levels increase the risk of cerebral ischemia.
**P333 Nutrient Deficiencies**

**Changes in TNF production and T cell phenotype in iron-deficient humans**

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**Introduction:** Today iron deficiency (ID) is the main nutritional deficiency involving 2 billions people in the world, which affects different immune functions. Evidences indicate that production of multifunctional cytokine tumor necrosis factor (TNF) and T-cell subsets are sensitive to limited iron availability.

**Purpose of Study:** We studied in vitro TNF secretion and transcription by stimulated-blood mononuclear cells (BMNC). Additionally, we determined the percentage of T (CD3) lymphocytes, subsets CD4 and CD8, and their memory (CD45RO) and naive (CD45RA) T cells.

**Methods:** Women 25–45 years old with ID due to gynecologic bleeding (n = 10) and normal iron status (n = 10) were included. The secretion and transcription of TNF were measured by ELISA and colorimetric quantitative assays, while T-cell subpopulations were analyzed by flow cytometric analysis.

**Results:** Cytokine levels were significantly lower in ID subjects; mean values varied between 0.4–0.7 ng/mL and 1.4–1.6 ng/mL in BMNC from ID and normal women, respectively (p < 0.001). Cells from ID individuals expressed about 2–3 times less TNF mRNA than those from controls; mean values ranged 24–31 atmol/mL in ID and 96–110 atmol/mL in normal women (p < 0.001). Patients with ID presented a decrease in the percentage of both CD8+ and CD4+CD45RA+ lymphocytes compared to healthy controls. The analysis of CD4+CD45RA+ to CD4+CD45RO+ ratio (means ± SD) were 0.28 ± 0.08 and 0.70 ± 0.21 in ID and normal iron women, respectively.

**Conclusions:** We conclude that both impaired TNF production and recruitment of T naive cells may be account for decreased cell-mediated immune functions in ID subjects, and thus capacity to resist infections and malignancies.

**Acknowledgment**

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**P334 Nutrient Deficiencies**

**Cluster randomized controlled intervention trial to assess the efficacy of multiple micronutrient supplementations (Sprinkles) on improving nutritional and health indicators in infants in southern Israel: Baseline characteristics**

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Anemia and other micronutrient deficiencies, MND, which have been linked to growth, cognitive impairments and increased susceptibility to infections are prevalent in children in southern Israel. The goal of this intervention trial was to compare the efficacy of new Multiple Micronutrient formulation use (Sprinkles group, Spr), single-serving sachets for home fortification, with the standard prevention,liquid iron and Vit A&D (Control group, Cont) in Jewish (J) and Bedouin (B) infants. The hypotheses: at age 12 and 18M Spr group will have lower rates of anemia and other MND, infections and higher compliance with supplementations. Study population included 6M old J and B infants matched by SES who attended Maternal and Child Health Clinic (randomization unit). We enrolled 121J and 140B infants in Spr group and 143J and 113B infants in Cont group.

Baseline data: There were no statistically significant differences (SSD) in infants’ sex and age, maternal and paternal age and education between intervention groups within each ethnic subgroup. Maternal age was 29 ± 3 y in J and 28 ± 6 y in B, maternal education was 13 ± 2 y in J and 9 ± 6 in B (p < 0.05). Anemia rates (Hb < 11 g/dl) at enrollment were: 38% in J (no SSD between intervention groups) and 57% in B infants (66% in Spr group and 49% in Cont group, p = 0.005). No SSD were found in% of infants with following conditions between intervention groups both in J and B subgroups: severe anemia (Hb < 10 g/dl) in J (7%) and B (17%) infants; low ferritin:11% in J and 5% in B infants; low transferin saturation 48% in J and 68% in B; low Zn level: 3.4% in J and 10% in B infants. B infants had significantly poorer nutritional indicators than J. A high rates of anemia and other MND were found at baseline. The trial will provide evidence on better way to prevent them.

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**P335 Nutrient Deficiencies**

**Comparative outcomes of daily versus twice-weekly iron supplementation for iron deficiency anemia prevention in infants**

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Recent National Nutritional Survey of Children in Romania showed that the prevalence of iron deficiency anemia (IDA), hemoglobin (Hb) <11.00 g/dl over the last 10 years, was 48–54% among
The mental and motor development of infants, this situation is a matter for public concern in Romania.

Aim: To assess the efficacy and compliance of two different dosage: daily and twice-weekly iron supplementation

Methods: 299 infants were enrolled in an interventional study using iron (III)-hydroxide polymaltose complex. 132 infants received 20 mg iron per day (Group A) and 167 infants received a twice-weekly administration of 50 mg (Group B). The supplementation duration was 6 months (age 6 to 12 months) for infants born with >2500 g and 10 months (age 2 to 12 months) for infants born with <2500 g. Hb levels were assessed at age 6 and 12 months old.

Results: Weight and mean Hb levels at baseline were similar between the groups. Hb levels increased significantly (p < 0.001) in both groups: in Group A from 10.94 ± 1.34 g/dl at age 6 months to 11.78 ± 1.03 g/dl at age 12 months and in Group B from 10.95 ± 1.08 g/dl to 11.72 ± 1.04 g/dl. There was no significantly statistic difference (p = NS) in the Hb response between group A and group B. Prevalence of anemia was also significantly reduced (p < 0.001) from 50.76% to 21.21% in group A and from 47.90% to 17.37% in group B. Both regimens were well tolerated and compliance on treatment was good.

Conclusion: The two prophylactic dosage proved to be equally effective and yielded the similar hematological results. Iron (III)-hydroxide polymaltose complex, given in either a daily or twice-weekly administration scheme, proved to be appropriate for IDA prophylaxis in infants.

P337 Nutrient Deficiencies
Dietary iron fortification to reduce the prevalence of anaemia
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Background: Iron deficiency anaemia, one of the most prevalent problems of micronutrient malnutrition, occurs in many developing countries. Causes of the problem are many, but one of the major causes is low supply of dietary iron. One of the strategies to overcome high prevalence of iron deficiency anaemia in developing countries can be achieved through food fortification, resulting in improved nutritional status.

Objective: The objective of this study was to assess the effect of iron-fortified cereals (maize and millet) through the determination of haemoglobin levels of infants from Kounkane in southern Senegal.

Method: A group of 79 infants 1–5 years of age were enrolled during 6 months in a double blind randomized-controlled trial. Both fortified and control groups received twice a dosage of antihelmintic prior to the beginning of the study and three months after. Haemoglobin was measured at baseline status at three months and at the end of the 6-month fortification period. SPSS 11.5 statistical analysis was run to determine the resulting increase in haemoglobin concentrations.

Results: Fortification resulted in a 1.67 g/dl and 0.8 g/dl increase in haemoglobin concentrations respectively in the fortified group and in the control group (p < 0.010). Prevalence of anaemia in both fortified and control groups was reduced from 89.2% to 66.7% and from 64.4% to 39.1% respectively with a much stronger effect in the treatment group.

Conclusion: This study showed that micronutrient-fortified cereals combined with antihelmintic treatment may be used as a convenient preventative measure in Senegal, to improve the nutritional status of infants and significantly reduce anaemia with its associated consequences.
P338 Nutrient Deficiencies

**Effect of dietary iron deficiency anemia on pregnancy outcome and duration of gestation**

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The aim of the study was to evaluate the effect of dietary iron deficiency anemia on pregnancy outcome and duration of gestation. The female albino rats of Wistar strain, with similar body weight (180–200 g) were fed on iron deficient diets (30, 15, 7, 2 mgFe/kg of diet) and one group on control diet (50 mgFe/kg of diet) for about one month. The females were then anesthetized by ether and tail blood was collected for evaluation of blood hemoglobin by hemoglobinometer and estimation of ACTH by RIA kits. The females were then kept for mating and mating was confirmed by detection of a vaginal plug, and this day was denoted as day 0. The females were kept on the same diets through out the pregnancy and the blood samples were again collected during 18th-20th day of gestation for estimation of ACTH and blood hemoglobin. The gestation period, number of neonates and weight of neonates were compared with that of controls by student’s t-test. No significant difference was observed in the number and survival of the fetuses, with decrease in the maternal dietary iron. A significant (p < 0.001) reduction in the gestation period was observed in the iron deficient anemic mothers. The weights of the neonates of the iron deficient females decreased significantly (p < 0.001). Two-way ANOVA showed a very significant (p < 0.05) rise in the level of ACTH when analyzed with two grouping factors (iron status and stages viz. before pregnancy, during pregnancy, after delivery). High ACTH in turn probably caused the stimulation of corticotropin releasing hormones in the fetuses and resulted into stress, which diminished the blocking effect of progesterone and resulted to preterm delivery. The probable cause of the low neonatal weight was insufficient supply of nutrients to the developing fetuses.

P339 Nutrient Deficiencies

**Effect of graded dietary levels of folic acid on serum homocysteine concentrations in rats fed semi-purified diets**

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Folic acid is the essential vitamin for the synthesis of DNA and methylation of homocysteine to methionine.

In view of the above, the objective of the present studies was to determine the relationship between increasing levels of dietary folic acid and serum homocysteine concentrations in rats fed AIN-93G diet.

Twenty-four, 4-week old, growing male rats (Wistar strain), were kept in individual cages and fed four AIN-93G diets. The diets were: I – folic acid deficient AIN-93G diet (control), II, III, and IV – folic acid supplemented diets, containing 8, 43.5 and 87 mg folic acid/kg diet. After 4wks of the experiment, the rats were anesthetized with thiopental and blood was collected by cardiac puncture, to centiguge tubes without anticoagulant obtain serum. Folic acid and homocysteine concentration in serum were determined using immunoenzymatic reagent kits (IMMULITE 2000 Folic acid and IMMULITE Homocysteine).

It was found that increasing dietary concentrations of folic acid (0, 8, 43.5 and 87 mg per kg of diet) increased serum concentration of this vitamin to: 5.73, 107.20, 160.17 and 184.83 ng/ml, respectively. Conversely, serum concentrations of homocysteine were decreased to: 11.46, 6.94, 4.51, and 3.76 µmol/L, respectively.

The close relationship between dietary and serum folic acid concentrations was described by significant (P < 0.05) correlation coefficient (r = 0.84). On the other hand, the relationship between dietary folic acid and serum homocysteine concentrations was negative (r = −0.84; P < 0.05).

In conclusion, serum homocysteine concentrations were partly dependent on folic acid dietary concentrations (R = 0.70), thus indicating that other factors may determine the efficient homocysteine to methionine conversion.

P340 Nutrient Deficiencies

**Effects of iron and iron plus vitamin E supplementation on lipid peroxidation in anemic women**

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The objective of this study was to assess the effects of iron and both iron and vitamin E supplementation on lipid peroxidation in iron deficient anemic women.

In a double-blind, randomized clinical trial, 84 anemic women aged 20–45 years old with hemoglobin (Hb) concentration <12.5 g/dl and hematocrit (Hct) <37.5% were selected and were randomly divided into two groups, one group received 50 mg iron as ferrous sulfate and placebo and the other, iron and 200 mg vitamin E tablets, 3 times per week for 12 weeks. At the beginning and end of the trial, general and 24-hours dietary recall questionnaires were completed and height and weight were measured for estimation of energy and nutrients intake and body mass index (BMI). Venous blood samples were withdrawn from non fasting subjects to measure blood concentration of Hb, % of Hct and plasma levels of ferritin, iron and total iron binding capacity (TIBC). Lipid peroxidation was assessed by measuring plasma concentration of malondialdehyde (MDA). Data were statistically analyzed using paired and independent t-test and one way ANOVA.

Results indicate that at the end of trial:

• There were no changes in anthropometric measurements and nutrients intake.
• Mean Hb concentration, % of Hct and plasma levels of ferritin were significantly increased in both groups (P < 0.0001).
• There were no changes in mean plasma iron levels but TIBC levels were significantly decreased in both groups (P < 0.05).
• Mean plasma levels of MDA in Fe-placebo and Fe-vitamin E groups were significantly increased to about 19% (P < 0.0001) and 16% (P < 0.05), respectively.

In conclusion, iron supplementation in iron deficient women stimulated lipid peroxidation and vitamin E supplementation had no significant effects on this stimulation.

P341 Nutrient Deficiencies

Fatty acid pattern of plasma unesterified fatty acids, triglycerides and phospholipids: its relevance to the perturbation of tissue lipid composition in long-chain polyunsaturated n-3 fatty acid deficiency

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Second generation long-chain polyunsaturated 3 fatty acid-depleted rats (3-D) are currently used as a model for the insufficient supply of these acids often prevailing in Western populations. In such rats, abnormal composition of lipids prevails in liver, soleus muscle, visceral fat, heart, brain and salivary glands. The fatty acid pattern of plasma unesterified fatty acids (FFA), triglycerides (TG) and phospholipids (PL) was now examined in female 3-D and control rats. This report concerns the 3 content of plasma lipids, and their C16 : 17/C16 : 0 and C18 : 19/C18 : 0 ratios. The 3 content of both PL and TG was decreased in 3-D rats. For instance, the PL C22 : 53 and C22 : 63 contents were, respectively, 3 and 8 times lower (P < 0.001) in 3-D rats than in control animals. The PL C22 : 63/C22 : 53 ratio was about thrice lower in 3-D rats (2.48 ± 0.09; n = 41) than in control animals (7.07 ± 0.25; n = 16), suggesting facilitated conversion of C22 : 53 to C22 : 63 in the former rats. The C16 : 17/C16 : 0 and C18 : 19/C18 : 0 ratios were increased in 3-D rats, whether in FFA, PL or TG. For instance, in TG, these two ratios averaged no more than 0.047 ± 0.003 and 6.28 ± 0.24 in control rats, as distinct (P < 0.001) from 0.132 ± 0.020 and 13.21 ± 0.55 in 3-D rats. Moreover, whether in control or 3-D rats, there was a significant correlation (P < 0.001) between the individual values for the C16 : 17/C16 : 0 and C18 : 19/C18 : 0 ratios in TG, supporting the view that these ratios inform on the same regulatory mechanism, e.g. the activity of Δ9-desaturase. In conclusion, these and further findings indicate that the fatty acid pattern of circulating lipids provides reliable information on the perturbation of such a pattern in the corresponding lipids of selected organs, mainly liver.

P342 Nutrient Deficiencies

Growth, a direct consequence of vitamin A supplementation that forms a cost-effective strategy of increasing compliance

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Introduction: Vitamin A deficiency affects a large proportion of children in less developed countries. Vitamin A deficiency (VAD) results in retarded growth, decreased immunocompetence, leading worldwide to high rates of morbidity and mortality in children. In fact, at least 23% of all child deaths are attributable to VAD. With WHO estimating that at least 50% of children die from malnutrition, eradication of VAD forms a crucial element in any strategy of improving child nutrition. Among the strategies advocated for alleviating communities from VAD is supplementation with high-dose capsules. Vitamin A supplementation programmes have been packaged within the Expanded Programme on Immunisation (EPI), given its recognized success and high compliance rates. However, caregivers do not have direct pictorial evidence of the benefits of EPI. Growth monitoring forms an alternative vehicle within which vitamin A supplementation can be integrated.

Purpose of Study: To evaluate the process of vitamin A supplementation in young children and investigate reasons for lack of compliance.

Methods Used: Survey methodology, with information collected using the road-to-health growth-monitoring cards and interviews of caregivers, as well as key informants.

Summary of Results: Not all households understood the benefits of EPI and compliance for vitamin A supplementation varied with district. However, the cards demonstrated that vitamin A supplements resulted in steeper growth curves that were clearly evident. This created eagerness in caregivers to go to the clinic to request for supplementation.

Conclusion: Growth monitoring forms an opportunity for motivating caregivers to demand supplements from health workers, thereby increasing compliance in vitamin A supplementation.

P343 Nutrient Deficiencies

Health feeding program is not enough to prevent anaemia among low income Brazilian

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Introduction: Anaemia is one of the most common nutritional problems in the world today. The World Health Organization (WHO) estimates that some two billion people are anaemic defined as haemoglobin concentrations that are below recommended thresholds.
**Purpose:** The present study evaluates the impact of an intervention to promote the Ten Steps for Healthy feeding of Children under Two Years on prevalence of anemia.

**Methods:** Five hundred infants were randomized at birth into intervention and control groups. The intervention group systematically received dietary counseling during home visits and assessment at 6 and 12 months; the control group, assessment. The results referent to 369 children of 12 to 16 months age showed that there was no evidence of the intervention effect on anemia. The anemia was defined as hemoglobin level < 110 g/L.

**Results:** The prevalence of anemia was 66.2% in the intervention group and 61.8% in the control group without statistical significance. The intervention was associated with higher proportion of infants in exclusive breastfeeding up to four months (RR = 1.58; CI95%:1.21–2.06) and six months (RR = 2.34; CI95%:1.37–3.99), breastfeeding at twelve months (RR = 1.26; CI95%:1.02–1.55), beyond greater haemoglobin consumption (p = 0.003), higher iron bioavailability diet (RR = 1.44; CI95%:1.09–1.91) and later cow milk introduction (RR = 1.28; CI95%:1.07–1.53).

**Conclusion:** The nutritional program improved the feeding practices but wasn’t enough to prevent anemia.

**Acknowledgment**
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P347 Nutrient Deficiencies

**Micronutrient malnutrition in children of north west frontier province of Pakistan**

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A study was carried out in North West Frontier Province (NWFP) of Pakistan to assess the micronutrient status of preschool children. A two stage cluster sampling techniques was followed to select 3074 children aged between 6–60 months from both urban and rural communities of the Province. Haemoglobin (Hb), serum ferritin (SF), plasma retinol (PR), plasma zinc, and á-antichymotrypsin and á1-acidglycoprotein were determined for assessing micronutrient and sub-clinical infection status of children. Results revealed that 69% of the children were iron deficient and 42% iron deficient anaemic. Thirty two percent of the children were moderately vitamin A deficient while 4% severely vitamin A deficient. Similarly zinc deficiency was observed among 54% of the children. The prevalence of sub-clinical infection in apparently healthy children showed that 11% had elevated á1-antichymotrypsin and 45% had raised á1-acidglycoprotein levels. The results by urban-rural classification showed that iron deficiency and anaemia were more prevalent in rural (71%vs 51%) than in urban (64% and 48%), respectively, while no significant differences were observed in the prevalence of zinc and plasma retinol deficiencies between urban and rural children, respectively. Multiple regression analysis revealed that SF and PR were positively and significantly (p < 0.05) correlated with Hb levels, while á1-antichymotrypsin and á1-acidglycoprotein were negatively and significantly correlated with Hb levels. No significant association between Hb and zinc levels was observed. The study concludes that micronutrient malnutrition and sub-clinical infection are prevalent in magnitude to be considered as a public health problem which needs to be addressed through integrated efforts and political commitment.

P348 Nutrient Deficiencies

**Prevalence of overweight and obesity in iron-deficient Iranian adolescent girls**

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**Background:** Many Iranian adolescent girls are iron deficient, but it is unclear whether iron deficiency is associated with other nutritional risk indicators.

**Objective:** To investigate the association between iron deficiency and weight status (measured as BMI) among a representative sample of adolescent girls.

**Methods:** A cross-sectional study was performed in a region of southern I.R. Iran. 431 iron-deficient participants (with or without anemia) were selected by systematic random sampling among all students in grades 1 to 4 from high schools for girls. Blood samples were collected and assayed for hemoglobin, hematocrit, serum ferritin, iron and total iron binding capacity. Anthropometric assessments included measurement of weight and height. Body mass index was calculated according to age and gender-specific BMI growth charts for children 2 to 20 years of age.

**Results:** 15.3% were at risk for overweight and 9.3% were overweight. The severity of iron deficiency increased as BMI increased from normal to at risk for overweight and to overweight. Iron deficiency anemia was most prevalent among overweight adolescent than at risk for overweight and normal weight adolescents (32%, 21%, and 18%, respectively).

**Conclusions:** The results of this study showed an inverse association of BMI with serum ferritin. Overweight adolescents demonstrated an increased prevalence of anemia. Because of potentially harmful effects of iron deficiency, obese adolescents should be routinely screened and treated as necessary.

P347 Nutrient Deficiencies

**Perturbation and age-related changes in the fatty acid pattern of soleus muscle phospholipids and triglycerides in rats depleted in long-chain polyunsaturated n-3 fatty acids**

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Altered D-glucose metabolism prevails in the soleus muscle of rats depleted in long-chain polyunsaturated 3 fatty acids (3). In these animals, the prior intravenous injection of an 3-rich medium-chain triglyceride:fish oil emulsion (3-FO rats), as compared to that of an 3-poor medium-chain triglyceride:olive oil emulsion (3-OO rats), may either correct or aggravate selected metabolic variables. This study deals with the fatty acid pattern of soleus phospholipids and triglycerides in control animals versus 3-depleted rats not injected with any lipid emulsion (3-NI rats) and in 3-OO versus 3-FO rats. In each group of 3-depleted rats, age-related changes were also monitored. The 3-depleted rats displayed low long-chain polyunsaturated 3 fatty acid content, facilitated metabolism of long-chain polyunsaturated 6 fatty acids, and increased Á9-desaturase activity. Both the age-related changes in lipid variables and those attributable to the prior intravenous injection of the 3-rich lipid emulsion consisted either in a move towards normalization or in the opposite direction, i.e. towards aggravation of the defect found in the 3-depleted rats. Emphasis is placed, therefore, on the unusual situation found in the skeletal muscle of 3-depleted rats, in which both lipid and metabolic variables may be either favourably or adversely affected by the same environmental factor(s).
**P349 Nutrient Deficiencies**

**Screening of metabolites in blood by LC/MS-TOF system for evaluation of vitamin deficiency in organism**

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Evaluation of vitamin level in organism is very important in connection with widespread metabolic syndrome which results in protein deficiency. Existing direct methods of vitamin determination in biomatrix (or biological matrices) and indirect enzyme activation tests don’t give the precise data about vitamin supply of organism. The level of vitamins and its metabolites excretion with daily urine is more informative but receiving of these data is connected with additional sample preparation because of formation of conjugates.

Analysis of specific low molecular metabolites from biochemical reactions in transport system of organism with abnormalities in enzyme metabolic links with vitamins as co-factor basically is not new approach, but today there is no fast, highly sensitive and high-resolution method of vitamin-dependent metabolites determination.

It was performed the determination of low molecular metabolites in serum (or blood plasma) with LC/MS-TOF interface (Agilent) and methanol deprotonisation as sample preparation. After additional reduction of tests of serum dithiotreitol the peak homocysteine which occurrence in blood usually connect with insufficiency of a folic acid and vitamins B12, B2 and B6 has been identified.

**Results:** There were no significant changes in body weight, BMI, food and nutrient intakes during period of zinc supplementation. The serum zinc concentration of treated patients were $0.68 \pm 0.16 \text{mg/l}$ vs $0.91 \pm 0.11 \text{mg/l}$ of control group, which shows significant difference ($p = 0.000$). The differences of FEV1, FVC, VC, FEV1:FVC were not statistically significant.

**Conclusions:** Serum zinc levels of asthmatic patients was remarkably low and improved significantly through zinc supplementation. No significant changes of body weight, BMI and respiratory factors observed through zinc treatment.

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**P350 Nutrient Deficiencies**

**Study of the effect of zinc supplementation on lung function in asthmatic patients in Hazrat Rassol Akram hospital, Tehran**

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**Introduction:** Asthma is a most prevalent disorder of the airways whose different aspects of management, including nutritional intervention, is of great interest and importance.

**Objectives:** The objective of present study was to investigate the effect of zinc supplementation on lung function in asthmatic patients.

**Materials and Methods:** A cross sectional clinical trial was conducted on two groups consisting of case (29 stable asthmatic patients) who received 50 mg zinc supplement every other day and matched control who received placebo pills, for period of 8 weeks. 10 ml blood samples were drawn prior and after the period of supplementation to measure serum zinc concentration. Body weight, BMI and Respiratory function parameters including Forced Expiratory Volume in 1 seconds (FEV1), Forced Vital Capacity (FVC), Vital Capacity (VC) and FEV1:FVC ratio (using Spirometer) were measured before and after supplementation. Dietary intake was obtained by 24-hour recall questionnaires prior and after treatment.

**Results:** There were no significant changes in body weight, BMI, food and nutrient intakes during period of zinc supplementation. The serum zinc concentration of treated patients were $0.68 \pm 0.16 \text{mg/l}$ vs $0.91 \pm 0.11 \text{mg/l}$ of control group, which shows significant difference ($p = 0.000$). The differences of FEV1, FVC, VC, FEV1:FVC were not statistically significant.

**Conclusions:** Serum zinc levels of asthmatic patients was remarkably low and improved significantly through zinc supplementation. No significant changes of body weight, BMI and respiratory factors observed through zinc treatment.

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**P351 Nutrient Deficiencies**

**The dietary intake of iron by preschool children**

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The optimal intake of iron(Fe)is of special significance for the growth, development and health of young children. The aim of this research was to determine the nutritional intake of Fe by preschool children in preschool children institutions.

The research was performed in period 1991–2005 through questionnaire based on storage charts of issued amounts of food and beverages in Niš Preschool Center. The participants were children aged 3–5 y. The questionnaire was taken by a doctor 4 times a year during 5 consecutive days. The data were statistically processed and interpreted with the reference to The Regulative Act of Standards of Preschool Children Feeding Programme in preschool children institutions.

As results showed, the amount of Fe in children food was from 4.8 mg (in 1998) to 8.3 mg (in 1997 and 1999), so the Standard of 9 mg was never achieved. The average intake of Fe was 6.4 mg, which was 64% of total daily needs, and 71.1% of the recommended standard intake. The amount of meat, fish and eggs varied in children’s food, with the lowest values of 6% (in 1993) and highest of 19% (in 1998). Fruit, vegetables and their products were not significantly included: the lowest intake values were in 1994 (7–11%) and only once (in 1997) the optimal intake of this food group was 21%. Because of the low intake of fruit and vegetables, vit. C (which allows easier binding of inorganic Fe) was always deficient in the food intake of the preschool. In 1993. the lowest intake of vit. C was measured (39.8 mg), while the optimal intake was only in 1991. (83.3 mg). The consumption of cereals and cereal products varied and the highest incidence was the one of the white flour products.

This deficiency could have been the reason of anemia among the children of this population group.
Poster Sessions

P352 Nutrient Deficiencies

The influence of maternal factors on the concentration of vitamin A in mature breast milk

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Introduction: The concentration of vitamin A in mature milk modifies along the breastfeeding time.

Objective: To evaluate the influences of nutritional, obstetric, socioeconomic and demographic factors on the concentration of vitamin A in mature breast milk.

Methods: 161 milk donators of the Milk Bank of Marilia City, Brazil, were investigated in this study. The nutritional status of the mothers was evaluated by anthropometric measurements and micronutrient determinations in breast milk and blood. The other maternal factors investigated were assessed by a general questionnaire. A pool of milk samples were obtained during a full day from each of the mothers for vitamin A, iron, copper and zinc determinations. Serum samples were obtained from the mothers at the same day for determination of the same micronutrients. Vitamin A concentrations in breast milk and blood were assessed by high performance liquid chromatography. Copper, zinc and iron concentrations in breast milk, and copper and zinc concentrations in blood were assessed by atomic absorption spectrophotometry. Ceruloplasmin concentration was determined by nephelometry and serum iron was measured colorimetrically after acidification and precipitation of plasma proteins using automated methods. A linear regression model was applied to assess the maternal factors associated to milk concentrations of vitamin A.

Results: Maternal age, maternal work, alcohol consumption, use of oral contraceptives, breastfeeding time, copper status and serum iron explained 34% of the variance of vitamin A concentration in mature milk.

Conclusion: This study confirms that nutritional, obstetric, socioeconomic and demographic factors show significant effects modulating mature breast milk concentrations of vitamin A in healthy mothers.

P353 Nutrient Deficiencies

The probiotic-containing vitamin-mineral supplements in children with high incidence of the acute respiratory infections (ARI)

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ARI in children is often accompanied by a decreased immunity, depletion of micronutrient supplies, intestinal dysbacteriosis.

Aim: To assess the efficacy of the probiotic-containing vitamin-mineral complex supplementation in children with high incidence of ARI.

Methods: The main group included 30 children. The control group consisted of 20 children at the age of 3–4 years. The gastroduodenitis and the biliary tract dysfunction were present in 15 children of the 1-st main group and in 10 children of the 1-st control group. In the 2-nd main group 15 children and in the 2-nd control group 10 children underwent the repeated courses of the antibiotic therapy. The blood levels of vitamin A, E and C, zinc and selenium, the serum â-interferon and the saliva levels of IgA, SlgA, the intestinal and nasopharyngeal microflora were determined in all children. The Multi-Tabs ImmunoKids (MTIK) supplement was administered to the children of the main group. The supplement contains all main vitamins, microelements and Lactobacillae GG (LGG).

Results: The relief of such digestive symptoms as abdominal pain and dyspepsia (p = 0.05) and vitamin deficiency (p = 0.05) were detected after MTIK intake (r = 0.5; p = 0.01). The hemoglobin index (p = 0.001) increased, the incidence of S. aureus nasopharyngeal carrier states (p = 0.01) decreased, the number of children with low intestinal content of bifidobacteria and lactobacteria reduced (p = 0.01), blood â-interferon levels came to normality (p = 0.01), vitamin A, E and D supplies increased (p = 0.01) and saliva levels IgA decreased (p = 0.05).

Conclusions: MTIK supplementation resulted in positive changes in the health state of children are related to the polymodal effect of the vitamin-mineral complex supplement with probiotics (LGG) on the children.

P354 Nutrient Deficiencies

Zinc deficiency among Iranian children under 6 years old

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Recently, zinc deficiency is considered as a major nutritional problem in developing countries. Preventing the complications and consequences of zinc deficiency, i.e. growth retardation, low immunity level, higher rate of infectious diseases and reduced educational performance, are essential.

According to National Integrated Micronutrient Survey (NIMS), conducted in 2001, the prevalence of zinc deficiency has been evaluated in children under 6 years old.

Aim: To assess the efficacy of the probiotic-containing vitamin-mineral complex supplementation in children with high incidence of ARI.

Methods: The main group included 30 children. The control group consisted of 20 children at the age of 3–4 years. The gastroduodenitis and the biliary tract dysfunction were present in 15 children of the 1-st main group and in 10 children of the 1-st control group. In the 2-nd main group 15 children and in the 2-nd control group 10 children underwent the repeated courses of the antibiotic therapy. The blood levels of vitamin A, E and C, zinc and selenium, the serum â-interferon and the saliva levels of IgA, SlgA, the intestinal and nasopharyngeal microflora were determined in all children. The Multi-Tabs ImmunoKids (MTIK) supplement was administered to the children of the main group. The supplement contains all main vitamins, microelements and Lactobacillae GG (LGG).

Results: The relief of such digestive symptoms as abdominal pain and dyspepsia (p = 0.05) and vitamin deficiency (p = 0.05) were detected after MTIK intake (r = 0.5; p = 0.01). The hemoglobin index (p = 0.001) increased, the incidence of S. aureus nasopharyngeal carrier states (p = 0.01) decreased, the number of children with low intestinal content of bifidobacteria and lactobacteria reduced (p = 0.01), blood â-interferon levels came to normality (p = 0.01), vitamin A, E and D supplies increased (p = 0.01) and saliva levels IgA decreased (p = 0.05).

Conclusions: MTIK supplementation resulted in positive changes in the health state of children are related to the polymodal effect of the vitamin-mineral complex supplement with probiotics (LGG) on the children.
**Results:** 19.4% of children 15–23 months and 31% of children 6 years old were zinc deficient. Prevalence of zinc deficiency in rural and urban areas were 38.7% and 26.6% respectively among children 6 years old. So the difference was significant. The difference among the children 15–23 in urban and rural are was not significant.

**Conclusion:** This study showed zinc deficiency is one of the major nutritional problem among Iranian children. Developing multiple strategies to fight with this problem such as zinc supplementation and food fortification for children should be one of the priorities of Ministry of Health in Iran.

### P355 Nutrient Deficiencies

**Zinc deficiency in the Niger inland delta, Mali**

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**Background:** Zinc deficiency is common in Sub-Saharan Africa. It is considered to cause 20% of the child mortality in poorer countries.

**Aim:** Child mortality is above the national average of 220/1000 or more than 1/3. The aim has been to see whether zinc deficiency could be one of the causes and if so how it could be remedied.

**Methods:** This investigation has covered both agricultural as well as human health aspects of zinc deficiency in the Niger inland delta. There is a link between poor soils and human health. An assessment of the zinc intake has been done. It has also included interviews of mothers to assess breast-feeding, weaning customs, presence of night blindness and child mortality. A special investigation has been carried out to identify traditional food preparation methods, degrading phytate, such as fermentation and malting.

**Results:** Soils in the Niger inland delta are zinc deficient and crops low in zinc. The zinc intake was assessed as about half of the recommended. Child mortality is clustered around two periods, at birth and at weaning age. Lack of midwives and maternal health care may be major reasons for the mortality at birth. The mortality at weaning age points to a low immuno-capacity when the child is confronted with the food of the family. The low zinc intake is due to a low content of zinc in the cereal-dominated diet and a low availability of zinc in the high phytate food. Among promising food preparation methods to produce a low phytate diet is for instance the soumbala, fermented seeds from the African locust bean tree.

**Conclusions:** The low zinc intake via a high phytate diet may be an important reason for the elevated child mortality, especially at weaning age. A hygienic weaning food with a good availability of zinc is urgently needed.

### P356 Nutrient Deficiencies

**Zinc parameters in the young school children: A prompt analysis**

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The Zn deficiency promotes retardation of the sexual maturation and growth, characterizing risk populations. The purpose of this study was to evaluate the nutritional state related to the Zn at schoolchildren between 9 and 12 years of age, in T1 and T2 of sexual maturation. Thirty seven schoolchildren had been evaluated at the private educational system of Sào João da Boa Vista (São Paulo State) attending the dietary intakes (24h Recall and Food Record) and according to the DRIs (2000), of plasma, eritrocyte and urine Zn concentrations, during the winter of 2004. The Zn at plasma, as well as the eritrocyte Zn and the urine Zn were determined by AAS. The used material was Zn-free according to standardized patterns of the LNM-FCF/USP. The average intake was 8,5 (±3,5) mg of Zn. However, 51% of the schoolchildren were consuming Zn below the RDAs, having ingested up to 2,8 mg of Zn. The average Zn concentration at plasma was 82,9 (±13,95) µg/dL, observing that only 13.8% of the children were below the expected value. The average Zn urine concentration was 235,4 (±133,0) µg/day, also lower than the expected inferior limit, grouping 73% of the schoolchildren. The average Zn eritrocyte concentration was 30,66 (±7,28) µg/Hb, classifying 92% of the schoolchildren under the expected value. Although the variables have not been gecorrelated between themselves, schoolchildren with low Zn ingestion, but with adequate concentration of Zn at plasma, presented low Zn eritrocyte and Zn urine, evidencing the existence of a homeostatic mechanism in relation to the nutritional deficiency. There’s the need of an urgent intervention to stimulate the consumption of food with Zn, emphasizing the importance in the children sexual maturation, typical events of the age.

### P357 Nutrient Signalling, Molecular Aspects

**Role of nutrient-sensing transcription factors in mediating molecular effects of nutrition**

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Nutrient effects on the expression of hepatic specific genes are part of the adaptative mechanisms aimed at maintaining energy homeostasis in mammals. When the diet is rich in carbohydrates, the expression of genes involved in glucose utilization (glucokinase, lipogenic enzymes) is activated and the expression of genes involved in glucose production (e.g. phosphoenolpyruvate carboxykinase, PEPCK) is inhibited.

These phenomenon are the results of an interplay between two main transcription factors, Sterol Regulatory Element Binding
Protein-1c (SREBP-1c) which is a key mediator of insulin transcriptional effects and Carbohydrate Response Element Binding Protein which is activated by a glucose metabolite. SREBP-1c is present in the hepatocyte in the form of a precursor in the membrane of the endoplasmic reticulum. Insulin activates its proteolytic cleavage and transport into the nucleus as well as its transcription rate. SREBP-1c in turn activates the expression of glucokinase, the first enzyme necessary for hepatic glucose metabolism which converts glucose into glucose-6-phosphate. Glucose-6-phosphate can then enter into the glycogen synthesis pathway or into the glycolytic pathway. One of the metabolite of glucose, probably xylulose-5-phosphate activates a phosphatase which dephosphorylates CHREBP initially localized in the cytoplasm. Dephosphorylation of CHREBP is a signal for its transfer into the nucleus where it can on its own (L-pyruvate kinase) or in conjunction with SREBP-1c (e.g. fatty acid synthase) activate genes linked to lipid synthesis from glucose. These subtle regulations allow a fine tuning of glucose utilization in the liver. This substate genes linked to lipid synthesis from glucose. These subtle regulations allow a fine tuning of glucose utilization in the liver. This substrate is converted into lipids only when the glycogen stores are repleted.

Our results help to unveil the mechanisms of action of lignans, molecules of wide interest nowadays and therefore could be of importance for their use for Women health.

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P358 Nutrient Signalling, Molecular Aspects

**Activation function-1 of estrogen receptor is necessary for agonistic actions of lignans**

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Lignans are plant compounds metabolized in the mammalian gut to produce the phytoestrogens, enterodiol (ED) and enterolactone (EL). They are found in a wide variety of foods including flaxseeds, legumes and whole grains. Because estrogens have been linked to breast cancer etiology, lignans could affect breast cancer risk, but the mechanisms by which they exert their estrogenic and/or anti-estrogenic effects in humans are still unclear.

To better understand how lignans interfere with human estrogen receptor (hER) signalling in hormone-dependant diseases, we examined and compared the effects of ED, EL and 17b-estradiol (E2) on cell proliferation and on the hER a (66 and 46kDa) and b mediated gene transcription in the breast cancer cell line (MCF-7).

In proliferation studies, ED and E2, but not EL, increase cell number in presence or absence of fetal bovine serum (FBS). In absence of FBS, ED and EL inhibit the E2-induced MCF-7 cell proliferation, but not in presence of FBS. The hER antagonist ICI 182,780 (ICI) inhibit ED and E2 effects on MCF-7 proliferation.

In transient transfections studies with the different hER and the C3 driven reporter plasmids, we show that ED, EL and E2 (1µM) respectively induced transcriptional activity by 5.9, 4.1 and 13.8 for hERa 66 and 1.5, 1.7 and 3.3 for hERa 46 and 1.1, 1.3 and 2.7 for hERb. These effects are blocked by ICI.

These results indicate 1) ED and EL are two times less potent than E2 to induce hERa 66 activity and 2) the activation function-1 is necessary for hER-mediated gene transcription by lignans in MCF-7 cells since hERa 46 and hERb are not induced.

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P359 Nutrient Signalling, Molecular Aspects

**Astaxanthin and canthaxanthin in UV-protection: Effects on gap junctional communication**

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Carotenoids are secondary plant components, efficient as antioxidants and photoprotecting agents. Human intervention studies with carotenoid supplements or diets rich in carotenoids have shown that they contribute to systemic photoprotection ameliorating UV-induced erythema. They also exhibit other biological functions, including modulatory effects on gap junctional intercellular communication (GJIC) important for homeostasis, growth control and development of cells. GJIC is a direct signaling pathway for the exchange of signals between neighbouring cells via channels composed of connexin proteins. Prior studies have shown that astaxanthin is a strong inhibitor of GJIC whereas canthaxanthin stimulates cellular communication via gap junctions. Aim of the present study was to determine the effects of the carotenoids astaxanthin and canthaxanthin on gap junctional communication in UV-A irradiated primary human skin fibroblasts. Preincubated cells (24h) respectively control cells were irradiated with 10J/cm² UV-A (365 nm). GJIC was measured at different time points after irradiation applying the dye transfer assay. Immunostaining was used to determine protein expression and phosphorylation patterns of connexin43, and N-cadherin. Immunostaining was used to visualize connexin43 location. Irradiation of cells with UV-A led to a decrease in GJIC and modulated the expression of connexin43 and N-cadherin. Canthaxanthin counteracted the decreased UV-A inhibition of gap junctional communication. Interestingly, the inhibitory effects of UV-A light on GJIC were not increased but partially restored by astaxanthin. The data suggest that different biological mechanisms play a role in the interaction of both carotenoids with GJIC.
DNA methylation is a mechanism regulating gene expression. Beta-carotene (BC), potent pro-vitamin A/retinoic acid source in human, was shown to have pro-chemotactic activity and stimulate expression of pro-angiogenic genes in endothelium. Angiogenesis, is an important mechanism in tumour malignancy. Fatty acids stimulate BC uptake. The arachidonic acid (AA) metabolites were shown the procancerogenic activity. This study was undertaken to define the possible changes in DNA methylation in endothelial cells and its progenitors after incubation with BC and AA.

HUVEC and cord blood endothelial progenitors (EPC) were incubated with BC and arachidonic acid (AA) for 24 hours. The CpG island methylation was quantified using the Combined Bisulphite Restriction Analysis (COBRA) method and the PCR products were digested by restriction enzymes. Global DNA methylation was analysed with cytosine extension assay using methyl-sensitive restriction enzyme HpaII, which allows [3H]dCTP to be incorporated into the DNA strands.

The global DNA methylation analysis pointed to the tendency to down-regulation of DNA methylation in HUVEC and EPC, after incubation with AA (p = 0.919) or BC (p = 0.227). Of the 18 investigated genes connected with the endothelial cell proangiogenic activity, DNA methylation was regulated in the promoter regions of: integrin beta3, connexin 43, CXCR4, KDR, MMP-2, laminin, Notch4 and VCAM1 genes.

Conclusion: The CpG island methylation might be an important mechanism of changes in the expression of pro-angiogenic genes after stimulation with beta-carotene and arachidonic acid.

Acknowledgment

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P361 Nutrient Signalling, Molecular Aspects

Comparison of different vehicles for tocopherols treatment of Caco-2 cells

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Several studies have focused on the ability of tocopherols to regulate genes expression. For such experiments the methodology used to treat cells is very important and could lead to different results depending of the vehicle used.

The objective of the present study is to compare different vehicles used to deliver tocopherols to differentiated Caco-2 in culture. We decided to compare ethanolic solution, complex with bovine serum albumin (BSA), and mixed micelles. alpha(α)-tocopherol at different concentrations were used for these experiments. Tocopherols quantification has been realised by HPLC and cytotoxicity by LDH measurement. mRNA levels were evaluated by qPCR.

After 24 h incubation with gamma(γ)-tocopherol at various concentrations, cells treated with mixed micelles presented a major tocopherol enrichment of intracellular content, whereas, cells treated with ethanolic solution or BSA only lead to a small accumulation of tocopherols. This discrepancy of tocopherol uptake could come from a discrepancy of tocopherol availability. We thus evaluated this parameter. Tocopherols rapidly disappeared from ethanolic solution but remained constant with BSA or mixed micelles.

The cytotoxicity test did not show major discrepancy between vehicles.

The effect of vehicle on expression of nuclear receptors has been evaluated because of the presence of several active molecules, especially in mixed micelles. Classical target genes of these nuclear receptors were also studied. Except SHP, a classical bile acids responsive gene that was induced by mixed micelles, no vehicle effect was observed on others genes.

This study provides a comparison of usually used vehicles, and seems to define mixed micelles as the best method for internalisation of tocopherols in Caco-2 cells.
Adipose tissue – derived progenitors (APC) in comparison to HUVEC were investigated.

CD34/AC133 cells were isolated from human cord blood. APC were obtained as the adherent fraction of subcutaneous adipose cells. Cells expressing VE-cadherin (EPC) were used. Influence of b-carotene as well as FFAs (palmitic, linoleic, arachidonic) on the gene expression was estimated by Real-Time PCR or oligonucleotide chip. Cell proliferation, angiogenesis in model and SDF-1 induced chemotaxis were measured.

bFGF, BC or FFA in non-toxic concentrations did not influence the UPC proliferation and the tube formation in vitro, however BC>VEGF>SDF induced chemotaxis of EPC, APC and HUVEC. Microarray and real-time PCR analysis showed that BC up-regulates the genes of extracellular matrix components, VEGF signalling pathway, G protein coupled receptors (and subsequent activation Ras/Rho signaling pathway), as well as regulators of Ras/Rho, confirming the main BC-induced progenitor chemotaxis/homing. The regulation of SDF/CXCR4 axis was evidenced. Our results documented the potent chemotactic activity of BC in endothelial progenitors, what may argue for angiogenic properties. Fatty acids did not exert chemotactic activity, but augmented the BC influence. In the presence of insulin, and adipocyte priming conditions FFA promoted differentiation of progenitors toward the lipid accumulating cells expressing the adipocyte-characteristic genotype.

**P364 Nutrient Signalling, Molecular Aspects**

**Effects of fatty acids and glucocorticoids on the adiponectin gene expression**

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**Introduction:** Adiponectin (ADP), a protein produced exclusively by adipocytes, increases insulin sensitivity. Rats treated with high fat diets decrease ADP gene expression, suggesting that lipid plasmatic profile and constituent of the diet can contribute for reduction of ADP. It is known that diet enriched with oil soy increases corticosterone. Adrenalectomy stimulates ADP expression and treatment with dexamethasone (DEX) inhibits release of adiponectin, in obese.

**Objective:** Evaluated the effect of different fatty acids in the expression of ADP in mice and effect of DEX in ADP gene expression in the culture of adipocytes.

**Methods:** Mice C57BL6 were treated for 60 days with diets enriched with oil soy, fish, lard or coconut. Epididymal adipose tissue was collected. 3T3-L1 adipocytes were treated with DEX for 48 hours. Total RNA was extracted from tissue and 3T3-L1 and RNAm for ADP was determined by Northern Blotting.

**Results:** Treatment with soy oil-enriched diet reduced expression of ADP in the epidydimal adipose tissue. Treatment of adipocytes with DEX diminished the expression of ADP as compared to the control group.

**Conclusion:** The reduction of the ADP expression by high fatty diet treatment could be partially explained by increased of corticosterone, therefore addition of DEX in the culture medium reduced the ADP expression.

**Acknowledgment**

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P365 Nutrient Signalling, Molecular Aspects
Estrogenic effects of isoflavones: Role of the two activation functions, AF-1 and AF-2
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Isoflavones (IF) belong to the broad family of phytoestrogenic compounds and their major dietary sources are soy-based products. However, the precise mechanisms of IF-induced human estrogen receptors (ER) transcriptional activation and their influence on cell proliferation and differentiation are still unclear. hER, a and b, differ by their activation function (AF-1) located in the A/B domains while AF-2 in the E/F domains share similarities. AF-1 is the dominant AF involved in ERα transcriptional activity in differentiated cells.

The aim of our study is to assess the respective involvement of AF-1 and AF-2 in the IF-induced ER transcriptional activity. Consequently, IF effects have been studied on the transcriptional activity of ER α and β, focusing on the role of AF-1, by transient transfections with either a full length form of ERα or a truncated form of ERα (DAF-1) with ERE and C3 promoters, in differentiated (HeLa) or undifferentiated (HeLa) cell lines as well as MCF-7, an ER-positive breast cancer cell line.

We show that in undifferentiated cells (HeLa), IF increase ERα and β transcriptional activities to the same extent as 17β-estradiol (E2) and these effects are mediated equally through AF-1 and AF-2.

In differentiated cells, AF respective implication varies as a function of the IF tested. Genistein (G) and daidzein (D), but not equol (E) increase AF-2 activity while D and E, but not G, decrease AF-1 activity, in ERα mediated gene transcription compared to E2.

The role of AF domains in ERα mediated gene transcription varies depending on the activating ligand, the target gene and the cell differentiation state in a complex fashion. Therefore, different IF induce a unique pattern of estrogenic activity, which can reflect the diversity of their action in vivo.

P366 Nutrient Signalling, Molecular Aspects
Fish oil (FO) modulates phosphatidylinositol-3'kinase (PI3K) activity and AKT serine 473 phosphorylation in ethanol fed rats
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In rats, FO (13% of energy) prevents the high fat diet (60% fat)-induced decrease in muscle and adipose tissue decrease in PI3K activity. We studied the effects of a high amount of FO (10% of ME) into a high fat diet (45% fat) on PI3K activity and serine 473 AKT phosphorylation in rats with or without alterations of insulin signaling induced by chronic ethanol feeding. Three groups of 16 rats male wistar rats were fed over 28 days with either a control diet (8% fat), a high fat peanut-rapeseed (PR) oil diet (45% PR) or a FO diet (36% FO + 9% PR). Eight rats of each group received in addition to diet either milk containing ethanol (25% of energy) to induce alterations of insulin signaling or milk alone. Rats were pair-fed so that energy intake, weight and ethanol intake were not different between the 6 groups. The last day, rats were sacrificed in fasted (n = 4) or in fed state (n = 4) in order to activate physiologically insulin signaling pathway. Ethanol feeding decreased PI3K activation in liver (~51%), muscle (~50%) and AT (~25%) (all P < 0.05), but did not alter AKT serine 473 phosphorylation. Both PR and FO diets completely prevented ethanol-induced defect of PI3K activation. In contrast, during ethanol feeding, n-3 diet but not PR oil diet increased AKT serine 473 phosphorylation in muscle (+48%; P < 0.05) while decreasing it in adipose tissue (~60%; P < 0.05). In conclusion, ethanol inhibited PI3K activation but not AKT phosphorylation in insulin-dependent tissues. FO prevented ethanol-induced inhibition of PI3K activation and exerted a tissue-specific effect on AKT serine 473 phosphorylation during ethanol feeding.

P367 Nutrient Signalling, Molecular Aspects
Gene expression profiling of a mouse model for human serine deficiency disorders
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D-3-Phosphoglycerate dehydrogenase (Phgdh; EC 1.1.1.95) is a necessary enzyme for de novo L-serine biosynthesis via the phosphorylated pathway. We demonstrated previously that Phgdh is expressed exclusively by neuroepithelium and radial glia in developing mouse brain and later mainly by astrocytes [1]. Mutations in the human PHGDH gene cause serine deficiency disorders (SDD) characterized by severe neurological symptoms such as congenital microcephaly and psychomotor retardation [2]. We recently showed that genetically engineered mice, in which the gene for Phgdh has been disrupted, have significantly decreased levels of serine and glycine, and exhibit malformation of brain such as microcephaly [3]. The Phgdh null (KO) mouse is therefore an excellent model for brain pathology of SDD. To understand pathogenesis of SDD at the molecular level, we perform gene expression profiling of the wild type and KO head at embryonic day 13.5. Comparative microarray analysis reveals that the up-regulated genes primarily encode proteins associated with amino acid metabolism, transcriptional regulation, and amino acid transport. Neuron-specific genes are significantly decreased in the KO mice, reflecting a drastic reduction of committed neuronal precursor cells. In addition, gene expression of cytoskeleton/structural molecules decline in the KO mice. Our studies show that serine deficiency causes alterations in expression of genes in several networks, and provide molecular insights into pathology of SDD as well as cellular mechanism(s) underlying nutrient-gene interactions.
Gastrointestinal hormones (GH) such as glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP) are involved in the regulation of whole body energy metabolism. Previously we have shown that rapidly and slowly digestible carbohydrates differ in their ability to stimulate secretion of GHs. GLP-1 plasma concentrations were significantly increased late (180–300 min) after ingestion of a starchy product with a high content of slowly available glucose. GIP plasma concentrations were correlated with the influx rate of glucose. These findings suggest that ingestion of different types of carbohydrates have different metabolic consequences. There is evidence that GH response can contribute to insulin sensitivity; however the underlying mechanism remains unknown.

Therefore we investigated the GH receptors (GHRs) distribution and compared the abundance in human tissues: liver and adipose tissue (visceral vs. subcutaneous) by semi-quantative RT-PCR and DNA sequencing.

In the liver we detected GLP-1R, but not GIPR. In both types of adipose tissue we detected highly abundant GIPR and low abundant GLP-1R. There were no differences in abundance of the GHRs between visceral and subcutaneous adipose tissue. The GLP-1R was low abundant in liver.

The presence of GIPR on adipose tissue and its absence on liver suggests that GIP affects adipose tissue metabolism, but not the liver metabolism. GLP-1 affects both adipose tissue and liver as GLP-1Rs are present on these tissues. In relation to our previous study we postulate that different types of carbohydrates mobilize different patterns of energy distribution which could explain advantage of slowly digestible carbohydrates above rapidly digestible ones in prevention of obesity/diabetes type 2.
P371 Nutrient Signalling, Molecular Aspects

Influence of dietary polyphenols on gene expression in apolipoprotein E deficient mice: A transcriptomic approach

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Polyphenols, present in many foods and beverages of plant origin, have been involved in the prevention of various diseases, and more particularly cardiovascular diseases. These protective effects have usually been explained by their antioxidant properties and their capacity to inhibit lipoperoxidation. It appears today that the mechanisms of action could involve effects on gene expression. The goal of this study is to compare the effect on gene expression of the most common dietary polyphenols and of some fruits rich in polyphenols in an animal model of atherosclerosis. ApoE deficient mice which spontaneously develop atherosclerotic lesions were fed during 6 to 12 weeks, a control diet or a diet supplemented with polyphenols at nutritional doses, or with freeze-dried strawberries, apples, grapes or apricots (two varieties low or high in polyphenols per fruit; 6% w/w in diet). The development of atherosclerotic lesions was assessed by histology on thin sections of the aortic root and global gene expression variations in aorta with mouse panogenic microarrays. An inverse relationship between polyphenol supplementation and atherosclerotic lesion development was observed (e.g. 25% reduction with catechin supplementation during 6 wks). First results indicate that catechin supplementation (0.02% in the diet) influences the expression of about 500 different genes. Classification of genes according to their function (Gene Ontology databases) shows significant effects on genes involved, among others, in lipid biosynthesis and metabolism, energy metabolism and mitochondrial transport, signal transduction, cell proliferation, apoptosis. These results should contribute to unravel the mode of action of polyphenols in the prevention of atherosclerosis.
**P373 Nutrient Signalling, Molecular Aspects**

**Influence of the combination of high, medium or low dietary fat and deficient, sufficient or high dietary vitamin A on nuclear receptor target gene expression in mice**

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Dietary lipids are known to activate nuclear hormone receptor pathways like that of peroxisome proliferator-activated receptors (PPARs). Dietary vitamin A, metabolised to retinoic acids, activates the retinoid X receptor (RXR) and retinoic acid receptor (RAR). It is known that dietary lipids and vitamin A induced gene expression influence each other pathways. In our study we want to investigate, how high, medium and low fat in the diet influences vitamin A (deficient, sufficient or high) induced target gene expression and nuclear hormone receptor target gene expression in general. We used 8 female C57BL6-wildtype mice per group and fed them with the different diets for 4 weeks. The fat in form of sunflower oil (~65% of linoleic acid) was applied as a low fat (2%), medium fat (5%) and high fat diet (10%). In a parallel study mice were gavaged for 7 days with [0 RE/kg diet (deficient), 2500 RE/kg diet (sufficient) and 324000 RE/kg diet (high)]. In a parallel study mice were gavaged for 7 days with specific synthetic ligands for the nuclear hormone receptors: RXR, RAR, PPARα, β and γ for induction of receptor-specific target gene expression, which serves as a positive control. Mice fed a high fat diet showed an increase in bodyweight after 4 weeks, while mice on low fat diet displayed no altered bodyweight. The bodyweight was not significantly influenced by the amount of dietary vitamin A. The weight of the liver was measured in both studies and displayed also no significant alteration. Total RNA extracted and isolated from the liver and further the expressions of various target genes like transglutaminase 2 (TG2 for RAR or RXR), ADRP (adipose differentiation related protein for PPARs) and various other target genes will be measured via RT-QPCR.

**P374 Nutrient Signalling, Molecular Aspects**

**NFkB activation in human intestinal Caco-2 cells exposed to realistic intestinal concentrations of DON**

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Deoxynivalenol (DON) is the most prevalent trichothecene mycotoxin in crops used for food and feed production in Europe and North America. In human intestinal Caco-2 cells, exposure to DON leads to activation of the mitogen-activated protein kinases (MAPKs) Erk1/2, p38 and SAPK/JNK as well as to a decrease in transepithelial resistance, suggesting that DON triggers intestinal inflammation. Our purpose was to investigate the influence of DON exposure on the activity of the nuclear factor kB (NFkB), a key mediator of inflammation acting downstream the MAPKs cascade.

Caco-2 cells, either stimulated or not by the pro-inflammatory agents interleukin-1β (IL1β), tumor necrosis factor a (TNFa) or lipopolysaccharides (LPS), were exposed to realistic intestinal concentrations of DON (0 to 10 μM). Different stages of NFkB activation cascade were examined: (i) phosphorylation and degradation of the inhibitor (IkB) using Western Blot; (ii) NFkB activity using transient transfection with a NFkB-luciferase reporter plasmid; (iii) influence of MAPKs inhibitors on IkB expression and NFkB activity. Results show that DON exposure (>250 ng/ml) dose-dependently increased NFkB activity, with however a stronger synergic effect in cells costimulated with IL1β (400%), TNFa (200%) or LPS (300%). Exposure of cells to specific MAPKs inhibitors (50 μM) decreased basal NFkB activity. A concomitant exposure to DON (>500 ng/ml) reversed this phenomenon for p38 and SAPK/JNK.

These data show that DON induces NFkB activity dose-dependently in Caco-2 cells. This effect seems mediated through the p38 and SAPK/JNK pathway, and is even more accentuated in cells triggered by pro-inflammatory agents, mimicking a pathologic epithelium. Research on downstream targets of DON are being performed.

**P375 Nutrient Signalling, Molecular Aspects**

**NPC1L1 and SR-BI are involved in the intestinal absorption processes of cholesterol solubilized in mixed micelles but not in large particles**

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In the small intestine, lipolysis products are solubilized into micelles, vesicles or large particles. As specific intestinal cholesterol transporters (NPC1L1 and SR-BI) were described, their specificity to the different intestinal particles is unknown. In this study the contribution of SR-BI and NPC1L1 to the intestinal cholesterol absorption processes was assessed using different structures. Each cholesterol donor (2 mM PC, 0.03 mM MG, 0.5 mM oleic acid, 0.1 mM cholesterol, [14C]-cholesterol traces and 0, 2, 3, 4, 5, 6 or 8 mM taurocholic acid salt) was incubated during 3 h to the apical medium of TC7 cells, human Caco-2 clone. Cholesterol uptake into the cell and secretion rates to the basolateral space was measured. Results. Bile acid concentrations have a marked effect on cholesterol absorption. Mixed micelles were more effective than bigger particles (from 10.83 to 2.23 of 10.47 ± 0.66 mmol/mg). When cholesterol was solubilized in mixed micelles, specific antibodies directed to NPC1L1 and SR-BI decreased significantly the cholesterol uptake. Using large particles, the antibodies were ineffective. The expression level of SR-BI was unmodified whatever the tested particles were. For NPC1L1, the expression levels...
were significantly increased after incubation with mixed micelles. Conclusions. The intestinal cholesterol transporters (SR-BI, NPC1L1) are involved in the absorption processes of small particles (23.01 ± 0.27 nm). Micelles being structures of very small size may easily reach the brush-border transporters. They are also able to induce signaling pathways that regulate the NPC1L1 expression level. The mechanisms of this regulation are unknown. Taurocholate itself and particle size are important regulation factors of cholesterol absorption.

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**P376 Nutrient Signalling, Molecular Aspects**

**Phellinus linteus activated death domain receptors for apoptosis in human Hep3B cells**

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Phellinus linteus has been used as a traditional medicinal mushroom in China, Japan, and other Asia countries for the treatment of various diseases. Aqueous extract from the fruiting body or mycelia of Phellinus linteus has been reported to produce antitumor and immunomodulatory activities in vivo and in vitro. However, the mechanisms underlying its tumoricidal effects are poorly understood. We used Hep3B cells to explore the possible pathway and identifying proteolytic mechanisms of Phellinus linteus aqueous extract for inducing cancer cell apoptosis in this study. The Hep3B cells were cultured with 1000 µg/ml Phellinus linteus. The activation rate of ERK, TRADD, FADD, and caspase 3, 8 were examined by using western blotting and ELISA reader. From the results we found that Hep3B cells were not sensitive to active ERK. The death receptor adaptor FADD and TRADD were found to be rapidly induced and accompanied with caspase-8 and caspase-3 activity increase. These results demonstrated that Phellinus linteus induced the apoptosis of Hep3B cells through a death-receptor-dependent pathway. Phellinus linteus is of potential as a candidate for cancer therapy.

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**P377 Nutrient Signalling, Molecular Aspects**

**Repression of metallothionein expression by dietary procyanidins**

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Procyanidins (PC) are the most abundant polyphenols in red wine and they are also found in cereals, fruits, chocolate and tea. They exert many beneficial health effects, especially on the cardiovascular system [1]. Metallothioneins (MTs) are low molecular weight, metal-binding proteins. They are important for detoxification of heavy metals and, in physiological conditions, for the homeostasis of Zn and Cu. Expression of MT genes is up-regulated by heavy metals, reactive oxygen species, pro-inflammatory cytokines, and glucocorticoids. Conversely, MT expression can be repressed by agents that promote DNA methylation or histone deacetylation [2].

In this study, we show that oral administration of a grape seed procyanidin extract (GSPE) to healthy rats results, 5 h after treatment, in a 70% inhibition of MT genes expression in the liver, as determined by microarray analysis. Similarly, in cultured human hepatocytes HepG2, GSPE inhibits basal MT expression up to 80%, as evaluated by RT-PCR. This inhibition is dose-dependent at GSPE concentrations that are not toxic for the cells.

In addition, pretreatment of HepG2 cells with GSPE prevents the induction of MT genes expression by different agents such as Zn, tert-butyl hydroperoxide, dexamethasone and IL-6.

These results show that MT genes are targets of PC action in hepatic cells, both in vivo and in vitro, and strongly suggest that MT gene expression may be used as a marker of cellular metabolic state and as a reporter of PC bioactivity. Preliminary results also suggest that repression of MT expression triggered by PC in hepatic cells might be mediated by DNA methylation and histone deacetylation in the promoter region of MT genes.

**Acknowledgment**

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**References**

Resveratrol (ResvidaTM) and EGCG (TeavigoTM) are anti-inflammatory phenolic substances in different cellular systems, since they potently reduce e.g. the production of inflammatory mediators. In macrophages, the two substances synergistically suppress nitric oxide (NO) and prostaglandin E2 (PGE2). We further analyzed the effects of RES/EGCG combination at the gene expression level by quantitative RT-PCR and DNA microarrays. Resveratrol and EGCG markedly impaired LPS-induced up-regulation of different inflammatory genes (iNOS, interleukins, cytokines and chemokines) these effects were synergistically enhanced by the combination of the compounds. DNA microarray data revealed synergistic effects for chemokines of the CC family, different interleukins, matrix metalloproteinases or cell adhesion molecules. Similarly, the expression of inflammation-related transcription factors, kinases or TNF-alpha-related genes was modulated by anti-inflammatory substances. We further mapped the effects in different pathways (interleukin, insulin, TLR, etc.). Taken together, the compounds attenuated the extent of inflammation-related transcription factors, kinases or TNF-alpha-related genes was modulated by anti-inflammatory substances. We further mapped the effects in different pathways (interleukin, insulin, TLR, etc.). Taken together, the compounds attenuated the extent of inflammatory pathways and their mediators.

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Resveratrol and EGCG synergistically modulate inflammatory pathways and their mediators

Human cord blood AC133+ cells were isolated with magnetic microbeads. Cells were grown in EBM medium with supplement of SDF and VEGF and antibiotics. Cells which expressing VE cadherin (EPC) were used for study. 24-hour incubation with non-toxic palmitic acid (PA), oleic acid (OA), arachidonic acid (AA), eicosapentaenoic acid (EPA) influence on gene expression was measured using oligonucleotide chip and real-time PCR. The effect on cell proliferation was measured by BrdU incorporation. Chemotaxis was performed using Boyden Chamber System (Becton Dickinson). Angiogenic potency was investigated by the tubule formation assay in the in vitro 3D matrigel model. To measure the activity of the main kinases the Fast Activated Cell-based ELISA Kits were used.

Unsaturated fatty acids increased gene expression related to homing of progenitors and genes characteristic for adipocytes. The activity of ERK kinase was not observed after incubation with all FA – consistent with the lack of influence on cell proliferation. However all used FAs in non-toxic concentrations activated EPC and HUVEC migration/activation of p38-kinase. The reduced activity of FAK kinase was observed (except PA in HUVEC), what may be connected with reduction of cell- matrix adhesion.

The dietary FA strongly influence the phenotype of EPC from proangiogenic towards adipogenic fate.

Acknowledgment
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The role of the peroxisome proliferator activator receptor on the control of amino acid oxidation

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The energy requirement during fasting is met mainly by triglycerides and no by amino acids (AA) that can also serve as energy source. However, it is not known the molecular metabolic switch that stimulates fatty acid (FA) oxidation and reduces AA degradation during fasting. FA oxidation is regulated by the transcription factor PPAR alpha, which in turn regulates expression of genes involved in beta-oxidation. Recently, we demonstrated the presence in the promoter region of the AA degrading enzyme histidase (Hal), two potential response elements for PPAR alpha (PPARE). Thus, the aim of this work was to determine the functionality and the metabolic importance of this PPARE to understand the potential role of PPAR alpha in the oxidation of amino acids. The results showed that graded concentrations of dietary protein in the presence of the artificial ligand of PPAR alpha, Wy14643, reduced the activity and expression of hepatic Hal. The dietary FA strongly influence the phenotype of EPC from proangiogenic towards adipogenic fate.
Several studies have focused on the ability of tocopherols to regulate genes expression. For such experiments the methodology used to treat cells is very important and could lead to different results depending of the vehicle used.

The objective of the present study is to compare different vehicles used to deliver tocopherols to differentiated Caco-2 in culture. We decided to compare ethanolic solution, complex with bovine serum albumin (BSA), and mixed micelles. α and/or γ-tocopherol, used at different concentrations) were used for these experiments. Tocopherols quantification has been realised by HPLC and cytotoxicity by LDH measurement. mRNA levels were evaluated by qPCR.

After 24h incubation with γ-tocopherol at various concentrations, cells treated with mixed micelles presented a major tocopherol enrichment of intracellular content, whereas, cells treated with ethanolic solution or BSA only lead to a small accumulation of tocopherol. This discrepancy of tocopherol uptake could come from a discrepancy of tocopherol availability. We thus evaluated this parameter. Tocopherols rapidly disappeared from ethanolic solution but remained constant with BSA or mixed micelles.

The cytotoxicity test did not show major discrepancy between vehicles.

The effect of vehicle on expression of nuclear receptors has been evaluated because of the presence of several active molecules, especially in mixed micelles. Classical target genes of these nuclear receptors were also studied. Except SHP, a classical bile acids responsive gene that was induced by mixed micelles, no vehicle effect was observed on others genes.

This study provides a comparison of usually used vehicles, and seems to define mixed micelles as the best method for internalisation of tocopherols in Caco-2 cel.

**P381 Nutrient Signalling, Molecular Aspects**

**Treatment of Caco-2 cells with tocopherols: Which vehicle?**

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UV exposure of the skin leads to chemical and biological reactions either damaging or adaptive to light-induced stress. Singlet molecular oxygen and secondary reactive oxygen species are generated and responsible for photooxidative damage affecting lipids, proteins and DNA. Such reactions are involved in the pathobiology of erythema formation, premature aging of the skin, development of photodermatoses, and skin cancer. Dietary antioxidants protect against UV-mediated skin damage. In the present study we investigated the UV-protective effects of vitamin E and several synthetic vitamin E analogs (2,5,7,8-Tetramethyl-2-(2’-carboxyethyl)-6-hydroxychroman esters) in human fibroblasts.

Human skin fibroblasts were incubated with vitamin E, respectively the vitamin E analogs for 24h and subsequently irradiated with UV-A/B light. Controls were treated with DMSO. As a measure of oxidative damage malondialdehyde formation and induction of hemeoxygenase-1 was determined. Cell toxicity was estimated applying the sulforhodamine B assay. All of the investigated compounds inhibited the formation of malondialdehyde and led to a decrease in hemeoxygenase-1 expression compared to control. No effect was determined regarding cell toxicity. The data suggest that vitamin E and synthetic vitamin E derivatives are suitable photoprotectants.

**P382 Nutrient Signalling, Molecular Aspects**

**UV protective effects of vitamin E analogues in cell culture**

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UV exposure of the skin leads to chemical and biological reactions either damaging or adaptive to light-induced stress. Singlet molecular oxygen and secondary reactive oxygen species are generated and responsible for photooxidative damage affecting lipids, proteins and DNA. Such reactions are involved in the pathobiology of erythema formation, premature aging of the skin, development of photodermatoses, and skin cancer. Dietary antioxidants protect against UV-mediated skin damage. In the present study we investigated the UV-protective effects of vitamin E and several synthetic vitamin E analogs (2,5,7,8-Tetramethyl-2-(2’-carboxyethyl)-6-hydroxychroman esters) in human fibroblasts.

Human skin fibroblasts were incubated with vitamin E, respectively the vitamin E analogs for 24h and subsequently irradiated with UV-A/B light. Controls were treated with DMSO. As a measure of oxidative damage malondialdehyde formation and induction of hemeoxygenase-1 was determined. Cell toxicity was estimated applying the sulforhodamine B assay. All of the investigated compounds inhibited the formation of malondialdehyde and led to a decrease in hemeoxygenase-1 expression compared to control. No effect was determined regarding cell toxicity. The data suggest that vitamin E and synthetic vitamin E derivatives are suitable photoprotectants.

**P383 Nutrients and Tissue Development**

**Effect of trans-10,cis-12 conjugated linoleic acid on apoptosis and thermogenesis in adipose tissue from adult hamsters**

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Trans-10,cis-12 conjugated linoleic acid (CLA) induces a strong body fat reduction in rodents and a more weak reduction in humans. It has been proposed that the age and maturity of experimental animals and subjects can modify the effectiveness of CLA as an anti-obesity molecule. In previous studies, we observed a significant reduction in adipose tissue weights (subcutaneous = 36%, epididymal = 26% and perirenal = 26%) in young hamsters fed a high-fat diet enriched with 0.5% trans-10,cis-12 CLA. The aim of the present work was to assess the effects of this CLA isomer on body fat accumulation in adult hamsters, and to compare this effect with that found in young hamsters.
hamsters. We also analyzed if thermogenesis and apoptosis were modified by CLA feeding.

Twenty male Syrian Golden hamsters (8-month-old) were divided into two groups and fed high-fat diets containing 0.5% linoleic acid or 0.5% trans-10,cis-12 CLA for 6 weeks. Apoptosis in white adipose tissue was determined by using a commercial kit and uncoupling protein 1 (UCP1) was quantified in interscapular brown adipose tissue by western blot.

Trans-10,cis-12 CLA feeding led to a reduction in adipose depot size: subcutaneous (−21%; P < 0.05), epididymal (−12%) and perirenal (−18%). Animals fed the CLA diet showed increased amount of UCP1 (+49.3%; P < 0.05) and enhanced apoptosis (+465.5%; P < 0.05).

Thus, although trans-10,cis-12 CLA remained effective in adult hamsters with regard to body fat reduction, aging decreases its efficiency. The reduction in adipose tissue size was due, at least in part, to increased brown adipose tissue thermogenesis and, thus to enhanced energy expenditure. Moreover, a reduction in the number of mature adipocytes also contributed to CLA fat-lowering effect, as suggested by increased apoptosis.

These results show that trans-10,cis-12 produces an increase in liver size due to hyperplasia, as observed in young hamsters. In contrast, the reduction in triacylglycerols and cholesterol observed in young animals was not found in the adults. It can be concluded that, in hamsters, the effects of CLA on liver depend on the age.

P384 Nutrients and Tissue Development
Effect of trans-10, cis-12 conjugated linoleic acid on liver size and composition in adult hamsters
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Liver is a target organ to study the impact of conjugated linoleic acid (CLA) on health. Many studies performed in mice have reported an increase in liver weight associated to a strong steatosis, induced by CLA. However, not all species are similarly CLA-sensitive with regard the effects on the liver. We have previously reported that, in young hamsters, trans-10,cis-12 CLA feeding induces an increase in liver weight associated to a strong steatosis, induced by CLA. However, not all species are similarly CLA-sensitive with regard to increased liver weight.

Twenty male Syrian Golden hamsters (8-month-old) were divided into two groups and fed high-fat diets containing 0.5% linoleic acid or 0.5% trans-10,cis-12 CLA for 6 weeks. Animals fed the CLA diet showed increased amount of UCP1 (+49.3%; P < 0.05) and enhanced apoptosis (+465.5%; P < 0.05).

Thus, although trans-10,cis-12 CLA remained effective in adult hamsters with regard to body fat reduction, aging decreases its efficiency. The reduction in adipose tissue size was due, at least in part, to increased brown adipose tissue thermogenesis and, thus to enhanced energy expenditure. Moreover, a reduction in the number of mature adipocytes also contributed to CLA fat-lowering effect, as suggested by increased apoptosis.

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P386 Nutrition and Ageing
Assessment of dietary calcium intake of the ‘Khuban’ private nursing home in Tabriz
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Introduction: A proper nutrition is important regarding to physiological changes in the elderly. Providing nutritional requirements specially micronutrients it is possible to provide a healthy and happy life for the elderly. According to the importance of calcium consumption in prevention and control of osteoporosis in geriatrics and also increasing calcium requirements in this life stage (1200mg daily), the present study was carried out to assess the dietary calcium intake of the elderly living in Khuban private nursing home in Tabriz.

Material and Methods: In this descriptive-analytic study BMI, energy, macronutrients and adequacy of dietary calcium intake were assessed in 79 elderly (31 men, 48 women), with average age 76.93 ± 0.88 years, by using method of three days dietary weighed record method (including one weekend and two working days). Nutritionist III was used in order to analyze energy and micronutrient intake. The results were compared with RDA for energy and calcium. Statistical analysis was carried out using Mann-whitney U test.

Results: According to the results, mean BMI in male and female subjects were 23.34 ± 0.80, 21.93 ± 0.65 kg/m² and mean energy intake were 1281.2 ± 229.6, 1442.3 ± 242.4 kcal respectively. 16.7% women and 25.8% men were underweight (BMI < 18.5). The mean dietary intake of calcium in women and men were 668.9 ± 137.4, 694.3 ± 113.9 mg respectively which were 55.6 ± 11.4%, 57.7 ± 9.5% of recommended values (RDA).

Conclusion: According to the results of the study the mean of energy and calcium intake were less than recommended values for the elderly. It is suggested that for preventing and controlling osteoporosis in the elderly. Adequate dietary calcium or calcium supplements should be provided.

P387 Nutrition and Ageing
Assessment of nutritional status in elderly residents in long care homes: A study in Modena (Italy)
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Introduction: The nutritional status of older people resident in long-term care homes is an important determinant in the quality of the life, morbidity and mortality.

Purpose: The aims of the study are: to gather data about ‘if and how’, in long term care homes of Modena and province, there exists a protocol for the assessment of nutritional status, in particular as regards the collection of body weight and height of nursing home residents.

Method: All 57 nursing homes in the province of Modena are enrolled, making up a total of 3,143 resident. An expert in nutrition, has issued a questionnaire to the person in charge of the structure and to one of the care staff, with different questions (timing 30 min).

Results: 93% of long-term care home usually collect the body weight of their residents, but the procedure isn’t standardized. Particularly the frequency (once a month, once every two month ecc) and the personnel involved in the collection of body weight differ greatly (nurses, physiotherapists and even entertainers).

There is a particular lack of homogeneity in the equipment used to measure the body weight. Infact every structure has its own scale, 48% of which are only suitable for weighing patients standing upright. Height data is usually collected in 13% of structures (for all patients).

Conclusion: Simple measures such as monitoring older peoples weight regularly need to be implemented as part of a surveillance measure of nutritional status. So it is important to improve nutritional knowledge among health care professional for the assessment and monitoring of the nutritional status of residents on a regular basis throughout their stay.

P388 Nutrition and Ageing
Correlation between body mass index and anthropometric indicators of fat distribution in elderly individuals
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Introduction: During the ageing, occurs a redistribution of the adipose tissue, accumulating mainly in the abdominal region. To evaluate this distribution, studies have used the waist circumference (WC) and waist-to-hip ratio (WHR). In adults, the correlation between these indicators and the Body Mass Index (BMI) has been statistically significant. However, there isn’t enough data affirming that this association remains with ageing.

Objective: To evaluate the correlation between BMI and anthropometric indicators of fat distribution in elderly.

Methods: Cross-sectional study constituted by 1668 elderly, using data from ‘National Vaccination Campaign in Elderly against Gripppe’ in 2005, in the city of Ouro Preto/MG/Brazil. The anthropometric measurements assessed were weight, height, waist and hip circumferences. The anthropometric indicators of fat distribution were WC and WHR. The correlation between BMI and the anthropometric indicators of fat distribution was evaluated using the Spearman correlation test.

Results: The WC and WHR means were 92.8 ± 10.9 and 0.93 ± 0.8 for men (n = 705) e 91.7 ± 11.8 and 0.89 ± 0.8 for women (n = 693), respectively. The values were statistically different between the gender (p < 0.05 to WC and p < 0.01 to WHR). The correlation between
BMI and WC was 0.79 (p < 0.001) for male and 0.78 (p < 0.001) for female. The correlation between the BMI and WHR was 0.49 (p < 0.001) and 0.21 (p < 0.001) for male and female, respectively.

**Conclusion:** The results evidenced a strong correlation between BMI and WC for both gender. Thught statistically significant, the correlation between BMI and WHR wasn’t as stronger as the identified with WC.

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**P389** Nutrition and Ageing

**Dietary intake and cognitive function in free-living active elderly: A transverse and short-term prospective study**

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**Background and Purpose:** The rise in the elderly population is liable to increase the incidence of neurodegenerative diseases. This study aimed to assess the relationships between dietary intake and cognitive function in a sample of free living, active elderly.

**Methods:** Fifty five men and 132 women aged over 65 were enrolled. Dietary intake was assessed using a three-day record and cognitive function using the Mini-Mental State Examination (MMSE). After 8.5 ± 3.5 months of follow-up, cognitive function was re-assessed in 110 subjects.

**Results:** A considerable portion of the subjects presented a low intake of monounsaturated fatty acids, n-3 fatty acids, n-6 fatty acids, fiber, vitamin B12, D, E, folate, potassium, calcium and magnesium; whereas most subjects had an excessive sodium intake. At baseline, no differences were found between subjects with normal or low MMSE score regarding all dietary parameters. At follow-up, sixty-three subjects (57%) showed an improvement of their MMSE score; their consumption of n-3 fatty acids and calcium was significantly higher than subjects without improvement. Subjects whose consumption of n-3 fatty acids was above the median had a significantly higher OR of improving their MMSE (OR = 1.51; 95% CI: 0.68–3.38). Conversely, subjects whose consumption of calcium was above the DRI had a significantly higher OR of improving their MMSE (OR = 5.41; 95% CI: 1.44–20.29), whereas no effect was found for n-3 fatty acids (OR = 2.48; 95% CI: 0.46–13.36).

**Conclusion:** Increased n-3 fatty acids and calcium consumption is related to improved cognitive function; the exact threshold values remain to be assessed.

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**P390** Nutrition and Ageing

**Gallocatechin-3-gallate, one of the catechin ingredients of green tea, has potent activity for skin protection in both epidermis and dermis**

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The tea plant Camellia sinensis has been cultivated in Asia for thousands of years. Tea catechins can be used as skin protective agents and (−)-epigallocatechin-3-gallate (EGCG) is known for the most powerful antioxidant among tea catechins until now.

To characterize skin protective activity of other catechins of green tea, especially (−)-gallocatechin-3-gallate (GCG), we examined several green tea catechins for effects on skin protection by in vitro or in vivo methods. EGCG and GCG inhibited UVA-induced MMP-1 expression, MMP-2 activity in human dermal fibroblasts and induced the levels of type I procollagen.

But, GCG stimulates PPAR-γ activation more effectively than EGCG in vitro and has a more potent stimulating activity than EGCG for the production of filaggrin in the HaCaT cell line and involucrin in SKH-1 hairless mice. Therefore, GCG could be a potentially effective agent in human skin protection due to its anti-aging effects in dermis and promotion of recovery of skin-barrier function in epidermis.

In conclusion, this may provide a possibility that GCG, the C-2 epimer of EGCG, can be a new class of lead ingredient for development of new health foods or cosmetics for skin protection by using green tea.

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**P391** Nutrition and Ageing

**Impact of protein intake on bone status in old protein-energy deficient rats**

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In the elderly, nutritional deficiencies such as low energy and protein intakes are supposed to increase the risk of osteoporotic fractures. Because of currently observed energy deficiencies during aging, modulations of the amount and the quality of protein intake could be an interesting strategy to prevent from aged-related bone loss. We investigated the effect on bone status of a 5-month dietary restriction in 16-month old male rats. The rats were randomised into six groups (n = 10 per group). Control animals were fed ad libitum a standard diet containing either casein (AL-C) or whey protein (AL-WP). Other groups received a 40%-protein-energy restricted diet with casein or whey protein (PER-C and PER-WP) or a protein-maintained energy-restricted diet (ER-C and ER-WP). Both restrictions (PER and ER) induced a decrease in femoral bone mineral
density (BMD). Bone loss was consistent with impaired biomechanical properties and a reduced cortical area at the diaphysis. Plasma osteocalcin and urinary deoxypyridinolin levels suggested a decrease in bone turnover. Interestingly, IGF-1 circulating levels were lowered as well. Overall, maintained-protein intake did not elicit any bone sparing effect in energy deficient rats. Regarding protein quality, neither casein nor whey protein clearly prevented osteopenia. Nevertheless, protein-maintained energy-restricted diet providing casein (PER-C) seemed to preserve bone health more efficiently than that based on WP. This study confirms that nutritional deficiencies may contribute to age-related bone loss, since lower BMD and biomechanical resistance are associated with increased risk of fractures. Nevertheless, the only modulation of the protein component of the diet does not seem to exhibit bone sparing effect by itself.

P393 Nutrition and Ageing

Importance of the food bolus granularity’s study in mastication assessment

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Mastication is the first major phase in a succession of mechanical and chemical transformations of food. Impaired mastication is known to affect food choice, favouring the selection of an unbalanced diet that may in turn alter the digestive process. The aim of this work was to study the effects of age and dental status on the food bolus particles’ granularity.

Various methods of granulometric analysis (sieving, laser diffraction, image analysis with or without scanner) and physiological recordings (electromyography) during mastication have been employed. In parallel, an in vitro model for the simulation of mastication has also been developed.

These methods have shown that: 1 – the main physiological parameters are characteristic for each subject and different between subjects. 2 – Food boluses (just before swallowing) produced by young normal-dentate subjects, present similar granularity but are different between foods. 3 – Adaptation of masticatory function is compatible with ageing which does not disturb masticatory performance. 4 – Full denture wearers can’t constitute a correct food bolus despite an increase of several masticatory physiological parameters. 5 – First results on food boluses produced by the in vitro model are different between foods but present similar granularity for a given food. An increase in the number of ‘chew’ by the in vitro model was associated with a decrease in the number of large particles.

All these results suggest that each subject adapts their mastication’s parameters in order to reach a state of the food bolus particles quite similar to that of other healthy subjects. Denture wearers display masticatory deficiencies. Further experiments with the in vitro model should allow a better understanding of the mastication process.

P394 Nutrition and Ageing

Malnutrition and its associated factors among institutionalized elderly in Tehran

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Introduction: Nutritional imbalance is a serious problem in developing countries, especially among the older population in nursing homes. This study was conducted to determine the nutritional status and its associated factors among the elderly in nursing homes in Tehran, Iran.

Methods: A total of 290 old people were randomly selected from 15 nursing homes in Tehran using two-stage cluster sampling. Nutritional status was assessed by mini nutritional assessment test. 288 subjects were included in the analysis. Dietary intake was assessed by 24-hour recall; physical activity was estimated by questionnaires. The nutritional status was assessed by mini nutritional assessment test according to the reference value of 23 (Malnutrition: ≤23; Normal: ≥23). Diabetes, hypertension, heart disease and cancer histories were recorded. The chi-square test was used to compare the distribution of the categorical variables. A P-value < 0.05 was considered as significant.

Results: The mean age of the subjects was 80.1 ± 6.9 years. The majority of the subjects were women (65.6%). The prevalence of malnutrition was 28.7%. Malnutrition was associated with age (P < 0.001), sex (P = 0.02), monthly household income (P = 0.007), regular exercise (P = 0.004), and diabetes (P = 0.001). The prevalence of hypertension, heart disease, and cancer were 75.1%, 46.8%, and 15.2% respectively.

Conclusion: Malnutrition was common among elderly in nursing homes in Tehran. Further studies are needed to determine the factors that are associated with malnutrition among elderly in nursing homes.

10th European Nutrition Conference
(MNA) and information was gathered on the subjects’ background, functional status and diseases.

Results: 12.8% of the subjects suffered from malnutrition (MNA < 17), and 56.2% were at risk (MNA 17–23.5). Body mass index, mid-arm circumference, calf circumference weight loss, daily use of drugs, psychological stress or acute disease, mobility status, neuropsychological problems and self-assessment about nutritional and health status correlated with nutritional status. Age and gender did not correlate with nutritional status.

Conclusion: High prevalence of risk factors of malnutrition detected by the MNA test in institutionalized elderly indicates that screening for malnutrition and nutritional interventions are necessary in nursing homes in Tehran.

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P396 Nutrition and Ageing

Plasma carotenoid levels and cognitive performance in an elderly population: Results of EVA study

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The hypothesis of carotenoids having a preventive role in cognitive impairment is suggested by their antioxidative properties.

We examined, in a cross-sectional analysis, the relationship between cognitive performance (assessed by Mini-Mental Status Examination (MMSE), Trail Making Test Part A & B (TMT A & B), Digit Symbol Substitution (DSS), Finger Tapping Test (FTT), and Word Fluency Test (WFT) and different plasma carotenoids (lutein, zeaxanthin, β-cryptoxanthin, lycopene, α- and β-carotene in a healthy elderly population (the EVA’Etude du Vieillissement Artériel’ study; n = 589, 73.5 ± 3 years).

Logistic regression showed that participants with the lowest cognitive functioning (<25th percentile) had a higher probability of having low levels of specific plasma carotenoids (<1st quartile): lycopene and zeaxanthin. For zeaxanthin, odds ratios were as follows: ORDSS = 1.9 [1.2;3.1], ORTMTA1.7 [1.1;2.7], ORFTT = 1.7 [1.1;2.7], and ORWFT = 1.8 [1.1;3.0]; for lycopene: ORDSS = 1.8 [1.1;3.0] and ORTMTB = 1.5 [1.0;2.4].

Our results suggest that low carotenoid levels could play a role in cognitive impairment even if it is not possible to affirm if these low levels of carotenoids precede or are the consequence of cognitive impairment. The observed associations have no functional significance yet, however a highly specific accumulation of lutein and zeaxanthin in the retina and in the macula is described and their protective role in age-related macular degeneration is well known. While retina is a puzzle whose ultimate solution lies on the other side of the optic nerve in its connection with the brain, we can therefore wonder if other areas of the brain could have the same affinity for some specific carotenoids? The biological significance of our findings needs further research.

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P397 Nutrition and Ageing

Precursor of dehydroepiandrosterone: diosgenin benefits treatment of postmenopausal osteoporosis

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Aims: Our study aimed to determine the possible role of diosgenin in reduction of bone mass loss of postmenopausal women who were treated with phytooestrogens and minerals/vitamins.

Methods: The study included 20 non-smoking 70…80 years old women. Their bone mineral density (BMD) was measured by dual

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P395 Nutrition and Food Science

Minimal processed products as an answer to nutritional requirements of elderly people

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The aging of the population as well as the increasing number of institutionalized elders are characterize the reality of the last decades. As people get older, their ability of being able to manage house hold tasks and to be capable of living independently is reduced.

On one hand an increasing number of old people live alone and their physical limitations impair simple performances, such as prepare food. Unpeel a potato or carrot may present an enormous obstacle and for a prolonged period may determine nutrient deficiency.

On the other hand an increasing number of elderly spend most part of the day or even the whole day at specialized institutions. Food services need to prepare and cook an enormous number of meals in a short time, most of the time without enough labour work, equipment or even physical conditions.

This scenario created an opportunity to a new category of products: minimally processed fruits and vegetables. The production of high quality goods, convenient, minimal processed must be the aim of producers and food industry.

Fruits and vegetables present the main sources of vitamins, minerals, fibre and water of human diet. Any impact of processing operations on these specific nutrients may have an important negative impact on the equilibrium of the diet.

The promotion of these kind of products on elderly meals, either institutionalized or not, may perform a promising option to improve the quality of their diet.

Either the elders themselves either food service workers and employees must know and accept this new category of products, since they present an excellent alternative providing less labour work needs.
energy X-ray absorptiometry (DXA) region L2-L4. Osteoporosis was diagnosed in all patients (T-score by DXA was $-2.5...-3.2$). Subjects were divided into two groups. The first group (n = 10) of patients with diagnosis of osteoporosis had also diagnosis of age-related depression but not those in the second group (n = 10). All patients were treated for osteoporosis by food supplement Bonette Comp., including phytoestrogens and minerals Ca, Mg, Zn, and vitamins C, D and K. Diosgenin was supplemented to the group of patients with diagnosis of osteoporosis and age-related depression.

**Results:** After 12 months treatment we observed positive changes in BMD (increase 4.8...8.1%) in all patients. The best results (increase 6.0...8.1%) were found in the group treated with diosgenin. In this group we also detected the beneficial effect on mood and well-being, and the decrease of age-related depression. It is possible, that diosgenin has beneficial effect on bone metabolism but also on neurological problems. There is evidence from previous research that DHEA may affect mood and well-being and increase BMD in women at age >70 years.

**Conclusion:** Diosgenin is effective dietary supplement in treatment of postmenopausal osteoporosis when submitted with phytoestrogens, minerals and vitamins, and besides may have beneficial effect on age-related depression.

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**P399 Nutrition and Ageing**

**Relation of the subjective and objective nutritional evaluations of elderly people institutionalized in the Southeast of Brazil**

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**Background:** The studies have demonstrated that the subjective self-evaluation of health, which can include the nutritional status, associates strong with the real or objective state of health of the people, and it is able to be faced as representation of the objective evaluations of health.

**Objective:** To verify the relation among the subjective and objective nutritional evaluations of elderly people.

**Methods:** It was a transversal study with elderly people that has been living in long term institutions located in the Southeast of Brazil. The dependent variable was the subjective nutritional self-evaluation of elderly people, being possible three answers: 0 = it believes to be under nutrition, 1 = it does not know to say, 2 = it believes not to have nutritional problem. The independent variable of the study had been the index of corporal mass (BMI) and the corrected arm muscle area (AAMc), evaluate by a dietitian. The means had been compared using the ANOVA and Tukey tests, adopting alpha 0.05.

**Results:** Eighty nine elderly people had been included (57 men x 22 women). The mean of age for both genders was 73.7 ± 9.1 years old, without statistical differences. Four elderly people (4.5%) had answered 0 (45.0%) had answered 1, and 45 (50.5%) had answered 2. The mean and standard deviation of BMI for answers 0, 1 and 2 had been, respectively: 19.14 ± 0.10 Kg/m², 22.97 ± 0.61 Kg/m², 25.25 ± 15.3 Kg/m² (p = 0.0145, 0.3 ± 2, p = 0.045). The mean and standard deviation of AAMc had not presented differences (p = 0.24).

**Conclusion:** The means of BMI had been statistically different for the elderly people that had been considered under nutrition of the ones that had considered not having nutritional problem. In contrast of the values of the AAMc, that had not shown differences.

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**P399 Nutrition and Ageing**

**Relationships between serum folate levels and dietary folate intake in Alzheimer disease patients**

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**Introduction:** Among the different hypotheses about the pathogenetic mechanisms of Alzheimer Disease (AD), several observations point to an involvement of folic acid; according to such observations, low serum folate levels seem associated to AD. However, it is not known whether or not the low folate levels are dependent on dietary folate.

**Purpose of the Study:** To investigate the relationships between serum folate and dietary folate in AD patients, in comparison with healthy age-matched individuals.

**Methods:** 22 AD patients, age 79 ± 4.3 y. Out of them, a group of 11 (AD Bellaria) was on a free diet; a second group of 11 (AD Monza) was on a controlled diet. The control group were 22 healthy subjects, age 69 ± 3.4 y, recruited among ex-blood donors (AVIS, Monza). Previously to serum folate assay, the dietary folate intakes were estimated by a 3-day dietary record, filled in by care givers (AD) or self-reported (controls).

**Results:** The average serum folate ± S.D. of control subjects was 6.5 ± 1.8 ng/ml, and was significantly higher than serum folate of AD subjects either of Monza group (4.2 ± 1.3 ng/ml, p = 0.00057) or of Bellaria group (4.5 ± 1.1 ng/ml p = 0.00027).

The dietary folate intake for controls was 813 ± 115 µg/3d, significantly higher than AD of the Monza group (615 ± 40 µg/3d, p = 0.0018), but significantly lower than AD of Bellaria group (965 ± 60 µg/3d, p = 0.0017).

**Conclusions:** Dietary folate intakes are higher in a group (Bellaria) of AD subjects than in control healthy subjects, while lower in another AD group (Monza). Despite this difference, serum folate levels are significantly lower in both AD groups than in controls.

These results suggest that the lower folate levels detected in AD subjects are not dependent on dietary folate intakes.
P400 Nutrition and Ageing

Self-reported overweight and obesity in European elderly

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Introduction: Obesity is a chronic disease associated with disabling conditions and premature death. The recognition of the prevalence of obesity in older adults is relatively recent and contrasts to the commonly accepted idea that ageing leads to weight loss and malnutrition.

Purpose: To evaluate the prevalence of overweight and obesity (Ov/Ob) in European Seniors and the sociodemographic variables associated to it.

Methods: This project was carried out within the European Project ‘Food in Later Life’, under the leadership of the University of Surrey and with financial support of the 5th EU Framework Programme. 3290 European citizens aged 65+ years from 8 EU countries (Denmark, Germany, Italy, Poland, Portugal, Spain, Sweden and UK) were interviewed in a face-to-face situation. BMI was calculated by self-reported weight and height (wh/ht2). WHO’s classification was used to determine the prevalence of Ov/Ob. The data descriptive analysis, was followed by uni and multifactorial analysis to characterize the study sample. SPSS version 14 was used for data analysis.

Results: 44.7% of the sample was overweighted and 15.7% obese. The remaining fell within the normal weight range (38.3%) or were underweight (1.4%). The prevalence of Ov/Ob was significantly higher amongst married elderly (OR = 1.52; p < 0.05), educated at a lower level (OR = 1.28; p < 0.001), amongst German (OR = 2.01; p < 0.001), Polish (OR = 1.80; p < 0.01) and Spanish (OR = 1.71; p < 0.01) subjects. On the contrary, Ov/Ob was lower in the oldest age group (OR = 0.78; p < 0.01).

Conclusion: In spite of the limitations associated to self-reported wt and ht, this study shows the magnitude of the problem in elderly living in the community.

P401 Nutrition and Ageing

The study of traditional foods: The greek experience*

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Introduction: Traditional foods are an integral part of the Mediterranean diet and there is a need to investigate them in order to elucidate their role in the beneficial effects of this diet.

Objectives: Our research team has been working towards this approach with the objective to formulate a multi-faceted framework for the systematic investigation of traditional foods and recipes, aiming primarily at the elucidation of the role of traditional Greek diet on health

Methodology: The study of traditional foods in Greece started in 1992 and over 100 primary and composite traditional Greek foods have been investigated in the following aspects:

- Determination of the nutrient value of primary and composite traditional foods.
- Recording of the production methods of the foods with audio-visual means
- Technological study of the potential incorporation of traditional food production into the industrial or semi-industrial level.
- Historical and folkloric review, which documents the traditional identity of the foods.
- The formation of evidence based records related to the traditional character of foods and recipes under investigation

Results: The results substantiate the health benefits of the majority of the Greek traditional foods and contribute to their preservation and dissemination. The Mediterranean diet, being a plant based diet, includes a significant number of traditional Greek dishes rich in antioxidants that meet current criteria for a prudent diet.

Conclusion: The longevity associated with the Mediterranean Diet could be partly attributed to Mediterranean traditional foods, which this diet incorporates.

Acknowledgment

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P402 Nutrition and Ageing

Very long chain n-3 fatty acids and cognitive function in older adults

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Background: Higher levels of very long-chain omega-3 polyunsaturated fatty acids (n-3 PUFA) are suggested to be related to better cognitive function and slower cognitive decline in older adults.

Objective: To evaluate the association between plasma n-3 PUFA levels (sum of eicosapentaenoic acid, docosapentaenoic acid, docosahexaenoic acid) and cognitive function in 5 cognitive domains and to determine whether plasma n-3 PUFA levels predict change in cognitive function over 3 years.

Methods: We used data from the FACIT trial, in which participants had received folic acid or placebo capsules for 3 years. Fatty acids in plasma cholesteryl esters were measured in 807 men and
women (50–70 yrs). Cognitive function was assessed with multiple cognitive tests at baseline and after 3 years. The tests were clustered into 5 a priori established cognitive domains. The cross-sectional associations were based on 807 participants, whereas the longitudinal associations were based only on 404 subjects who had received placebo capsules.

Results: The cross-sectional analyses showed that plasma n-3 PUFA levels were not associated with cognitive function in any of the 5 cognitive domains. The longitudinal analyses showed that higher plasma n-3 PUFA levels at baseline were associated with greater improvement in scores in sensorimotor speed (multiple linear regression coefficient, z-score = 0.31, 95%CI: 0.06, 0.57) and complex speed (0.40, 95%CI: 0.10, 0.70) over 3 years. N-3 PUFA levels at baseline did not predict changes in memory, information-processing speed or word fluency over 3 years.

Conclusion: In this population, plasma n-3 PUFA levels were not associated with cognitive function, but were associated with greater improvement in the speed-related cognitive domains over 3 years.

P404 Nutrition and Ageing
Diets enriched in soybean isoflavones and green tea improve natural killer activity and decrease lipid peroxidation of immune cells from old mice
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Objective: Assessment of a dietary intervention aimed to increase adherence to Mediterranean-type diets (MeDiets).


Subjects: 1866 asymptomatic high-risk participants (55–80 years) followed-up during 1-year.

Methods: Participants were randomly assigned to 3 groups: a low-fat diet (LFD) or two MeDiets. Those allocated to MeDiets received personal educational interviews to negotiate nutritional goals plus group sessions every 3-month and either free virgin olive oil (Mediet+VOO, 1 litre/week) or free nuts (Mediet+nuts, 30 g/day). The LFD group only received a leaflet recommending the National Cholesterol Education Program-III guidelines. Within-group and between-group changes in food group consumption and nutrient intake were assessed.

Results: Regarding within-group changes, participants allocated to both Mediet significantly increased the consumption of virgin olive oil (218% for Mediet+VOO), nuts (334% for Mediet+nuts), vegetables, legumes and fruits, whereas a decreased consumption was observed in the three groups for meats (p < 0.05 for the 3 groups) and pastries (p < 0.05 only in the 2 Mediet, but not in LFD group). Monounsaturated and polyunsaturated fatty acid intake significantly increased only for the 2 MeDiets. Between-group significant differences were observed for increased consumption of virgin olive oil, nuts, vegetables, and legumes for both Mediet versus the LFD. Favourable changes in the overall profile of nutrient intake were found for the two MeDiets when compared with the LFD.

Conclusions: A dietary intervention supplemented with healthy fat sources repeated every 3-month during 1 year is able to modify the overall dietary profile.
Poster Sessions

**P405 Nutrition and Cancers**

**A pilot study to validate curcumin consumption questionnaire using curcumin blood level and 3-day records**

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Curcumin, derived from the rhizome of curcuma longa, is one of the primary ingredients in turmeric and curry powders that are used as spices in Middle Eastern and Asian countries. More recently, laboratory studies have demonstrated that dietary curcumin exhibits various biological activities and significantly inhibits colon tumorigenesis and tumor size in animals. A pilot study was conducted to assess reported intake of curcumin and validate curcumin consumption questionnaire through measuring curcumin blood level in the laboratory as a biomarker and performing 3-day dietary records and food frequency questionnaires.

Design: Cross-sectional study. Subjects: About 60 subjects were selected from the Middle Eastern community in San Diego (37 female and 3 males; age mean ± SD was 39 ± 10.3) using Respondent Driven Sampling. An interview was conducted by a professional diettitian to fill the curcumin consumption questionnaire. Blood samples from 25 subjects (22 consume turmeric at least on weekly basis and 3 who never consumed turmeric) were collected. The questionnaire inquiries focused on the main foods that include turmeric. The types of turmeric were also collected and analyzed for curcumin levels.

Curcumin blood analysis indicated traces of curcumin in blood but was below the detection limit of the assay.

**P406 Nutrition and Cancers**

**African spices’ antioxidants and cancers prevention: Case of Cameroon**

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Spices and condiments are aromatic substances which are used to spice dishes and improve the taste of foods. Mixtures of these spices give flavours which are appreciated and used for traditional dishes and grills.

An investigation was carried out in 10 markets of Yaounde, led to four mixtures mostly used for our study: ‘Mbongo’ mixture made of height spices, mostly Aframomum sulphatum(40.5%), Scorodophloeus zenkeri(30%), used for soup’s fish; ‘Nkui’ mixture made of nine spices which the majors are Scorodophloeus zenkeri(42%), Mombisa whitei(28.5%), used for Triumphetta pentandra sticky soup; ‘Kankan’ mixture made of height spices which the majors are Tetraptera tetraptera(21%), Scorodophloeus zenkeri(20%). Their antioxidant capacity was determined by titration of their content in Zn, Cu, Mn, by atomic absorption spectrophotometry, B-carotene, polyphenols and vitamin C by spectrophotometry.

The mineral antioxidants were present in large quantities in the mixtures. The Mn and Zn contents were significantly high (p < 0.05) in ‘Mbongo’ and respectively in order of 1012.5 ± 3.53 and 88.2 ± 4.12 mg for 100g of DM. The Cu content was high in the ‘Kankan’ mixture with 26.85 ± 0.68 mg for 100g of DM. Polyphenols were the most highly represented organic antioxidants particularly in the ‘yellow soup’ mixture (95.98 ± 3.76) x 103 mg for 100g of DM. β-carotene and vitamin C contents were significantly highest (p < 0.05) in the ‘Mbongo’ mixture respectively, 76.15 ± 3.46 mg for 100g and 464.00 ± 17.26 μg/g of DM.

The mixtures of our study, rich antioxidants content, can be used to trick activated oxygenated species and prevent cancer.

**P407 Nutrition and Cancers**

**Cell cycle phases and proliferative capacity of melanoma B16F10, in mice on different dietary proteins**

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The effect of different dietary proteins (AIN-93, 12 g protein/100g diet) on cell phases and proliferative capacity, in mice bearing B16F10 melanoma was studied. Whey protein isolate (WPI); bovine collagen hydrolysate (BCH); a BCH fraction (FP1), each one was offered with or without the chemotherapic (ChTP) drug Taxol (15 mg/kg bw) once a week for three weeks. Cells (5 x 10⁴ B16F10) were implanted from tumor bearing to healthy mice on special diets. After 30days of cells implantation the mice were submitted to euthanasia for necropsy and investigate metastasis, caquexia, cell cycle phases and AgNORs. BCH and FP1 were balanced for essential amino acid to conform with WPI. No difference in growth and caquexia were found in the various treatments. Comparing with WPI, BCH promoted higher (p < 0.01)% of cells in the quiescent (GO/G1) phase. BCH+WPI was also higher (p < 0.001) above 70% of the cells in GO/G1. In the presence of ChTP, BCH and FP1 + WPI differed from control (p < 0.05). Cell% in phases S and G2/M did not differ among treatments (p > 0.05). Apoptosis (%) was lower for BCH and FP1 + WPI, compared with WPI alone (p < 0.01). Chemotherapeutic decreased WPI apoptosis but increased for BCH + WPI and FP1 + WPI (p < 0.01). Total NORs and dot number/cell increased in all treatments. No difference with WPI was found in cluster number/cell. ChTP increased NORs for WPI with further increase for BCH + WPI (p < 0.001) and FP1 + WPI (p < 0.01). Combination of these proteins with Taxol is likely to help in the treatment of melanomas, by increasing the percentage of quiescent cells and apoptosis.
Correlations between trends in stomach cancer morbidity and in dietary factors in Poland

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Introduction: Present stomach cancer morbidity rate is twice lower in relation to 1960 despite H. pylori infection affecting about 80% of the population. A reduction in the morbidity rate initiated in the beginning of the 1970s is probably determined by the changes in the dietary pattern and an improvement in the conditions of the food storage and transportation.

Purpose: Examination of the relationship between cancer morbidity trends and selected dietary factors.

Methods: Standardized stomach cancer morbidity rates for total population in the period 1960–2004 were used. Data on average food quantities available for consumption per capita/year and on amounts of the energy and nutrients derived from food were utilized. Pearson’s linear correlation coefficients between standardized cancer morbidity rates and the consumption of the fruit, vegetables and the dietary content of vitamin C, fat, dietary fibre, proteins and carbohydrate were estimated. Trends in the refrigerators use were analysed. The same applied to kitchen salt consumption.

Results: The highest Pearson’s correlation coefficients were noted for vitamin C (r = 0.81), vegetables (r = 0.72) and fruit (r = 0.69). Similarly high (r = 0.73) was correlation coefficient for the refrigerators use reflecting the fact that only 2% of Polish households owned that equipment in 1960, over 35% in 1970 and over 80% in the beginning of the 1980. It was showed also that kitchen salt consumption in 2004 was over two and a half times lower in relation to the pre-war period.

Conclusions: Growth in the consumption of vitamin C sources and an improvement in its bioavailability and a reduction in the kitchen salt use are probably among principal causes of the long-term decline in stomach cancer morbidity rates in Poland.

Effect of leucine-rich diet on chemical body composition in rats inoculated with Walker 256 tumor

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Cachexia is the most important problem to cancer patients. Branched-chain aminoacids stimulate the protein metabolism. We investigated changes on chemical body composition in tumor-bearing rats, submitted to leucine-rich diet. Adult rats were distributed in 8 groups in agreement with the local of tumor implant, fed or not leucine diet: C-control; L-leucine-rich diet; Wip-intraperitoneal implant; Wim-intramuscular implant; Wsc-subcutaneous implant; Lip-leucine and intraperitoneal implant; Lim-leucine and intramuscular implant; Lsc-leucine and subcutaneous implant. The rats were weighted on the initial and final day of the experiment and were sacrificed before distress state. The results showed that the survival was reduced especially in Wip and Lip groups (7 days) compared to intramuscular and subcutaneous implant (around 20 days). Tumor growth induced reduction in body and carcass weight in all groups (especially in Wim, Wsc and Lim). The tumor weight was similar in groups fed control or leucine-rich diet. There was a significant increase on the total body water in all tumor-bearing rats. The body fat was reduced in all tumor-bearing rats, especially in Wim, Wsc and Lsc. The carcass lean body mass was decreased especially in Wsc and Lsc groups, but was preserved in Lip and Lsc groups when compared respectively to the Wip and Wsc rats. The different places of tumor inoculation led to different ways in that carcinoma developed and induced changes on the host chemical body composition, especially when associated to leucine-rich diet, suggesting that the tumor evolution was more aggressive in the intraperitoneal implant (lower survival), but the tumor could waste more the host carcass when implanted in intramuscular and subcutaneous local.

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farnesyl protein transferase and the level of membrane RhoA GTP-binding were decreased in EPA- and DHA-treated PC3 cells.

**Conclusion:** These results suggest that \( \beta \)-0.3 PUFA could inhibit the adhesion and invasion of PC3 cells in vitro by down-regulating the expression and activation of the Rho GTPases.

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### P411 Nutrition and Cancers

**Efficacy evaluation of Brazilian herbal material against tumor promoting stage**

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**Introduction:** Tabebuia avellanedae (Bignoniaceae) (TA), which is native in South America from Brazil to northern Argentina, is well known in traditional folk medicine used for the treatment of various disease during five hundred years. Previously, we reported that extract essense of TA (TA ess.) and including naphthoquinones type compounds, NFD, inhibited TPA-induced in vitro assay. The present study purposed to evaluate for in vivo activity, using natural source materials.

**Method:** TA ess. and NFD were used for throughout the examination.

For the study in vivo assay, SENCAR mouse two-stage skin and lung inhibitory carcinogenesis test was evaluated according to objective production of papillomas and change of body weight. Oral administration of TA bark (provided from Taheebo Japan Co. Ltd) inhibited the promotion stage of carcinogenesis in mouse skin (tumor initiator/promoter: DMBA/TPA) and in mouse lung (4NQO/8% glycercol), suggesting that the extract might be a functional material for chemoprevention as well as fruits and vegetables.

**Result:** The material treatment group showed about 60% inhibition in the number of tumors developed both skin and lung carcinogenesis experimental systems. During each experiment, the body weight of each mouse was measured on weekly, and test treatment group showed almost same body weight gains compared with positive control.

**Conclusion:** The results of this study should encourage future efforts toward Obtaining an important new interesting material for chemopreventive Activity.

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### P412 Nutrition and Cancers

**Ethanol extract of Dunaliella salina induces cell cycle arrest and apoptosis in human non-small cell lung cancer cells**

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**Introduction:** Non-small cell lung carcinoma (NSCLC) comprises about 75–85% of lung cancer. Chemoprevention is the significant alternative to reduce lung cancer mortality. Dunaliella salina (DS) contains \( \beta \)-carotene, \( \beta \)-carotene, xanthophyll, zeaxanthin, lycopene, and chlorophyll. Therefore, the roles of DS in the prevention and treatment of lung cancer have been received increasing attention.

Purpose of the study: We aimed to investigate how the ethanol extract of Dunaliella salina (EDS) on proliferation and apoptosis in human lung cancer cell line A549.

**Methods and Results:** Ethanol extract of DS show more inhibition of generation of the ABTS + radical cation. 24 and 48h treatment, MTT test shows 25 \( \mu \)g/ml of EDS significantly reduces A549 cell proliferation by 25.2% and 48.3%, respectively. To explore its mechanism in cell proliferation, we showed that DS markedly reduced A549 proliferation via the inhibition of BrdU incorporation at 25 \( \mu \)g/ml by 65.8%. In using Fascan, we demonstrated that 48h. treatment with 25 \( \mu \)g/ml EDS bring about a G0/G1 arrest in A549 cells. DNA fragmentation assay showed EDS\( [25, 50, 100] \mu \)g/ml\(^2\)induces significant apoptosis at 48h. Then, MC540/PI method demonstrated that administration with EDS\( [25] \mu \)g/ml\(^2\) in 12, 24 and 48h. induce apoptosis by 28.9, 35.9, and 36.2%. Western blotting assay demonstrated that EDS\( [25] \mu \)g/ml\(^2\) significantly increased the expression of p53, p21 protein. This accounts for cell cycle arrest. Enhancement of Fas, Fasl, and Bax might be responsible for the apoptotic effect induced by EDS.

**Conclusion:** EDS significantly induce anti-proliferation. Significantly increased p53 and p21 explain cell cycle arrest on G0/G1. Fas, Fasl, and Bax account for the apoptotic effects of A549 by lower concentration of EDS.

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### P413 Nutrition and Cancers

**High protein-high red meat and high carbohydrate weight loss diets do not differ in their effect on faecal water genotoxicity**

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Although high red meat intake has been weakly associated with an increased risk of colorectal cancer (CRC), these studies have rarely been adjusted for confounders such as abdominal obesity, energy intake and other dietary factors which may modify CRC risk. Study
of the overall dietary and lifestyle pattern may prove more important than any individual component when assessing CRC risk. In this study, 33 obese men (mean age 50 ± 5 years, mean BMI 33 kg/m²) were randomized to either a calorie reduced higher protein-high red meat (HP) diet or a calorie reduced high carbohydrate (HC) diet. Faecal samples were collected at baseline, after 12 weeks intensive weight loss and after 9 months weight maintenance on the diets. Both diets resulted in an average weight loss of 9.3 ± 0.7 kg after 12 weeks with no further significant change in weight at 9 months. Samples were assessed for a number of bowel health biomarkers including faecal water (FW) genotoxicity which was measured using the cytokinesis-block micronucleus cytome assay in WIL2-NS cells. Two-way ANOVA showed a significant effect with time (P < 0.001) but not diet for total DNA damage, with a reduction in genotoxicity after 12 weeks intensive weight loss (P = 0.006), and a subsequent increase at the end of 9 months weight maintenance to levels not significantly different from baseline. There was no significant effect for time or diet on faecal pH, short chain fatty acid excretion, phenol or p-cresol. The results from this study suggest that HP and HC weight loss diets may modify the carcinogenic profile of the bowel contents such that weight loss may exert a beneficial effect by reducing genotoxic load in the short term, however these results require verification against a non-weight loss control.

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**P414 Nutrition and Cancers**

**High protein-high red meat and high carbohydrate weight loss diets do not differ in their effect on lymphocyte DNA damage using the cytokinesis-block micronucleus cytome assay**

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The effect of both weight loss and different dietary patterns used for weight loss on DNA damage frequency in peripheral blood lymphocytes has not been assessed to date. In this study, 33 obese men (mean age 50 ± 5 years, mean BMI 33 kg/m²) were randomized to either a calorie reduced higher protein-high red meat (HP) diet or a calorie reduced high carbohydrate (HC) diet. Blood samples were collected at baseline, after 12 weeks intensive weight loss and after 9 months weight maintenance on the diets and DNA damage was assessed using the cytokinesis block micronucleus (CBMN) cytome assay. Both diets resulted in an average weight loss of 9.3 ± 0.7 kg after 12 weeks with no further significant change in weight at 9 months. Two-way ANOVA showed no effect of time or diet on micronucleus frequency (chromosome loss/breaks). An effect of time (P = 0.03) but not diet was seen for nuclear buds (gene amplification), with a trend for reduction in frequency of nuclear budding with weight loss (P = 0.057) and weight maintenance (P = 0.061). There was a positive trend with time for nucleoplasmic bridges (chromosome rearrangement) but did not achieve statistical significance (P = 0.051). There was no significant effect of time or diet for nuclear division cytotoxicity index. The results from this study suggest that weight loss or weight maintenance on either a HP or HC diet may alter the genome stability profile in peripheral blood lymphocytes, but there was no difference between the two dietary patterns.

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**P415 Nutrition and Cancers**

**Inhibitory effect of piceatannol, a polyphenol present in grapes, against the proliferation and invasion of hepatoma cells**

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Cancer cells have two biological properties, namely, endless proliferation and metastasis. The invasion of cancer cells is an important and characteristic step of cancer metastasis. We reported that resveratrol suppressed the invasion of a rat ascites hepatoma cell line of AH109A in culture and that reactive oxygen species (ROS) accelerated the invasive capacity of AH109A by promoting the expression of hepatocyte growth factor (HGF), a cell motility factor (CEM, 21, 445, 2004). In the present study, we investigated the effect of piceatannol (PIC) on the proliferation and invasion of AH109A cells. The effect on the AH109A proliferation was assessed by 3H-thymidine incorporation method, while the effect on the AH109A invasion was evaluated by co-culturing AH109A cells with mesenteric-derived mesothelial cells. To estimate if PIC would be effective in vivo, rats fasted overnight were given oral intubation of PIC. Blood was obtained 2 hours after oral administration. The hepatoma cells were cultured in the absence or presence of PIC or PIC-loaded rat serum and/or ROS (H2O2). Cell cycle, apoptosis and intracellular peroxide levels in AH109A cells were analyzed by flow cytometry. HGF secretion from the hepatoma cells was determined by ELISA. PIC (0–200 microM) and sera from rats orally given PIC (0–10 mg/kg body weight) dose-dependently suppressed both the proliferation and invasion of AH109A in culture. PIC resulted in cell cycle arrest at the G2/M phase and apoptosis. PIC suppressed the ROS-potentiated invasive capacity by scavenging the intracellular ROS and reduced HGF secretion. These results suggest that PIC may suppress AH109A proliferation through cell cycle arrest and apoptosis and that the antioxidant property of PIC may be involved in its anti-invasive activity.

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**P416 Nutrition and Cancers**

**Israeli ‘cancer shift’ over heart disease mortality led by women, who may have greater risk with high intake of n-6 fatty acids**

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My hypothesis is that higher female sensitivity to increased n-6 polyunsaturated fatty acids (PUFA) and their carcinogenic effects...
may contribute to the recent Israeli ‘cancer shift’ over heart disease (HD) mortality (23.1 vs. 22.3%, 1999). High n-6 PUFA intake is presumed to underlie the ‘Israeli Paradox,’ an unexpected gap between ‘ill’ health (cancer, HD, diabetes) and ‘good’ diet (limited Calories, total and saturated fat; high unsaturated fat, vegetables, fruit). The gap is much more pronounced for women and cancer.

Scientific, epidemiological, and dietary surveillance reports were reviewed and analyzed. Cancer death rates for Israeli Arabs, who consumed a more traditional Mediterranean diet – more monounsaturated fatty acids (MUFA), mostly olive oil, and less n-6 PUFA – are still 1.1–1.7 times (males-females) lower than in Israeli Jews, but are rising faster (23.6, 5.1% vs. 5.3, 5.3%, 1980–2000) with dietary ‘Israelization’ – specifically, increased intake of n-6 PUFA. Israeli-Jewish women had higher percentages of cancer mortality than men (24.1 vs. 23.7%), attained a much larger (29 vs. 7%) ‘cancer:HD mortality shift’ (ratio > 1), ranked much worse for cancer (15th/44 countries) than men (37th) and HD (38th, 34th, respectively), and had much higher cancer prevalence (1:3) than Israeli-Arab women (1:6), despite similar dietary compositions, save for higher n-6 PUFA and PUFA:MUFA ratio.

Population studies and international comparisons of Israeli Jews, Arabs, and women support association of high n-6 PUFA with cancer risk and female sensitivity beyond genetics and environment. Gender has been suggested to influence n-6 PUFA metabolism and carcinogenesis, and is here proposed to modulate cancer epidemiology and potential for differential nutritional prevention.

**P417 Nutrition and Cancers**

**Leptin and leptin receptor expressions in human primary breast carcinoma**

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**Introduction:** Obesity is a risk factor for breast cancer development in post-menopausal women. Hyperleptinemia, described in obese patients, may be implicated in the process of breast carcinogenesis.

The aim of this study was to detect both the expressions of leptin and leptin receptor (Ob-R) in breast carcinoma and to investigate their relationships with clinicopathological variables, such as the estrogens (ER) and progesterone (PR) receptors, the Ki67 proliferation factor and the tumor size.

**Methods:** Expressions of leptin and Ob-R were investigated by immunohistochemistry on human biopsies (n = 45). Samples and clinicopathological features were obtained from the Anti-Cancer Centre. Statistical analysis was performed using Spearman rank correlation.

**Results:** Expressions of leptin and Ob-R were detected (85% and 75% of cases studied respectively) in primary breast carcinoma. The expression of leptin was strongly correlated with Ob-R detection (p < 0.001, r = 0.516). In addition, Ob-R expression in primary breast carcinoma was correlated with ER expression (p = 0.027, r = 0.210) and tumor size (p = 0.036, r = 0.271) but not correlated with Ki67. A positive tendency was observed between Ob-R detection and PR expression (p = 0.0798, r = 0.103). However, the expression of leptin showed no statistically correlation with these variables.

**Conclusion:** Firstly, co-expression of leptin and Ob-R in primary breast cancer shows that leptin acts on mammary tumor cells via an autocrine pathway. Secondary, the fact that Ob-R expression positively correlated with tumor size may underline the potential role of leptin as a growth factor. Finally, co-expression of Ob-R and steroids receptors suggests that Ob-R would be of potential prognostic importance and an interestingly biomarker for breast cancer.
P419 Nutrition and Cancers

Leucine-rich diet associated to vitamin C improved the antioxidant stress response in young tumor bearing rats

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The muscle wasting in cancer cachexia is associated with increased oxidative stress. Branched-chain amino acid, especially leucine, can improve the muscle protein metabolism and the cell signaling and vitamin C acts as a power antioxidant agent. This work evaluated the effects of leucine-rich diet and vitamin C on the antioxidant stress response during the Walker 256 tumor development in young rats. Wistar rats were distributed in 5 groups: N, normal; W, tumor-bearing; WL, tumor-bearing fed leucine diet; WC, tumor-bearing received vitamin C in drink water; WCL, tumor-bearing fed leucine diet and vitamin C. The results showed that leucine and vitamin C improved the levels of serum glucose, total protein and albumin in tumor-bearing rats. The tumor growth reduced the liver alkaline phosphatase activity (AP), but this enzyme was maintained in WLC and WL groups; the liver malondialdehyde (MDA) content increased in W, but reduced in the other groups, which had preserved the glutathione-S-transferase activity (GST). Tumor growth produced changes on myocardium activity, especially in group W. The skeletal muscle PA activity was affected with increase on muscle MDA content in W, WL and WC groups, in addition the leucine and vitamin C (WLC rats) maintained the MDA level and the GST activity in gastrocnemius. Although, tumor weight was similar in all groups, the leucine and vitamin C affected negatively the tumor cells, increasing the MDA levels and reducing the GST activity in this tissue. Leucine-rich diet associated to vitamin C improved the serum parameters and enhanced the enzymes activity of antioxidant response, especially in tissues which were more affected by tumor growth.

P420 Nutrition and Cancers

Leucine-rich diet changes muscle fetal protein metabolism in tumor-bearing pregnant rats

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Cancer occurs in approximately 1 per 3.000 pregnancies and accounts for one-third of maternal deaths. Leucine has been used experimentally to minimize the protein metabolism changes during tumor growth. The present work investigated the effects of tumor growth on muscle protein metabolism and oxidative stress in fetus pregnant rats fed a leucine-rich diet. Fetal groups from pregnant Wistar rats were: control (C), control fed leucine-rich diet (L), tumor-bearing (W), tumor-bearing fed leucine-rich diet (WL), Pair-fed control (P) and Pair-fed Leucine (PL). After 20 days the fetal muscles were analyzed. The results showed that fetal protein synthesis was decreased in W group (0,74 ± 0,05 nmol (14-C) phenylalanine /ug protein/h), when compared to the other groups (C = 1,03 ± 0,04; L = 1,14 ± 0,07; WL = 1,02 ± 0,08; P = 0,99 ± 0,04; LP = 1,18 ± 0,09). The significantly recover on muscle protein synthesis in fetus of WL group suggested a positive effect of this branched-chain amino acid. There was a significant increase on protein degradation in W fetus (1718 ± 55 nmol tyrosine/ug protein/h), and a protective effect of the leucine-rich diet on muscle protein waste in WL group (1384 ± 37), since it was similar to C group (1330 ± 48). The muscle enzyme glutathione-S-transferase activity was increased in LW fetus (9,7 ± 0,8 nmol/min/ug protein) in comparison to W group (7,2 ± 0,7). The muscle alkaline phosphatase activity increased in LW group (LW = 4682 ± 337 nmol/ug protein/min vs W = 3440 ± 200). The malondialdehyde content (MDA) in fetal muscle was decreased in LW fetus (W = 8,23 ± 0,30 nmol/mg protein-Is vs LW = 5,17 ± 1,72). The leucine supplemented diet can alter the fetal muscle protein metabolism, improving the fetal muscle protein synthesis and reducing the oxidative stress. Support: FAPESP, CNPq and FAPEX/UNICAMP.

P421 Nutrition and Cancers

Long-term trends in cancer mortality and morbidity and in dietary pattern in Poland

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Introduction: total cancer mortality rate have remained rather stable for the last a dozen or so years in Poland and the growth in the morbidity rate has been significantly reduced. Beneficial trends in the dietary pattern have been observed.

Purpose: a comparison of the two variables.

Methods: standardized mortality and morbidity rates for all cancer types overall covering the period 1963–2004 were taken into account. Food balance sheets data showing average food quantities available for consumption per capita/year and original authors’ estimates on the average amounts of the energy and nutrients per capita/day since 1950 to 2004 were considered in the analysis. Two different sub-periods were taken into account with the 1989 year as that marking the end of the centrally regulated food market.

Results: standardized cancer mortality rate was 155/000 thous. in 1989 and was over 30% higher in relation to 1963. It remained almost unchanged through the further years. Morbidity rate increased over 55% to 1989 and reached 183/000 thous. Growing trend was stopped in 1994. Dietary pattern was changing towards an affluent diet in the first sub-period. It was reflected predominantly in the growth in the consumption of meat and its products, butter and other animal fats, sugar, and milk and dairy products, accompanied by the decline in the consumption of the cereals and potatoes. There was a reversal from these trends in the second sub-period and a dynamic growth in the con-
consumption of vegetable fats and oils, fruit and poultry was noted instead.

**Conclusions:** stabilization in the cancer mortality rate over the last a dozen or so years and much weaker growing morbidity trend in comparison to earlier decades was probably associated, among others, with beneficial trends in diet.

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**P422 Nutrition and Cancers**

**Low fruit consumption as a dietary risk factor for high prevalence of cancers related to diet (lung, breast, esophageal, stomach, colorectal and cervix) in Iran**

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**Introduction:** Epidemiological studies showed that the risk of cancer incidence decreased by high consumption of fruit and vegetables. The purpose of this study was to assess the fruit and vegetable consumption in Iranian households and its relation to lung, breast, esophageal, stomach, colorectal and cervix cancers.

**Methods:** We used data of national comprehensive study on household food consumption pattern and nutritional status Iran (2001–2003) and mortality statistics in 23 provinces of Iran in (2003–2004). Dietary pattern of 4614 households in 23 provinces were selected by systematic stratified sampling design. Data on food consumption were collected by a combination of weighing and recall method for three consecutive days. Net weight of fruit intake was calculated and provinces were divided in two low and high fruit consumption (LFrC, HFrC) groups, based on mean daily per capita intake of fruit and vegetable were 142 and 229 g. Mean daily per capita intake in HFrC were nearly 2 times higher than LFrC(178 versus 90g). Prevalence of mortality of cancer and coronary heart disease in HFrC and LFrC were (3.6%, 5.6%) and (37.2%, 33.3%) respectively.

**Results:** The average prevalence of cancer in Iran were 4.9%. The mean daily per capita intake of fruit and vegetable were 142 and 229 g. Mean daily per capita fruit intake in HFrC were nearly 2 times higher than LFrC provinces (178 versus 90g). Prevalence of mortality of cancer and coronary heart disease in HFrC and LFrC were (3.6%, 5.6%) and (37.2%, 33.3%) respectively.

**Discussion:** Based on findings, total intake of fruit and vegetable in low fruit consumption provinces were less than WHO recommendation (400g/day). According to higher prevalence of cancer in these provinces fruit and vegetable intake is a major dietary risk factor for health in Iran.

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**P423 Nutrition and Cancers**

**Modulation of signaling NF-kB activation pathway by polyphenols in human intestinal Caco-2 cells**

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Current studies support beneficial effects of polyphenols (PP) in various chronic inflammatory diseases, e.g. the inflammatory bowel diseases. The inhibition of nuclear factor κB (NFkB) by PPs may explain their anti-inflammatory properties, but few data are available in the intestine. The purpose of this study was thus to investigate the effects of PPs on NFkB activation using human intestinal Caco-2 cells. Effects of standard PPs (50 uM) were studied on different cellular events associated with NFkB activation: (i) NFkB induction performed in cells transfected with a NFkB-luciferase construct and stimulated by inflammatory agents (interleukin-1β (IL1β), tumor necrosis factor a (TNFa) or lipopolysaccharides (LPS)), (ii) phosphorylation of the inhibitor of κB (IkBa) analyzed by Western Blot and (iii) secretion of interleukin 8 (IL8) quantified by sandwich Elisa assay, in IL1β-stimulated cells. Results showed that chrysin and ellagic acid inhibited NFkB-luciferase activity, whereas genistein and resveratrol increased the activity (P < 0.05). These effects were independent of the nature of the inducer (IL1β, TNFa or LPS), indicating that PPs may modulate NFkB activation pathway by acting on a common event to the cytokine- and LPS-mediated cascades. Chrysin strongly reduced IL1β-induced IkBa phosphorylation, but other PPs did not have any effect. Ellagic acid, genistein, and EGCG reduced (~70%) the secretion (P < 0.05). The data indicate that PPs can modulate the NFkB activation pathway in the intestine and chrysin could block NFkB activation via the inhibition of IkBa phosphorylation. The other molecular targets of the active PPs are still to be identified.

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**P424 Nutrition and Cancers**

**Nutritional, physico-chemical and bioactivity characterization of whey protein products**

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Whey proteins show protective properties for a number of pathological conditions in culture cells, animal models and humans. The aim of the present study was to select a biologically active material to use in a clinical trial with children suffering from acute myeloid leukemia (AML) submitted to chemotherapy. Five whey protein products were investigated for nutritional, physico-chemical and bioactivity properties, in vivo (rat) and in vitro. Two products were produced in
pilot plant scale, a WPC (A) and a WPI (B) from Hilmar Ingredients, Ca. and INRA, Rennes, Fr. respectively. Three other were commercial products, a WPC (C) and a hydrolysate (D) from Hilmar, Ca. and WPI (E) from New Zealand. Rat growth and tissue glutathione (erythrocytes and liver) were measured after 7 and 21d on the diets (AIN-93, 12g protein/100g diet). No statistical differences among products were found for growth and glutathione (GSH) after 21 days on special diets. Solubility (water pH 4.6) was higher (almost 100%) for the WPIs and (~80%) for the WPCs. Electrophoresis (SDS-PAGE) showed a stronger lactoferrin band in (A) and no lactoferrin in (E). In vitro cytotoxicity (B16F10) murine melanoma cells was significantly higher for (A) and (D). Index of 50% cytotoxicity (IC50) was 2.68 mg/mL for (A) and 3.66 for (D). In vitro IL-10 and TNF-á secretion by human peripheral blood mononuclear cells (HPBMC) were highly stimulated by products (A, C, D) and poorly stimulated by products (B) and (E), both in the presence or absence of BCG or phytohemagglutinin (PHA). Considering all performed tests the most bioactive samples were (A, C, D). Sample (A) was the strongest secreter of TNF-á and IL-10. It was the most effective against murine melanoma cells and seemed to be most adequate material for the clinical trial.

Conclusion: Nearly half of studied patients had overweight or obesity. The prevalence of these abnormalities was high especially in patients with colorectal cancer and women with breast uterus and ovary cancer so excessive weight could be the important factor influencing its morbidity.

P425 Nutrition and Cancers

Overweight and obesity in hospitalized patients with cancers in Poland

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Introduction: Cancer prevalence in Poland is very high. There were noted 121,000 new cases in 2003. Obesity is considered one of the major risk factors of most of cancers.

Purpose: The purpose of the study was to estimate the frequency of overweight and obesity in hospitalized patients with cancers in Poland and to identify what kind of cancers are connected with the highest prevalence of overweight and obesity in this population.

Methods: The study was carried out for 3267 randomly selected patients aged 16–100 years, hospitalized in 12 hospitals in Poland in 1999–2000. The information on diagnosis of each patient was obtained. Anthropometric measurements served to assess, who had overweight or obesity. There were chosen 309 patients with cancers for presented analysis.

Results: Alimentary system cancers were the most frequent reason of hospitalization, especially colorectal – 28% of patients, pancreas – 13% and stomach – 13%. About 30% of women were hospitalized because of breast, uterus and ovary cancer.

Overweight and obesity occurred among 37% of men and 53% of women hospitalized by the reason of cancers. The weight loss during 3 month before hospitalization had been noted in 62.5% of patients.

Among patients with colorectal cancer 52% of men and 54% of women were overweight or obese. However these percentages 3 month before hospitalization were 66% and 86% respectively.

Relatively high per-cent of overweight and obesity – 64% was found in women with breast, uterus and ovary cancer.

P426 Nutrition and Cancers

Relation of fish consumption with prevalence of cancer and coronary heart disease (CVD) in different regions of Iran

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Introduction: Fish and seafood play an important role in healthy diet. Fish is high in protein and is a major source of poly unsaturated fatty acid (PUFA) and omega3-FAs.

The purpose of this study was to assess the relationship of fish consumption to prevalence cancer and coronary heart diseases in Iran.

Methods: We used data of National comprehensive study on household food consumption pattern and nutritional status IRAN (2001–2003) and mortality statistics in 23 provinces of Iran in 2003–2004. Dietary pattern of 4614 households in 23 provinces were selected by systematic stratified sampling design. Data on food consumption pattern were collected by a combination of weighting and weight-recall method for three consecutive days. Net weight of fish intake was calculated and provinces were divided into low fish consumption (LFC) and high fish consumption (HFC) ones based on total mean fish intake in 23 provinces. Mean weighted average intakes were calculated.

Results: The prevalence of cancer and coronary heart disease in Iran were 4.9% and 38% respectively. Mean daily per capita of fish and canned fish intake in Iran were 7 and 2 grams, respectively. Portion contribution of fish to total food basket was less than 1% (%0.65) and for total meat intake it was 11%. The mean daily per capita fish consumption in HFC provinces (Hormozgan, Bushehr, Khoozestan: seaside provinces) was 34.4g versus 2.1g in (LFC) provinces with no access to sea borders. Mortality rates of cancer and coronary heart disease in these provinces were (%2.4,%4.5) and (%3.4.6,%37.7), respectively.

Conclusion: Prevalence of cancer is 50% lower in provinces with high fish consumption. According to potential high access to seafood sources in Iran, there is a need for advocacy for more fish consumption.
Role of polymorphisms in genes for selenoproteins on prostate cancer risk
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Selenium (Se) is a micronutrient that is low in New Zealand (NZ) soils as well as other countries and is at sub-optimal levels in the typical NZ diet. Epidemiology studies have shown that populations with low levels of selenium have a higher mortality from cancer and there is strong evidence that low Se intake is associated with increased oxidative stress, high DNA instability, and enhanced pro-inflammatory conditions all factors that may increase the risk of cancer.

Selenium is thought to have an important role in protection from cancer development. The antioxidant properties of selenoproteins are well known in this regard, although many other functions have been recently established including regulation of the pro-inflammatory cytokines. SNPs in certain selenoproteins have shown to affect the activity of the molecule and may imply that individuals with specific SNPs respond differently to dietary Se supplementation.

Here, we present the results from a study involving men from Auckland, New Zealand with regard to the SNPs of SEPP1 Thr234Ala and GPx1 Pro197Leu genes, the serum Se level, plasma selenoprotein P levels, DNA damage, and prostate cancer incidence to see whether a link exists between these parameters. Preliminary data suggest that DNA damage is increased by low Se levels, especially in the context of certain genotypes.

Sarcopenic obesity among breast cancer patients who receive adjuvant chemotherapy
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Weight gain is a common side effect of adjuvant chemotherapy for breast cancer that decreases quality of life and also may reduce both disease-free and overall survival. In this study, our aim was evaluated the possible effect of adjuvant chemotherapy under weight body in breast cancer patients. Twenty-five women, 46 ± 9 years, with breast cancer stage I or II, pre and post menopausal, were assessment before (T0) and after (T1) adjuvant chemotherapy. Actual weight, body mass index (BMI), body composition (fat and lean mass percent) and phase angle were evaluated. Parameters were statistically analyzed by SPSS software, 13.0 version. The results showed that after treatment forty-four percent of patients increased weight in 5% (4.5 ± 1.2kg; p < 0.00) and the BMI increased to 26 kg/m² (p < 0.00), where there was an increase of 4% in patients with obesity I or II. This modification on weight showed positive correlation with fat mass percent (r = 0.644; p = 0.00) and negative correlation with lean mass percent (r = -0.532; p = 0.00), after to adjuvant chemotherapy. The BMI showed correlations with fat (r = 0.752; p = 0.00) and lean mass percent (r = -0.604; p = 0.00). We observed that phase angle was lower after treatment (T1-T0 = -0.40; p = 0.00). These results demonstrate that breast cancer patients develop sarcopenic obesity during adjuvant chemotherapy and this fact can contribute to tumor recurrence and worse quality of life. Theses results were supported by decreased in phase angle that is a good predictor of cellular integrity and clinical prognosis. Therefore adequate feed orientation can contribute to reduce weight gain.

Stability of lycopene and other tomato’s micronutrients in simulated human gastrointestinal conditions
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Dietary intake of tomatoes or tomato products containing lycopene has been shown to be inversely associated with degenerative pathologies such as cardiovascular diseases or cancers. Nevertheless, the role of the micronutrients other than lycopene, and of the potential metabolites produced during digestion remains unclear. The protective effect of these compounds will depend on their bioavailability and therefore their stability in the human digestive tract.

The objective of this study was to evaluate the luminal degradation of lycopene and other tomato’s micronutrients during in vitro digestion.

Digestions of meals containing red or yellow tomato puree or oleoresine beads of lycopene were performed using TIM system, which closely reproduces the human gastrointestinal conditions. Samples were regularly collected during digestion and the amounts of various carotenoids (lycopene, luteine, zeaxanthine, α-carotene et α-13-cis-carotene) and vitamins A and E were determined by HPLC.

Zeaxanthine, α-13-cis-carotene and vitamin A were found in none of the samples. α-carotene was stable during digestion whereas vitamina E and lycopene were degraded, mainly in the small intestine. Moreover, the stability of lycopene from red tomato was higher than that from oleoresine beads.

In conclusion, the stability of the micronutrients seems to be influenced by their nature, the food matrix and the gastric or intestinal environment. Soon, new experiments will be conducted associating TIM system and intestinal cells in culture in order to (i) evaluate the intestinal absorption of the micronutrients recovered in digesta and (ii) study the influence of digestion on the antiproliferative property of lycopene or other possible bioactive fractions of tomatoes.