Abstracts

Invited Speakers

Opening Conference
Mediterranean Diet Was First Known for Its Beneficial Health Effects

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Mediterranean diet was first known for its beneficial health effects by the 17th century (1614), when Giorgio Castelvetro, an exiled Italian in UK, was already spreading the word about the benefits of the Mediterranean food habits. However, it is only in the 2nd part of the last century that epidemiology through the "7 countries studies" provided the first scientific data to suggest a link between the Mediterranean diet (Med-D) and health. Nutritionists were eager to propose a biological mechanism and analysed all nutrients and macronutrients present in the Med-D. Ancel Keys was the first to pinpoint the ratio of monounsaturated fatty acids (MUFA)/saturated fatty acids (SFA) as the magic bullet against cardiovascular diseases, identifying the importance of oleic acid. Then, micronutrients derived from plants (whole grain cereals, raw and cooked vegetables, fresh and dry fruits, legumes, nuts, wine and olive oil) were tested in in vitro or in vivo experiments and showed health-related properties. However, epidemiological studies could not identify one nutrient that explained by itself the relationship between the Med-D and health. Thus a holistic approach, a priori and a posteriori dietary patterns, was implemented to understand this relationship. Unexpectedly, this approach when applied to cohorts in Mediterranean countries in comparison with studies in non-Mediterranean countries, showed some specific characteristics and was able to distinguish one specific Mediterranean food, namely olive oil, which could be essential in the dietary pattern in order to observe the beneficial effects of this diet. Thus, the conference will go along the winding path of this long scientific story, through the various analytical and epidemiological advances up to today's convincing evidence of the health advantages of the Med-D.

Session 1
Mediterranean Diet and "Morbid" Tissues: History Counts, Future Counts

Iris Shai

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Pathogenic fat tissues and carotid atherosclerosis reflect past lifestyle status and may improve by future changes. Visceral obesity is part of dysfunctional adipose tissue and is closely related to clustering cardiometabolic risk factors. Unlike visceral adipose tissue (VAT), the association between subcutaneous adipose tissue (SAT) and obesity-related morbidity is controversial. However, we found that abdominal SAT is composed of two subdepots that associate differently with cardiometabolic parameters. As opposed to deep SAT (DSAT), higher absolute and relative distribution of fat in abdominal superficial SAT (SSAT) may signify beneficial cardiometabolic effects in patients with type 2 diabetes. Lifestyle interventions, mainly including limiting trans fats, carbs and fructose and increasing mono and poly unsaturated fats, generally induce preferential mobilization of visceral fat. The two-year DIRECT trial suggests that weight loss diets can induce a significant regression of measurable carotid atherosclerosis, that the effect is similar in low-fat, Mediterranean, or low-carbohydrate strategies and appears to be mediated mainly by the weight loss-induced decline in blood pressure. A 17 years follow-up of up than 37,000 teenagers suggests that although the risk of diabetes is mainly associated with increased BMI close to the time of diagnosis, the risk of coronary heart disease is associated with an elevated BMI both in adolescence and in adulthood, supporting the hypothesis that the processes causing incident coronary heart disease, particularly atherosclerosis, are more gradual than those resulting in incident diabetes.

Session 2
Fruit, Vegetables and Cancer Risk

Carlo La Vecchia

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A diet rich in fresh fruits and vegetables appears to be favourable on the risk of most common epithelial cancers, including those of the digestive tract, but of also major nondigestive neoplasms such as lung. For most sites, the addition of a portion of fruit or vegetables per day leads to a decline of the relative risk of the order of 10 to 20%, and this constitutes the basis of several recommendations to eat at least five servings of vegetables or fruits per day.

The relation between frequency of consumption of vegetables and fruit and cancer risk was analysed using data from a series of

case-control studies conducted in Northern Italy. The relative risks (RR) for digestive tract neoplasms ranged from 0.2 to 0.5 for the highest compared to the lowest tertile of vegetable intake. Favourable effects were also observed for selected hormone-related neoplasms. Fruit was related to a reduced RRs for cancers of the upper digestive tract, stomach and of the urinary tract. For digestive tract cancers, population attributable risks for low intake of vegetables and fruit ranged between 15 and 40%. Common vegetables and fruits, including garlic and onions, cruciferous vegetables, tomatoes and apples have been specifically related to reduced risk of selected cancer risk.

The role of selected antioxidants was also considered. Beta carotene, vitamin E and calcium showed a significant inverse relation with breast cancer risk. For colorectal cancer, the RR reached 0.46 in subjects reporting high calcium/vitamin D and high antioxidant intake. Other aspects of a diet rich in vegetables and fruit in cancer prevention include selected flavonoids and proanthocyanidins and total antioxidant capacity (TAC).

In Mediterranean populations, a low risk diet for cancer would not only imply increasing fruit and vegetables, but also preferring olive oil to other seasoning fats, particularly saturated ones.

Session 3
Bread and overweight

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The traditional belief held by the general public is that bread fattens. This encourages many people to restrict, or even eliminate, bread from the diet. The objective of a recent from our group was to assess, based on the best available scientific evidence, whether or not eating patterns that included bread (refined or whole-grain) consumption was associated with excess of overall obesity or abdominal adiposity in general, and in subjects undergoing obesity management. We reviewed the articles published over the past 30 years which related the consumption of dietary patterns that included refined and whole-grain bread to ponderal status and abdominal fat distribution. We selected 38 epidemiological studies that fulfilled the inclusion criteria. There were 22 cross-sectional, 11 prospective cohort and 5 intervention studies. The results obtained indicate that dietary patterns that included whole-meal bread did not influence weight gain and may also be beneficial to ponderal status. With respect to dietary patterns that included refined bread, the majority of cross-sectional studies indicated no effects but most well designed cohort studies demonstrated a possible relationship with the distribution of abdominal fat. The results from experimental designs were not conclusive.

Moreover, we analysed 2213 participants at high risk for CVD from the PREvencion con DIeta MEDiterranea (PREDIMED) trial to assess the association between changes in the consumption of bread and weight and waist circumference gain over time. Dietary habits were assessed with validated FFQ at baseline and repeatedly every year during 4 years of follow-up. Using multivariate models to adjust for covariates, long-term weight and waist circumference changes according to quartiles of change in energy-adjusted white and whole-grain bread consumption were calculated. The present results showed that over 4 years, participants in the highest quartile of change in white bread intake gained 0.76 kg more than those in the lowest quartile (P for trend <0.003) and 1.28 cm more than those in the lowest quartile (P for trend <0.001). No significant dose–response relationships were observed for change in whole-bread consumption and anthropometric measures. Gaining weight (+2 kg) and gaining waist circumference (+2 cm) during follow-up was not associated with increase in bread consumption, but participants in the highest quartile of changes in white bread intake had a reduction of 33% in the odds of losing weight (+2 kg) and a reduction of 36% in the odds of losing waist circumference (+2 cm).

The results of the latest study suggested that reducing white bread, but not whole-grain bread consumption, within a Mediterranean-style food pattern setting is associated with lower gains in weight and abdominal fat. However, the role of bread in the weight gain in Mediterranean countries is uncertain.

References:

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Session 6
Nut Antioxidant Compounds and Health

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Nuts are rich sources of multiple essential nutrients, mono-and polyunsaturated fatty acids (MUFA and PUFA), and fibres. They possess strong antioxidant activity and provide an array of phytochemicals/bioactives that may contribute to the health benefits attributed to this whole food. The benefits of inclusion of nuts into human diet are mainly related to their fat components, most of which are rich in MUFA, PUFA, tocopherols, and phytosterols, among others. In addition, there are a number of fat and non-fat constituents in nuts that may elicit antioxidant, free radical scavenging, anticarcinogenic and antimutagenic activities, as well as cholesterol-lowering and cardioprotective properties. In this respect, phytochemicals/bioactives in nuts may be implicated in possessing multifunctional properties in preventing several chronic diseases. This presentation would discuss issues related to the levels of natural antioxidants and phytochemicals/bioactives present in nuts and their by-products. Where possible, the health claims by Food and Drug Administration (FDA) and European Food Safety Authority (EFSA) and health benefits of nuts will be high-

lighted. The content and recommended dietary allowances (RDA) of nutrient antioxidants (such as vitamins A, C, E, and the mineral selenium) present in various nuts will be compared. Moreover, the levels and compositions of fat-soluble bioactives such as fatty acids, tocols, phytosterols, and sphingolipids present in 12 nut oils (almond, Brazil nut, cashew, chestnut, hazelnut, heartnut, macadamia, peanut, pecan, pine nut, pistachio, and walnut) will be compared and reviewed. Overall, nuts can be considered as functional foods due to an array of health promoting phytochemical/bioactive compounds.

Session 7
Nuts and cardiovascular disease

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Nuts are nutrient-dense foods with complex matrices rich in unsaturated fatty acids and other bioactive compounds, such as L-arginine, fiber, healthful minerals, vitamin E, phytosterols, and polyphenols. By virtue of their unique composition, nuts are likely to beneficially impact cardiovascular health. Epidemiologic studies have associated frequent nut intake with a reduced incidence of coronary heart disease, sudden cardiac death, and diabetes in women, but not in men. Many small feeding trials have clearly demonstrated that intake of all kinds of nuts has a cholesterol lowering effect, even in the context of healthy diets. There is increasing evidence that nut consumption has a positive effect on oxidative stress, inflammation, and vascular reactivity. Blood pressure, visceral adiposity, insulin resistance, and the metabolic syndrome also appear to be positively influenced by nut consumption. Contrary to expectations, epidemiologic studies and clinical trials suggest that regular consumption of nuts is not associated with undue weight gain. Recently, the PREDIMED randomized clinical trial of long-term nutrition intervention in subjects at high cardiovascular risk has provided first-class evidence that regular nut intake is associated with a 50% reduction in incident diabetes and, more importantly, a 30% reduction in cardiovascular disease. Of note, incident stroke was reduced by nearly 50% in participants allocated a Mediterranean diet enriched with a daily serving of mixed nuts (15 g walnuts, 7.5 g almonds, and 7.5 g hazelnuts). Thus it is clear that frequent nut consumption has a beneficially impact on risk of cardiovascular disease that is likely to be mediated by salutary effects on intermediate risk factors.

Session 8
Fermented Dairy Food and Cardiovascular Risk

Linda Tapsell

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Cheese and yoghurt are well recognised fermented dairy foods which are integral to many cultural eating patterns. They also form part of the Mediterranean diet which has been shown to be protective in the prevention of cardiovascular disease. Establishing the evidence supporting the risk or benefit associated with dietary patterns is one thing, but narrowing the focus to single foods presents particular methodological challenges. In the case of dairy foods, varying food composition in the category may mask the true effects of fermented products on disease outcomes. More recent observational studies are beginning to separate out yoghurt in particular in a favourable light suggesting a greater focus on fermented dairy foods is warranted. The saturated fat content of these foods still presents with translational issues as there is a strong scientific basis for arguing against the inclusion of a high proportion of saturated fat in the diet. Despite this there is now a move to focus research on the whole food rather than the individual component parts. This approach acknowledges potential synergistic effects between nutrients within foods, and between foods within whole diets, which may be of greater importance. Observational studies of population dietary patterns have consistently shown that a regular intake of milk, cheese and yoghurt may be associated with a reduced risk of cardiovascular disease, and despite the presence of saturated fat, there is no clear evidence that dairy food consumption is associated with CVD. This of course assumes a dietary context of energy and nutrient balance, food variety and moderation in amounts consumed. The indications are that moderate amounts of fermented dairy foods play a significant role in dietary patterns that protect against cardiovascular disease, which has implications for nutrition communications and for the development of new dairy products within that category.

Session 9
Epidemiological Studies Relating Olive Oil Consumption to Disease

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The customary high intake olive oil (OO) is one the hallmarks of the Mediterranean diet, and for centuries OO has been recognized for its nutritional properties. Accumulating epidemiological evidence now confirms its potential role in healthy ageing and increased longevity by reducing risk of several major chronic diseases, such as cardiovascular disease, certain cancers, diabetes, metabolic syndrome as well as age-related cognitive decline and dementia.

Research within the Spanish segment of the European Prospective Investigation into Cancer and Nutrition (EPIC-Spain) cohort, a unique setting for studying nutrition and chronic diseases, has confirmed the protective effect of OO on mortality; compared to non-consumers of OO, high consumers had a significant 26% reduction in mortality, and 44% reduction in cardiovascular disease mortality. There was also a 7% decreased risk of incident coronary heart disease related to a 10 g/day/2000 kcal intake of OO, which increased to 28% for exclusive virgin OO consumers. Evidence from observational studies on OO's cardiovascular benefits has been confirmed by dietary trials such as PREDIMED (PREvención con DIeta MEDiterránea) showing that OO consumption reduces incidence of mayor cardiovascular events and their risk factors.

There is also some epidemiological and experimental evidence suggesting OO might reduce risk of certain cancers, in particular digestive tract and breast cancer; however most epidemiological evidence is based on case-control studies which have inherent limitations. In the Mediterranean countries of the EPIC cohort no association was observed between OO and overall breast cancer in postmenopausal women, however there was a potentially beneficial effect in tumors without sex-hormone receptors.

The biological explanation for OO's ability to improve the outcome of a number of different diseases and overall mortality is linked to its high proportion of monounsaturated fatty acids, vitamin E and diverse phenolic compounds which have been shown to have anti-inflammatory, antioxidant, antiatherogenic and possibly anticarcinogenic effects.

Session 10
Clinical Trials in Nutrition: The Predimed Study

Ramón Estruch, Emilio Ros, Jordi Salas-Salvadó, Maria-Isabel Covas, Dolores Corella, Fernando Arós, Enrique Gómez-Gracia, Valentina Ruiz-Gutiérrez, Miquel Fiol, José Lapetra, Rosa Maria Lamuela-Raventos, Lluís Serra-Majem, Xavier Pintó, Josep Basora, Miguel Angel Muñoz, José V. Sorlí, José Alfredo Martínez, Miguel Angel Martínez-González, for the PREDIMED Study Investigators

CIBER Fisiopatología de la Obesidad y Nutrición (CIBER obn) and the PREDIMED Network (RD 06/0045), Instituto de Salud Carlos III (ISCIII), Spanish Government.

Cardiovascular disease is the main cause of death in industrialized countries, but there are marked geographical differences in incidence rates. The low incidence of coronary heart disease in Mediterranean countries has been ascribed in part to dietary habits. Observational cohort studies and the Lyon Diet Heart study, a secondary prevention trial, have reported an inverse association between Mediterranean diet adherence and cardiovascular risk. We conducted a randomized trial of this dietary pattern for the primary prevention of cardiovascular events.

Methods: In a multicenter trial, we randomly assigned 7447 participants (55 to 80 years of age; 57% women) at high cardiovascular risk, but with no cardiovascular disease at enrollment, to one of three diets: Mediterranean diet supplemented with extra-virgin olive oil, Mediterranean diet supplemented with mixed nuts, or control diet (advice to reduce dietary fat). Participants received quarterly individual and group educational sessions and, depending on group assignment, free provision of extra-virgin olive oil, mixed nuts, or small non-food gifts. The primary end point was the rate of major cardiovascular events (myocardial infarction, stroke or cardiovascular death).

Results: The two Mediterranean diet groups achieved good adherence to the intervention based on self-reported intake and biomarker analyses. The results of an interim analysis prompted stopping the trial after a median follow-up of 4.8 years. A primary end point event occurred in 288 participants. The multivariable-adjusted hazard ratios (95% confidence intervals) were 0.70 (0.54 to 0.92) and 0.72 (0.54 to 0.96) for the Mediterranean diet with extra-virgin olive oil (96 events) and Mediterranean diet with nuts groups (83 events), respectively, versus the control group (109 events). No diet-related adverse effects were reported.

Conclusions: In subjects at high cardiovascular risk, Mediterranean diets supplemented with extra-virgin olive oil or nuts reduced by 30% the incidence of major cardiovascular events.

Session 11
Fruit and Vegetable Intake in Adults is Low: Barriers to and Potential for Increasing Consumption

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Despite the knowledge about the benefits of a regular high fruit and vegetable (F&V) consumption and more or less successful efforts to its promotion in many countries, actual intake data in Europe show a great need for improvement. Indeed, with their low energy density, F&V are an effective tool to counteract the obesity epidemic and associated non-communicable diseases.

Trends in fruit and vegetable consumption: Based on FAO Food Balance Sheets, consumption of F&V in Europe has been increasing over the last decades. Nevertheless, individual food consumption data repeatedly show that the WHO recommendation of 400 g/d of F&V is rarely met. In the recent Austrian Nutrition Report 2012, mean intake was below the national recommendations (600–900 g F&V/d), especially for vegetables. A comparable picture is seen in other European countries, in the US and also in many low-income countries. Consumption is particularly insufficient in vulnerable groups with high requirements for micronutrients like children, adolescents, and elderly.

Barriers to higher consumption of fruit and vegetables: In low income groups, financial aspects are a potential barrier to increasing consumption of F&V that are more expensive than less healthy energy-dense foods. Limited knowledge about storage and preparation especially of less common varieties also lowers F&V intake. Seasonal variability can reduce availability, while imported F&V harvested before full maturity and transported over long distances are often disliked by consumers.

Potential for increasing vegetable and fruit consumption: As dietary habits are mainly acquired in childhood, increasing F&V intake of this age group offers a promising approach. Interventions in schools and at workplaces have shown some success.

In light of freshness and cost effectiveness, regional and seasonal products should be preferred. Modern preservation tech-

nologies can increase their availability, but knowledge about them and awareness of the quality of processed F&V should be extended.

Session 12
Vegetarian Diets and Risk of Metabolic Syndrome: Mediterranean Diets as a Paradigm

Joan Sabaté

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The metabolic syndrome is a cluster of disorders that are associated with a heightened risk for diabetes and cardiovascular disease. Theprevalence of metabolic syndromeis increasing in both developed and developing countries. Itsetiologyis still under investigation and includes an interactive process of environmental, genetic and metabolic factors.Diet is an important and modifiable environmental factor to investigate in the development of the metabolic syndrome.Nuts, otherplant foods and several plat-based dietary patterns reportedly lower the risk of metabolic syndrome while meat increases the risk. Recent results from the Adventist Health Study will be presented that show associations between vegetarian dietary patterns and metabolic syndrome. Possible etiological mechanism that may contribute to metabolic syndrome development and prevention will be reviewed.

Debate Session 1
Possible Adverse Effects of Frying with Vegetable Oils

Carmen Dobarganes García

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Heating fats and oils at high temperature in the presence of air, a common procedure in culinary practices as frying, results in a complex mixture of new oxidation compounds which may impair the nutritional value of the food. In the last years, nutritional aspects have emerged on the potential biological effects of oxidised lipids. There is increasing evidence that they may be detrimental to health, particularly in connection with the development of atherosclerosis, liver damage, and promotion of intestinal tumours

Frying, one of the fastest and oldest cooking methods, is applied to the production of a growing number of new products because of the positive organoleptic characteristics of the fried foods. Two types of frying processes can be distinguished depending on the conditions applied. Continuous frying process is normally used for the preparation of commercialized foods, which are stored before consumption, e.g., crisps, donuts and frozen pre-fried foods. On the contrary, discontinuous frying process is used right before food consumption in the household, restaurants and fried food outlets. In both types of processes, quality and safety of fried foods have to be guaranteed.

In this presentation, the influence of the oil used for frying and the main differences between continuous and discontinuous processes are defined with respect to the incidence of oxidation reactions and fried food safety. Data on the present situation in the frying sector are given which reveals the critical points where special attention should be paid. The main conclusion drawn is the need of a frequent quality control when discontinuous frying is applied which is in turn parallel to the need of analytical criteria compatible with the absence of laboratory facilities.

Debate Session 2
Dietary Exposure to Metals and Organic Pollutants Through Fish Consumption: Risks are Higher than Benefits?

José L. Domingo

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The beneficial health effects in humans of fish consumption are clearly supported by an important number of studies performed in the last 30 years. These studies have repeatedly linked fish consumption, especially those species whose content in omega-3 fatty acids is high, with healthier hearts in the aging population. The nutritional benefits of fish and seafood are also due to the content of high-quality protein, vitamins, as well as other essential nutrients. In contrast, a number of studies, particularly investigations performed in recent years, have shown that the unavoidable presence of environmental contaminants in fish and shellfish can also mean an evident risk for the health of certain consumers. While prestigious international associations as the American Heart Association have recommended eating fish at least two times (two serving a week), based on our own experimental results, as well as in other reported data we cannot be in total agreement with that recommendation. Although the intake of most fish and shellfish species should not mean adverse health effects for the consumers, the specific type of the species consumed, the frequency of consumption, as well as the meal size, are essential issues for adequately balancing the health benefits and risks of a regular fish and seafood consumption.

Closing Conference
Virgin Olive Oil: A Key Food in the Traditional Mediterranean Diet

María-Isabel Covas

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Olive oil is the primary source of fat in the Mediterranean Diet. However, and beyond basic nutrition, olive oil is a dietary component which may provide additional health benefits. Due to this, olive oil can be considered as a "Functional Food".

Among olive oils, virgin olive oils, produced by the first press or centrifugation in cold conditions are those proven to be more effective on classic and novel factors for degenerative diseases. Here, we will review the state of the art concerning the knowledge of the most important biological and clinical effects related to the intake of virgin olive oil on lipoprotein metabolism, oxidative damage, inflammation, endothelial dysfunction, and blood pressure. The extent to which we possess evidence of the health benefits of olive oil phenolic compounds, the differential characteristics of virgin olive oil versus other types of olive oils or vegetable oils, will also be assessed. In order to reinforce the evidence of the benefits of virgin olive oils, current research is focused on the mechanisms by which polyphenols present in them can exert their benefits. New mechanisms such as in vivo protective nutrigenomic effects of virgin olive oil polyphenols, within and without the frame of the Mediterranean diet, in humans will be reported.

Oral Presentations

O01

Effect on HDL Properties and Subclass Distribution of a Long-Term Consumption of Virgin Olive Oil and their Phenolic Compounds

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Background and Objectives: Several studies show that olive oil (OO) and its phenolic compounds (PC) have beneficial effects on the lipid profile. The EUROLIVE Study reported an increment of HDL-cholesterol (cHDL) linked with the PC content of the OO administered in healthy volunteers. Our aim is to elucidate whether besides an increase in cHDL an improvement in HDL functionality occurs. We explored the issue in a subsample of the EUROLIVE study.

Methods: A crossover, randomized, double-blind, controlled trial was performed with 53 healthy male volunteers (25–65 years), from three European centres. Participants received daily 25 mL/day of OO with a low (2.7 mg/kg) or high (366 mg/kg) PC content. Intervention periods were of 3 weeks separated by 2-week washout periods. Lipid and protein characterization was determined by standardised methodology. PC content of HDL was measured by MC-MS. The HDL monolayer fluidity was assessed as anisotropy (r) by polarization fluorimetry. HDL subclass distribution was measured by Lipoprint. HDL2 and HDL3 subclasses include from 1 to 3 and 4 to 9 bands, respectively.

Results: Regular and moderate consumption of VOO produced an increment of the PC content in HDL together with a de-crease in HDL monolayer anisotropy. A rise in the large HDL2 subclass and a decreasing trend in the small HDL3 subclass were observed after VOO.

Discussion and Conclusions: An improvement in the HDL fluidity was observed after the intervention with VOO. The increment of the antioxidant content of the HDL particle could explain this fact. An increment of the HDL2 subclass particles was also observed. This, together with the increment of HDL monolayer fluidity could improve the capacity for cholesterol efflux of the HDL lipoprotein. Therefore, VOO consumption could be a useful tool in the management of high cardiovascular risk patients.

O02

Effect of Apples and Walnuts on Classical Risk Factors and Inflammatory Markers in Patients after Myocardial Infarction Undergoing Cardiac Rehabilitation

Polona Mlakar[1], Barbara Salobir[2], Janja Strasek[3], Nusret Èobo[3], Marjeta Terèelj[2], Miso Sabovic[4]

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Background and Objectives: In Slovenia we have an integrated production of high quality apples and walnuts rich on antioxidants. A cardio protective diet enriched with this traditional source of antioxidants might have beneficial effects on classical risk factors and inflammatory markers, especially when combined with exercise. The aim of our study was to test this hypothesis on patients included in short term cardiac rehabilitation (CR) after myocardial infarction (MI) in Health Resort Šmarješke Toplice.

Methods: The observed parameters were measured before and after completed CR program, approved by our national insurance company. Patients were randomized into a group which had a diet, daily enriched with two apples (300 g) and a fist of walnuts (30 g) (N = 15), and a group with no specific diet (N = 15). Control group united thirty age balanced healthy adults, with no risk factors for coronary heart disease.

Results: In comparison to healthy individuals patients had lower systolic blood pressure, total- and LDL-cholesterol due to treatment of arterial hypertension and hyperlipidemia (all $p < 0.05$), positive markers of metabolic syndrome (lower HDL-cholesterol, higher BMI, waist to hip ratio, $p < 0.05$) and inflammation (higher neutrophils, hs-CRP, both $p \leq 0.002$). We observed a significant drop in systolic and diastolic blood pressure, heart rate, total-, LDL-cholesterol, triglycerides, BMI, waist-to-hip ratio, neutrophils and hs-CRP in the diet group (all $p < 0.05$), as in the non-diet group we observed only a decrease in total cholesterol ($p < 0.05$).

Conclusions: The results of our study indicate that diet enriched with natural antioxidants from apples and walnuts significantly improves not only the classical risk factor profile, but also levels of inflammatory markers during short term CR. On the other hand, CR without the diet has no such effect. Thus, it seems that cardio protective diet enriched with antioxidants from apples and walnuts should be an integral part of every CR program for patients after MI.

O03
Impact of Probabilistic Food Replacement: Substitution of Meat with Oily Fish Consumption in the UK Diet

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Background and Objectives: This study aims to look at changes in the UK diet when implementing some key aspects of the Mediterranean diet, such as oily fish, which can reduce risks of heart diseases. Consumption of oily Fish intake in the UK is well below the recommendations of at least 140 g per week. This analysis aims to look at the impact of substituting red meat and processed meat consumption with oily fish and the fatty acid intake profile.

Methods: Red meat and processed meat consumption was substituted by oily fish consumption in UK adults aged 19 to 64 using a probabilistic food replacement model. Nutrient composition of oily fish analysis was set by discrete data distributions of nutrient composition from various oily fish consumed in the UK, adding to a random choice of oily fish consumption. The meat consumption was not fully replaced by fish consumption, but a replacement probability of 0.20 was applied to assume that 20 percent of times oily fish was consumed instead of meat.

Results: After modelling oily fish replacement in the UK, mean daily intake of oily fish increased from 9 g/d to 22 g/d reaching the recommended intake of oily fish. Cis n-3 fatty acid intake, expressed as a percentage of total energy, increased from 1.01% to 1.12% (p < .00001), saturated fat intake decreased from 12.21% to 12.11% (p < .00001) and vitamin D intake increased significantly from 3.7 ug/d ($\pm$0.1) to 4.6 ug/d ($\pm$0.1) (p < .00001).

Conclusions: Substituting consumption of red meat and processed meat by oily fish consumption may lead to a more beneficial fatty acid intake profile and increased vitamin D intake.

O04
Fluid Preparations of Gentian Lutea and Artemisia Absinthium Stimulate Oral Taste Receptors Eliciting Acute Increases of Peripheral Vascular Resistance

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Background and Objectives: Aperitifs and digestives (alcoholic beverages) are commonly drunk before and/or after meals in Mediterranean cultures to facilitate digestion. These beverages are produced using aromatic and/or bitter herbs. As digestion requires adequate post-prandial hyperaemia, we investigated whether the consumption of two bitter herbs gentian (Gentiana lutea) and wormwood (Artemisia absinthium) impacted the cardiovascular system. Bitter taste receptors occur both in the oral cavity and the gut. Compounds occurring in both gentian and wormwood stimulate multiple oral bitter taste receptors.

Methods: Part 1. Capsules containing placebo, 1000 mg gentian and 1000 mg wormwood were ingested by 15 participants. Continuous cardiovascular recordings were obtained with the Finometer for 2 minutes pre-ingestion and 30 minutes post-ingestion. Maximum changes from pre-ingestion readings for the post-ingestion period "8 to 30" minutes were compared between placebo and test capsules. Part 2. Similarly using 13 participants gentian and wormwood fluid extracts (40% alcohol) containing 500 and 1500 mg in 100 mL water (0.4% alcohol) were ingested. Maximum changes from pre-ingestion readings for the post-ingestion period "0 to 6" minutes were compared with the placebo.

Results: Gentian and wormwood capsules elicited no changes. During the "0 to 6" minute post-ingestion period the fluid extracts gentian 500 mg and 1500 mg plus wormwood 500 and 1500 mg increased indexed peripheral vascular resistance: by 0.059 (P = 0.007), 0.092 (P = 0.003), 0.066 (P = 0.015) and 0.090 (P < 0.001) MU.m-2 respectively. Additionally, gentian 1500 mg and wormwood 1500 mg increased diastolic pressure by 3.0 (P = 0.018) and 3.4 (P = 0.001) mm/Hg respectively. Whereas encapsulated gentian and wormwood had no effect on cardiovascular parameters, fluid preparations stimulated oral taste receptors eliciting increases in vascular tonus. The pharmacodynamics of these bitter tastants potentially facilitates digestion by supporting post-prandial hyperaemia.

Conclusions: Bitter tastants occurring in Mediterranean foods and drinks may support normal digestive function.

O05

Postprandial Effect of Bread Prepared with Wine Grape Pomace Flour, on Glycemia, Plasma Antioxidant Capacity and Oxidative Damage

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Background and Objectives: Lifestyle modifications, including healthy food intake, exercise, and suppression of tobacco smoking, constitute the most powerful tool to fight chronic diseases. Antioxidants and fiber, two components of Mediterranean diets, are key functional elements for healthy eating and nutrition. We prepared flour from wine grape pomace (WGPF), a rich source of antioxidant and fiber, to be used as an ingredient for functional foods and as a dietary supplement to increase the intake of dietary fiber and bioactive compounds.

Methods: WGPF was obtained from white grapes (Chardonnay variety, Chile). The byproduct of pressing crushed grapes was dried, grounded and stored. In a randomized, crossover study, the effect of feeding bread prepared with 20% WGPF on postprandial levels of plasma glucose, insulin, antioxidant capacity and oxidative damage was investigated. Two standard meals using white bread (WB) (50 g available carbohydrate/serving) or white bread with 20% WGPF (GB) together with 300 ml of water were administered to 2 healthy volunteers. GB contained 7.6 g dietary fiber/00 g, 4.8±0.6 mg gallic acid Eq/g polyphenols and 49.6±4.4 ORAC (μmol Eq. Trolox/g). Capillary and venous blood sample were taken at baseline and at 5–360 min after starting bread intake.

Results: Whereas no differences were found in glycemic curves, GB induces significantly lower postprandial insulin levels than WB. Plasma antioxidant capacity, measures as plasma DPPH levels, was increased significantly by GB compared with WB. Plasma oxidative damage, measures as malondialdehyde (MDA) levels, was significantly attenuated by GB versus WB.

Conclusion: WGPF supplementation preserves plasma antioxidant capacity and prevents oxidative damage produced by a standard meal. WGPF may be a useful ingredient to develop new functional foods for prevention and treatment of chronic diseases that are associated with oxidative stress, such as atherosclerosis and diabetes.

O06

Enrichment of Olive Oil in Oleuropein by Ultrasound-Assisted Maceration and Antioxidant Activity

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The inhabitants of Mediterranean countries have a longer life expectancy and lower risk of chronic diseases. Epidemiological studies indeed suggest that the diet and lifestyle of these populations lead to decreased rates of cancer, diabetes and cardiovascular diseases. Olive oil is typically the main lipid source in this region, being used for cooking, cosmetics and medical purposes. The possibility to improve the nutritional value of olive oil by enriching it in phenolic compounds from olive leaves (e.g., oleuropein) by ultrasonic maceration was studied. The experimental design used led to the following optimal extraction conditions: ultrasonic power of 60W, temperature of 6°C and sonication duration of 45 min. The high total phenolic content (270.3±0.0 mg of gallic acid equivalent/kg of oil), oleuropein-tocopherol (55.0±2.0 g/kg of oil) concentrationsα (0.0±2.2 mg/kg of oil) and obtained by optimised ultrasound-assisted extraction (UAE) proved the efficiency of this process when compared with the conventional method. Furthermore, the radical-scavenging activity of the processed oil (DPPH test) and its stability toward lipid autoxidation (frying test) confirmed its enrichment in antioxidants. This protection may extend to the gastric compartment where millimolar concentrations of polyphenols can accumulate after consumption of olive oil. Thus oleuropein is characterized by its total stoichiometrie (ntot = 2.8±0.) and its rate constant of first H atom abstraction DPPH (K = 3703±246 M-s-), deduced from the kinetic analysis of the decay of the DPPH visible band following addition of the antioxidant.

O07

Fads Genotype Affects Change in Arachidonic Acid Levels after a Mediterranean Dietary Intervention

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Mediterranean diet increases intake of n-3 and n-9 fatty acids and lowers intake of n-6 fatty acids. Limiting n-6 fatty acid levels is expected to decrease levels of pro-inflammatory eicosanoids. The purpose of this study was to determine whether polymorphisms in fatty acid desaturases (FADS and FADS2) may identify subgroups who have a greater response to dietary changes. 07

individuals with a personal history of adenomas or colon cancer were randomized to either a Mediterranean diet or to a healthy diet. Fatty acids were measured in both serum and colonic mucosa at baseline and at 6 months. Each individual was genotyped for 4 SNPs in the FADS/FADS2 cluster. A 4-locus haplotype was constructed of the FADS and FADS2 genotypes. A co-dominant model was assumed to examine the relationships between SNPs and baseline fatty acids using ANOVA. Linear regression was used to evaluate the relationship of diet and genotype on change in fatty acid levels over 6 months. Genetic variation in the FADS cluster was strongly associated with baseline serum AA ($p < 0.000$) but less evidence was present for serum and colonic mucosa EPA and DHA. Minor allele carrier has lower AA levels at baseline than major allele carriers. Both diets led to slightly but not significantly lower AA levels at 6 months. The Mediterranean diet intervention increased both EPA and DHA proportions in the colonic mucosa. Minor alleles in the FADS gene cluster significantly modified response to serum AA after intervention. Interaction of polymorphisms in FADS genes and the Mediterranean diet led to significant decreases in AA concentrations only in individuals who carried minor alleles. Changes in n3 fatty acids were more driven by diet than by genotype. This decrease in n-6/n-3 fatty acid ratios may in turn limit the conversion of AA to inflammatory eicosanoids thereby affecting colorectal cancer risk.

O08

Antifibrotic Effect of Boswellic Acid Analogues as Inhibitor of Rat Hepatic Stellate Cells

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Background and Objectives: Therapeutic strategies to limit fibrosis progression include removing the source of injury, blocking hepatic stellate cell activation and collagen deposition, and increasing matrix degradation. After liver injury, HSCs become activated to a profibrogenic myofibroblastic phenotype and can regulate net deposition of collagens and other matrix proteins in the liver.

Fruits, vegetables, and natural beverages are among foods which collectively have been consistently associated with risk reduction in several kinds of diseases including liver disorders. Small molecules with anti-inflammatory activity, e.g., boswellic acid (BA) and its derivatives, that may inhibit HCV specific enzymes e.g. proteases and helicase, inhibit HSCs, and exhibit antiviral activity are hypothesized as specific, economic, and effective antifibrotic alternatives for HCV.

In this study, Boswellic acid and its derivatives have been tested for their activity to inhibit PDGF-driven proliferative activity of rat HSCs.

Methods:
– Synthesis of BA analogues:
– Glucosyl derivatives:

2,3,4,6-tetracetyl-(3-O-acetyl-keto-B-boswelloyloxy)-glucopyranose.
– Allylation of Acetyl-Keto-BA (AKBA) and Other deivatives
2- In vitro antiproliferative effect of BA analogues on Rat Hepatic Stellate Cells (HSC-T6)

Results: The results in this report show that the compounds with high activities inhibited proliferation of HSC-T6 cells at the highest concentration with inhibitory rates of about 00% when stimulated by PDGF. All the above results suggest that inhibition of HSC proliferation by tested compounds mainly arose from the blocking of the proliferation action induced by PDGF. A significant anti-proliferative activity of HSCs was observed after treatment with BA and its analogues

Conclusions: The obtained results showed that these compounds effectively blocked HSC prolif eration and they may by beneficial in liver fibrosis. The relationship of structure-bioactivity may provide a basis for rational structure modification. Boswellic acid and its analogues may be used as potential antifibrotic agents among HCV patients.

O09

Consumption of Fried Foods and Risk of Metabolic Syndrome: The Sun Cohort Study

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Background and Objectives: There is scarce evidence from long-term prospective studies relating the consumption of fried foods with the incidence of Metabolic Syndrome (MS). The aim of this study was to assess the association between fried food consumption and the incidence of MS.

Methods and Results: We followed 8,289 participants (283 men and 5,476 women, mean age = 35.9 y, SD = 0.4) during a median period of 8.3-y. They were initially free of any MS criteria. The MS was defined according to the harmonizing criteria of the International Diabetes Federation and the American Heart Association/National Heart, Lung, and Blood Institute. Each component of the MS was recorded at the 6th and 8th-y of follow-up. The outcome was defined as the presence of greater than or equal to 3 of the components of MS after greater than or equal than 6 years of follow-up.

During 65,335 person-years, 420 incident cases of MS were identified. Frequent consumption of fried foods was not associated with the incidence of MS [HR = 0.98 (95% CI: 0.77–0.26) p for trend = 0.86]. However, central adiposity and high blood pressure were positively associated with fried food consumption [HR for consumption greater than or equal to 4 times/week compared with less than or equal to 2 times/week = 0.0 (95% CI: 0.0–0.9) (p for trend 0.02) and HR = 0.6 (95% CI: 0.02–0.32) (p for trend 0.0), respectively] after multivariable adjustment.

Conclusions: In this Mediterranean cohort of relatively young adults, frequent consumption of fried foods was not associated with MS. Two out of five components of MS (central adiposity and

high blood pressure) were positively associated with frequent fried food consumption.

O10
Assessment of Heterogeneity in Types of Vegetables Served by Main Household Food Preparers in Ontario and Food Decision Influencers

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Background: Higher fruit and vegetable consumption has been promoted through guidance such as Canada's Food Guide, and 44% of people over 2 reported eating 5 or more fruits and vegetables in 2008. Can consumption of fruits and vegetables be further improved? While nutritionally relevant, global measures of fruit and vegetable consumption may mask variation in the types and forms of vegetables preferred by different individuals.

Objectives: To explore preferences for and perceptions of vegetables, we assessed main food preparers based on the frequency of preparing specific Canadian-grown vegetables (i.e., potatoes, frozen potatoes, tomatoes, canned tomatoes, mushroom, broccoli, asparagus, Brussels sprouts, and frozen mixed vegetables).

Methods: Latent profile analysis of data from an on-line panel survey (N = 756) extracted three segments of food preparers. Other questions were analyzed according to consumption segments.

Results: More open to new recipes, the "Crucifer lover" segment (2.6%) prepared and consumed substantially more Brussels sprouts, broccoli and asparagus than the other segments. Low convenience orientation was the predominant characteristic of the crucifer lover segment. Furthermore, they endorsed lower belief that healthy foods tend not to taste good and higher variety seeking in meal planning than individuals in the other segments. Although similar to the "Average consumer" segment (5.0%) in many ways, the "Frozen vegetable user" segment (3.6%) used significantly more frozen vegetables than the other segments due to higher prioritization of time and convenience in meal preparation and a stronger "healthy-not tasty" perception. Furthermore, perception of specific vegetables on taste, healthiness, ease of preparation and cost were substantially different across the three consumer segments.

Conclusion: The substantial heterogeneity in the types of vegetables consumed and perceptions across consumer segments has implications for the development of new, more targeted approaches to promoting these foods.

O11
Meat Intake, Cooking Methods and Doneness and Risk of Colorectal Cancer

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Background and Objectives: Meat intake has been associated with colorectal cancer (CRC). However this relationship may be modulated by cooking methods and degree of doneness, which influence the formation of carcinogens. Our objective was to assess the relationship between meat intake, cooking methods and degree of doneness and CRC in a multi-center Spanish case-control study.

Methods: Meat intake was assessed using a food frequency questionnaire, including detailed cooking methods and meat doneness questions, in 504 newly-diagnosed CRC cases and 2606 population-based controls, recruited in 8 Spanish hospitals between 2007 and 202. Food density (grams of meat/00kcal) was used to assess higher proportions of meat intake. Odds ratios (OR) and 95% confidence intervals (CI) were calculated using logistic regression models comparing intake tertiles (for overall meat intake and degree of doneness) or dichotomizing at the median for different cooking methods. All models were adjusted for age, gender, study area, body mass index, educational level, smoking habits, waist circumference, total energy intake and daily ethanol, fiber, fruit and vegetable intakes.

Results: Mean meat intakes were 4±76 and 8±64 g/day among cases and controls respectively. After adjustment, overall meat intake was associated with significantly increased odds of CRC (OR = 0.40; 95%CI = 0.7–0.68). Meat doneness was significantly associated with CRC, with no association for rare (OR = 0.85;

95%CI = 0.73–0.99), but elevated risk associated with medium- and well-done meat (OR = 0.48; 95%CI = 0.24–0.76). There was limited evidence of differences in risk associated with meat cooking methods.

Conclusions: Our study suggests that meat intake is a risk factor for CRC, and that greater degrees of doneness may increase this risk.

O12
Adherence to the Mediterranean Diet, Prospective Abdominal Fat Change, and 0-Year Incidence of Abdominal Obesity

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Background and Objectives: Abdominal obesity is a strong predictor for metabolic disorders and premature mortality. Prospective data on the association between the Mediterranean diet and surrogate markers of abdominal fat is scarce. Therefore, we determined the relationship between the adherence to the Mediterranean and a) changes in waist circumferences (WC) and waist to height ratio (WHtR) and b) 0-year incidence of abdominal obesity.

Methods: We conducted a prospective population-based study of 3052 male and female Spaniards aged 25 to 74 years who were followed from 2000 through 2009. Diet and leisure-time physical activity (LTPA) were recorded on validated questionnaires. Weight, height, and WC, were measured.

Results: WC and WHtR increased by 4.6% and 4.3%, respectively. 0-year incidence of abdominal obesity was 22.6% and 23.9% according to WC and WHtR cut-offs, respectively. Adherence to the previously validated Mediterranean like diet score (MLDS) was negatively associated with WC and WHtR gain in sex and age adjusted models. Further adjusting for energy intake, energy over and underreporting, educational level, alcohol consumption, smoking, BMI, and WC at baseline did not affect the direction and magnitude of the associations. The odds of becoming abdominal obese were 0.60 (CI: 0.40;0.92) and 0.54 (CI: 0.33;0.88) according to WC and WHtR cut-offs in participants with high adherence to the MLDS (top tertile) and with WC and WHtR baseline values above the mean.

Conclusions: Adherence to the Mediterranean diet prevents abdominal fat gain. The protective effect of the Mediterranean diet on 0-year incidence of abdominal obesity was limited to participants with higher baseline WC and WHtR.

Posters with Presentation

PP01
Incretin-Like Effect of Grape-Seed Derived Procyanidins

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Procyanidins derived from grape seed (GSPE) improve glucose homeostasis under insulin-resistance conditions [1] due to their insulin-like effect on adipose tissue [2] and to their action on b-cells [3]. But their bioavailability remains as an open question. We postulate that procyanidins, through their direct interaction with enteroendocrine cells and/or their inhibition of the enzyme DPP4, could have an incretin-like effect.

We showed that GSPE inhibits DPP4 activity in vitro [4]. We also proved its inhibitory activity in human cell lines, and after chronic treatments in healthy rats, cafeteria-feed rats and Zucker fa/fa rats [4]. We described an inhibitory effect on intestinal DPP4 activity and mRNA expression. Now we treated CaCo2 cells (enterocytes) with 250 mg of GSPE/L for 1 hour and collected the basolateral media to treat HUVEC cells (vascular endothelial cells) for 1 hour. Under this treatment, GSPE compounds absorbed by CaCo-2 cells inhibited the DPP4 activity in these endothelial cells.

To directly prove the incretin effect, we treated Wistar rats with an acute GSPE treatment (1 g of GSPE/kg of body weight) for 1 hour. During the last 20 minutes rats received a glucose load. We found that GSPE treated rats showed a lower increase on glucose levels than the controls, accompanied by an increase on plasmatic insulin. GSPE treated rats also showed an increased plasmatic active GLP-1.

In conclusion, GSPE improves glycemia after an oral glucose load, due to its incretin-like effect through the inhibition of DPP4 activity that leads to increased active GLP-1.

PP02

No Effect of a Combination of Soya Protein and Psyllium on Plasma LDL Cholesterol Levels in Patients with Hypercholesterolemia

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Background and Objectives: Psyllium and soya protein have both been reported to lower plasma cholesterol. The aim of this study was to determine the effect of a combination of soya protein and psyllium on plasma LDL cholesterol levels.

Methods: The study design was a randomised, double-blind, placebo controlled, crossover study of 57 patients with hypercholesterolemia. To be included, patients (both sexes) should have an LDL cholesterol between 3.0 and 5.5 mmol/l, plasma triglycerides < 2.5 mmol/l, BMI between 18.5 and 35 and be aged 20–70 years. Patients were randomised to a supplement with two of the following: Psyllium, psyllium placebo (cellulose), soya protein and soya-protein placebo (casein) for two 6 week periods separated by 4 weeks of washout. All patients had been advised a heart healthy diet before inclusion.

Results: Nineteen men and 38 women with a mean age of 55.9 years and mean plasma LDL cholesterol of 4.32 mmol/l were included. Results were available for 57 participants. Plasma LDL cholesterol decreased by 0.13 mmol/l (CI: −0.03;0.13) comparing psyllium to its placebo (p = 0.11), while LDL cholesterol increased by 0.09 mmol/l (CI: −0.07;0.25) comparing soya protein with its placebo (p = 0.28). There was no interaction between supplements with soya and psyllium (p = 0.69) indicating no effect of the combination of the supplements. There were no clinically meaningful effects on HDL cholesterol, triglycerides or apolipoprotein B levels of any of the preparations or their combinations.

Conclusion: Neither psyllium nor soya protein reduced plasma LDL cholesterol in this controlled trial. Furthermore, there was no effect of the combination of psyllium and soya on LDL cholesterol levels.

PP03

Mediterranean Diet and Functional Indicators Among Older Adults in Non-Mediterranean and Mediterranean Countries

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Background and Objectives: The Mediterranean diet (MEDDIET) has been shown to be related to longevity. Its association with functional indicators is yet to be explored. This study aimed to determine the association between adherence to MEDDIET and function of older adults in the United-States and Israel.

Methods: Data from the US National Health and Nutrition Survey (NHANES) 1999–2002 and from the Israeli National Health and Nutrition Survey (MABAT ZAHAV) 2005–2006 were used. Community dwelling older adults with nutritional and functional data were included in the analyses. Adherence to the MEDDIET was assessed by the 9-unit score (MDS).

Results: Among 2791 NHANES and 1786 MABAT ZAHAV participants, mean age = 71.2y and 74.9y, 20% and 27% had low MDS (0–2), 66% and 62% had a medium score (3–5), and 14% and 11% had a high score (6–9), respectively. Higher MDS was associated with higher education and better lifestyle behaviors. Cognitive and physical functions were significantly better in NHANES and MABAT ZAHAV among the highest MDS.

In NHANES, MDS (high vs. low) was associated with faster walking speed after adjusting for gender, age, education, BMI, physical activity, and number of chronic diseases [Odds Ratio (OR) = 0.71, p = 0.034]. When cognitive function was added, the association was attenuated [OR = 0.75, p = 0.093]. In MABAT ZAHAV, in an adjusted model, MDS was associated with fewer disabilities [OR = 0.89, p = 0.014] for one-point increase in MDS.

Conclusions: Adherence to the MEDDIET is associated with better health characteristics and better functioning. Further studies may shed light on temporal and causal relationships between MEDDIET and these parameters.

PP04

Combination of the Anti-Adipogenic Agents Resveratrol and Phenelzine in Drinkng Water is not Useful in Treating Very-High-Fat Diet-Induced Obesity

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The polyphenol resveratrol is well-known to inhibit adipogenesis under both invitro and in vivo conditions. Phenelzine also limits the adipocyte differentiation of different murine and human models of cultured preadipocytes, and we have recently reported that this hydrazine derivative inhibits de novo lipogenesis in mouse adipocytes (Carpéné et al., J Neural Transm., 2013, in press). Since hydrazine analogues of natural or contaminant origin can be found in edible plants, it was tested whether a dietary supplementation with a combination of phenelzine and resveratrol was able to reduce the adiposity and glucose intolerance induced in mice by very-high-fat diet (60 % HFD), in a way offering more interest than when the compounds are used separately. No reduction of body weight gain was observed in the group ingesting very low, water-soluble, dose of resveratrol and was almost inexistant in the group treated with both phenelzine and resveratrol. The alteration of glucose tolerance induced by 60% HFD challenge, and the increased percentage of fat mass, were not reversed in the treated groups, in spite of a reduced food and water intake. In view of these findings, negative in nature, the direct effects of a combination of phenelzine and resveratrol were verified on adipocyte lipogenesis. Unexpectedly, there was no additivity of the effects of 10 µM phenelzine and resveratrol in inhibiting glucose transport and de novo lipogenesis in mouse fat cells. Such lack of synergism in fat cells partly agrees with the limited effects observed in vivo. Taken together, our observations indicate that the combination of low doses of resveratrol and phenelzine has apparently no interest in treating obesity, at least when induced by HFD chlallenge.

PP05

Different Effects on Gene Expression Profile by High Extra Virgin Olive Oil and Corn Oil Diets in Experimental Breast Cancer

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Background and Objectives: We have previously demonstrated the differential effect of high fat diets on experimental mammary carcinogenesis. Thus, whereas a high corn oil diet (HCO) has a clear stimulating effect, a diet high in extra virgin olive oil (HEVOO) has a negative modulatory influence. In this work we have studied the effects of these high fat diets on the gene expression profile of mammary gland and experimental tumours.

Methods: Female rats were distributed into 5 groups depending on the type and timing of diet administration: LF (low fat diet from weaning), HCOIP (HCO from weaning), HCOP (HCO from induction), HEVOOIP (HEVOO from weaning), and HEVOOP (HEVOO from induction). For each group, 6 adenocarcinomas, and 3 abdominal mammary glands at different ages (36 days, 51 days, 100 days and 246 days) were selected. Gene expression profile was determined using GeneChip® Rat Exon 1.0 ST Array (Affymetrix).

Results: Data showed that the mammary gland presented a higher number of differentially expressed genes by effect of diets than tumours, being most of them downregulated in comparison to control. In mammary gland, after short dietary intervention the genes differentially expressed where mainly specific in each group, whereas from 51 days onwards both high fat diets regulated a higher number of common genes. In both tissues, the high fat diets modulated the expression of genes with a role in metabolic and developmental processes. Moreover, in mammary gland, the HCO diet, but not the HEVOO one, downregulated genes related to specific biological processes, such as the immune system response.

Conclusions: Our data suggest that these diets have different effects on the expression profile of both mammary gland and experimental tumors.

Novel Biomarkers of Bread Intake in Cardiovascular High-Risk Participants. A Mass Spectrometry-Based Metabolomics Approach

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Bread is a key component of the Mediterranean Diet which provides important amounts of complex carbohydrates, fiber and B vitamins, among other bioactive compounds, especially whole-grain bread (WG-B). Nutrimetabolomics explore the complex relationship between the consumption of dietary compounds and the maintenance of health or disease development with the aim to discover new biomarkers of intake and effect, respectively. On this regard, the study of food metabolome measure diet exposition to food consumption.

In this study, a metabolomics strategy designed to discover new biomarkers of food consumption was applied by classifying participants of the Predimed study according their reported bread consumption (either white bread (WH-B) or WG-B).

Bread intake was defined according to FFQ which was previously completed by the free-living elderly Mediterranean population at high cardiovascular risk. Subjects of the Predimed study were stratified at baseline by their consumption of bread: 2 groups of Regular-bread consumers (≥1 portion of bread/day either WH-B or WG-B) or non-bread consumers (NBC) (≤3 portions of bread/month). Urine samples of subjects were analyzed by HPLC-Q-TOF-MS followed by multivariate data analysis (OSC-PLSDA and HCA).

Urinary metabolome showed differences between both regular-bread consumers and NBC. The metabolite furosine was tentatively identified showing no differences between both types of bread consumption. This metabolite has been related to roasting bread processing. Furthermore, regular-consumers of WG-B showed significantly higher levels of 2,8-dihydroxyquinoline-β-D-glucuronide than NBC and WH-B. This metabolite has been associated with PPAR-alpha activity.

The results reinforce the capacity of metabolomics to explore the metabolism impact of dietary components and the ability to obtain new biomarkers of intake and effect combining epidemiological nutritional data and metabolomics.

Polyphenols from Raisins Have Similar Bioavailability to those from Grapes and White Wine: A Human Intervention Study

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The polyphenol composition of raisins is not as simple to measure as it is for grapes and white wine owing to changes occurring during the drying process and the high sugar and fibre content. Extraction efficiency was improved (78+6.7% to 125+5% recovery of spiked compounds) when extracting a dried powder of raisins. Caftaric acid was present at comparable levels to those in the literature (31.2 µg/g of raisin) whilst rutin, protocatechuic acid, epicatechin and catechin were at levels lower than reported. Grapes and non-alcoholic white wine generally had higher levels of measured polyphenols apart from caftaric acid. A cross-over intervention study (n = 9) was carried out involving consumption of 100 g raisins, 400 g grapes and 300 ml non-alcoholic white wine. Despite the differences mentioned above, raisins (p = 0.002) and grapes (p = 0.005) resulted in a significantly higher level of dihydroferulic acid (DHFA) in the urine compared to non-alcoholic white wine. Other metabolites were present at comparable levels for all three treatments, showing that raisins, white wine and grapes give similar levels of polyphenol metabolites in humans despite substantial differences in processing of the grapes.

PP09

A Mediterranean Diet Supplemented with Nuts or Virgin Olive Oil Increases Total Polyphenol Excretion and Plasma Nitric Oxide, and Significantly Decreases Blood Pressure

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Background and Objectives: Several observational and intervention studies have found an inverse association between the risk of cardiovascular disease and the consumption of polyphenol-rich foods and beverages such as cocoa, fruit and vegetables, tea, virgin olive oil and wine. The determination of total polyphenols (TP) excreted in spot urine samples has been successfully used as a biomarker of the consumption, bioavailability and accumulation of TP in a cross-sectional clinical trial.

The aim of this study was to evaluate the effects of a one-year intervention with two traditional Mediterranean diets (Med-diet) supplemented with extra-virgin olive oil (EVOO) or nuts on total polyphenol excretion (TPE) in spot urine samples, as well as on systolic and diastolic blood pressure (BP) and plasma nitric oxide (NO) in individuals at high cardiovascular risk.

Methods: An intervention substudy was carried out with 180 high-risk participants within the PREDIMED trial. Participants were assigned to a low-fat control diet (n = 65) or to a Med-diet group with a high intake of either EVOO (n = 65) or nuts (n = 50). Anthropometrics and clinical measures, BP and plasma NO were measured at baseline and after one year of intervention. TPE in urine samples was determined by the Folin-Ciocalteu assay.

Results: Systolic and Diastolic BP decreased significantly after the Med-diet intervention supplemented with EVOO [–5.71 mm Hg (CI –9.16 to –2.27; P < 0.01) and –3.37 mm Hg (CI –5.23 to –1.50; P = 0.01), respectively] or nuts [–6.31 mm Hg (CI –11.18 to –1.44; P = 0.01) and –4.51 mm Hg (CI –6.84 to –2.19; P < 0.001), respectively]. These changes were associated with increases in urinary TPE and plasma NO.

Conclusion: A one-year intervention with a traditional Med-diet supplemented with either EVOO or nuts increased TPE in urine samples and plasma NO in elderly participants, and decreased systolic and diastolic BP.

Posters

P001

Incretin-Like Effect of Grape-Seed Derived Procyanidins

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Procyanidins derived from grape seed (GSPE) improve glucose homeostasis under insulin-resistance conditions [1] due to their insulin-like effect on adipose tissue [2] and to their action on b-cells [3]. But their bioavailability remains as an open question. We postulate that procyanidins, through their direct interaction with enteroendocrine cells and/or their inhibition of the enzyme DPP4, could have an incretin-like effect.

We showed that GSPE inhibits DPP4 activity in vitro [4]. We also proved its inhibitory activity in human cell lines, and after chronic treatments in healthy rats, cafeteria-feed rats and Zucker fa/fa rats [4]. We described an inhibitory effect on intestinal DPP4 activity and mRNA expression. Now we treated CaCo2 cells (enterocytes) with 250 mg of GSPE/L for 1 hour and collected the basolateral media to treat HUVEC cells (vascular endothelial cells) for 1 hour. Under this treatment, GSPE compounds absorbed by Caco-2 cells inhibited the DPP4 activity in these endothelial cells.

To directly prove the incretin effect, we treated Wistar rats with an acute GSPE treatment (1 g of GSPE/kg of body weight) for 1 hour. During the last 20 minutes rats received a glucose load. We found that GSPE treated rats showed a lower increase on glucose levels than the controls, accompanied by an increase on plasmatic insulin. GSPE treated rats also showed an increased plasmatic active GLP-1.

In conclusion, GSPE improves glycemia after an oral glucose load, due to its incretin-like effect through the inhibition of DPP4 activity that leads to increased active GLP-1.

Influence of Psychosocial Factors on Breastfeeding Behavior of Mothers in Kakamega Central District, Kenya

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Health professionals currently use fact-based approach to promote breastfeeding behavior in Kenya. This practice imposes messages to breastfeeding mothers without considering their opinions and beliefs thus posing a challenge to the Ministry of Health. Approximately 52% of mothers initiate breastfeeding within the first hour of birth, 13% exclusively breastfeed for six months, while 57% continue breastfeeding through the first year. These rates fall short of the national goal and desired target of achieving the fourth Millennium Development Goal aimed at reducing the under five mortality rates by 2015. This study was conducted to determine the predictive power of maternal attitude, subjective norm and perceived behavioral control on breastfeeding intention of mothers in Kakamega Central District. A cross-sectional research based on a modified Model from Ajzen's Theory of Planned Behavior was used. Purposive sampling was used to select three postnatal clinics and one home based clinic from a total of 10 clinics in Kakamega Central District. Proportionate stratified sampling was used to select 230 respondents out of 3,873 aged between 18–40 years. Focus Group Discussions collected Qualitative data which was analyzed using a Grounded Theory Approach. Interview schedules and questionnaires were used to collect Quantitative data which was analyzed using chi-square test and Pearson's correlation coefficient. Structural Equation Modeling was used to determine the relationships between Latent and Observed variables. Data fitted acceptably well after modification index was done. The predictive power indicated maternal attitude to a better predictor of breastfeeding intention (â = 0.38, p < 0.01, n = 230); followed by perceived behavioural control (â = 0.35, p < 0.01, n = 230); then subjective norm (â = 0.25, p < 0.05, n = 230). Intention in turn strongly predicted breastfeeding behaviour (â = 0.95, p < 0.001, n = 230) and its predictors accounted for 68% of the variance on breastfeeding intention. Breastfeeding promotions should therefore utilize communication approaches with theoretical backgrounds that enhance comprehension of motivational components of breastfeeding intention.

Factors Influencing Nutritional Status and Food Consumption Patterns of Children with Cancer: A Case of Kenyatta National Hospital, Kenya

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Observations at the Kenyatta National Hospital wards prior to the research period indicated a marked increase in cases of child cancer patients being admitted with various complications. These complications interfered with the children's food consumption patterns as there was increased morbidity and infections since the immunity of these children was weakened and they were not able to fight the disease effectively. The purpose of this study was to investigate the factors influencing nutritional status and food consumption patterns of children with cancer at Kenyatta National Hospital. A descriptive survey design was used. The study sample was made up of 60 children aged 6 months' to14 years and 15 service providers. Purposive sampling was used. Data collection instruments included a self-administered questionnaire, an interview schedule, anthropometry, 24 hour dietary recall and an observation checklist. Data was analysed using the Statistical Package for Social Sciences Programme. Research findings revealed that 32% of the children were stunted, 26% were underweight while 12% were wasted. The findings confirmed that all the 18.3% children in the advanced stage of the disease were malnourished. A majority (88.5%) of the children's food intake was affected by the type of treatment received while the disease process affected 71.8% of the patient's food intake. Most of these interferences occurred in the middle (55%) and advanced stages (18.3%) of the disease. Therefore as treatment becomes more vigorous and as the disease advances the patients tend to develop more nutritional problems since their food intake is affected. Therefore, it is concluded that food consumption patterns of children with cancer at Kenyatta National Hospital were influenced by the following factors: type of cancer a child suffered from, stage of the disease, duration of cancer disease and therapy used to manage their conditions

Effect of Oleic Acid on Intestinal Epithelial Cancer Cell Growth

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Background and Objectives: Colorectal cancer etiology is complex, involving both genetic and environmental factors. However, 50–80% of cases of colorectal cancer are considered due to environmental factors, such as dietary habits [1]. Despite high fat intake being associated with increased risk of cancer, there are some indications that different types of fat have different effects [1], effects that could be related with fatty acid composition of fat. Thus, it has been shown that MUFAs such

Abstracts

as oleic acid promote human colon growth [2] whereas n-3 and n-6 PUFAs have different effects due to their action on eicosanoid production [3], mediators involved in intestinal epithelial cell growth [4]. However, there are not studies that assess the mechanism of the proliferative action of oleic acid on intestinal epithelial cells. The aim of this study was contributed to clarify this point using an adenocarcinoma derived cell line (Caco-2).

Results and Conclusions: Our results show that oleic acid (10–100 μM), cis form of C18:1 was able to induce Caco-2 cell growth and DNA synthesis in absence of growth factors whereas the trans form, elaidic acid, was not proliferative. Moreover, we observed that palmitoleic acid (C16:1) but not myristic and erucic acids (C14:1 and C22:1, respectively) were able to reproduce the mitogenic effects induced by oleic acid. Furthermore, we also demonstrated that proliferative effects induced by oleic could be related with eicosanoids synthesis. Thus, our findings shown that 5-lipoxygenase pathway inhibition reverted the proliferative effect of oleic acid and that this event was blocked by cysteinyl leukotriene receptor anatgonist.

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P007

Mediterranean Diet and Risk of Hyperuricemia in Elderly Subjects at High Cardiovascular Risk

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Background and Objectives: A Mediterranean-type diet could play a role in decreasing serum uric acid concentrations due to its antioxidant and anti-inflammatory properties. To evaluate whether better adherence to the Mediterranean diet reduced or prevented the development of hyperuricemia.

Methods: Cross-sectional and prospective analysis in 4449 elderly subjects at high cardiovascular risk participating in the PREDIMED study, a randomized clinical trial for the primary prevention of cardiovascular disease. A validated 14-item questionnaire was used to assess adherence to the MedDiet. Hyperuricemia was considered to be present when serum uric acid was >7 mg/dL in men or >6 mg/dL in women.

Results: After a median follow-up of 5 years, 756 individuals of the 3037 (24.9%) who did not have hyperuricemia at baseline developed hyperuricemia, whereas 422 of the 964 hyperuricemic individuals at baseline (43.8%) reverted this condition. In cross-sectional analyses, an inverse association was observed between baseline adherence to the Mediterranean diet and hyperuricemia (P for trend <0.001). Baseline consumption of red meat, fish and seafood, and wine was associated with a higher prevalence of hyperuricemia. The multivariable-adjusted odds ratio for reversion of hyperuricemia was 1.74 (95% CI: 1.04–2.90) in the highest versus the lowest quintile of baseline adherence to the Mediterranean diet. No significant association was found between baseline adherence to Mediterranean diet and the incidence of hyperuricemia. The three intervention diets had a similar effect in the reduction of hyperuricemia.

Conclusions: Higher baseline adherence to the MedDiet is associated with lower risk of hyperuricemia.

P008

Frequency of Nut Consumption and Risk of Total Mortality in the Predimed Study

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Background and Objectives: The frequency of nut consumption has been associated with a reduced risk of coronary heart disease mortality, sudden cardiac death and total mortality. The association between nut consumption and total mortality has not been evaluated in subjects at high cardiovascular risk from a Mediterranean region. To examine the association be-

tween the frequency of nut consumption and the risk of total mortality in individuals at high cardiovascular risk.

Methods: Prospective associations were tested in 7,216 subjects randomized to one of the three interventions (two Mediterranean diets supplemented with nuts or olive oil or a control diet) in the PREvención with MEDiterranean DIet trial (median follow-up: 4.8y). Nut consumption was ascertained by a validated food-frequency questionnaire at baseline, and mortality by medical records and consultation of National Death Index. Cox regression models were fitted to estimate the hazard ratios (HR) for total mortality.

Results: We documented 323 cases of death. Total nut, walnut consumption and consumption of other nuts (excluding walnuts) were associated with a significantly reduced risk of total mortality after controlling for potential confounders (P- trend <0.05). Compared to those who never consumed nuts, those who consumed nuts >3 times per week had 39% lower risk of mortality (HR: 0.61; 95% CI: 0.45, 0.83). In the Mediterranean diet+nuts group, those individuals who consume nuts frequently had lower risk of mortality compared to those in the lower category (HR: 0.37; 95% CI: 0.22, 0.66).

Conclusions: The frequency of nut consumption was associated with a significantly reduced risk of total mortality.

P009

Macronutrient Intake, Kidney Function and Chronic Kidney Disease: A Cross-Sectional Study in a Population at High Cardiovascular Risk

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Background and Objectives: Litlle is known about the role that nutrient intake plays in kidney function. The aim was to examine the associations between nutrient intake and the preva-

lence of chronic kidney disease (CKD) or microalbuminuria (MiA) in elderly individuals at high cardiovascular risk.

Methods: 2123 nondiabetic subjects from the PREDIMED trial were assessed cross-sectionally. Dietary data were collected using a food-frequency semiquantitative questionnaire. Analysis of covariance was used to assess associations between quartiles of nutrient intake and estimated glomerular filtration rate (eGFR) or urinary albumin-to-creatinine ratio (ACR). The odds ratio (OR) for the presence of CKD or MiA according to quartiles of nutrient intake was assessed by logistic regression models.

Results: Subjects in the top quartile of fiber intake had a decreased risk of CKD [OR: 0.68; 95% CI: 0.48–0.95]. Subjects in the highest quartile of n-6 polyunsaturated fatty acid (n-6 PUFA) consumption showed lower average eGFR. Conversely, subjects in the highest quartile of n-6 PUFA intake showed an increased risk of CKD [OR: 1.44; 95% CI: 1.03–2.01]. No significant associations were found between the intake of other macronutrients and eGFR, urinary ACR or risk of CKD or MiA.

Conclusions: A high n-6 PUFA intake was inversely associated with eGFR and directly associated with an increased risk of CKD, while a high fiber intake was associated with a decreased risk of CKD.

P010

Are Low Glycaemic Index Diets an Alternative in the Obesity Treatment in Spain?

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Energy-restricted diets are the actual treatment for obese patients in Spain but some studies suggest that low glycaemic index diets could be a substitute to improve the treatment for obesity. Several trials have been done to prove if low glycaemic index diets reduce lipid profile in type 2 diabetic patients but there is still controversy in this field. Some trials show a total cholesterol reduction in patients with type 2 diabetes mellitus after following a low-glycaemic index diet. However, other studies did not find any statistical significance but found markedly reductions in cholesterol and triglycerides. Findings from the trials included in this literature review must be interpreted with caution because they have some limitations like population characteristics and number and bias might have been introduced with the types of food included in the diets.

P011

Knowledge and Attitudes of Restaurant Managers Regarding Healthy Eating

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Eating outside home has become very common in western countries. Food service industry has therefore a growing significance in people's nutrition. Very few studies focus on food choices, food's nutritional values, and strategies aimed to increase nutritional value of meals outside home. Existing research shows that healthier choices can be promoted through increasing availability and attractiveness of healthy menu items, much more than by nutritional labeling of the items. It is also known that the pricing of foods is one of the leading factors influencing the customer's choice.

This study examines the knowledge and attitudes of Israeli restaurant managers on the subject of healthy eating. A structured questionnaire was answered by 21 restaurant managers in several cities. The questions dealt with their managerial experience, knowledge in healthy nutrition and their attitudes to it. The managers were asked who establishes the menu, what the main considerations of menu planning are, and whom they would like to consult about it.

Healthy eating was found to be among the less important factors in menu establishment, and most managers expressed no interest in consulting a dietitian or other health professional about it. The importance a manager attributed to nutrition considerations of restaurant clients strongly correlated with his personal interest towards healthy food. Managers who were personally more interested in healthy food also estimated the production costs of healthy dishes as no higher than those of regular dishes.

Strengthening the interest of restaurant managers in healthy eating may therefore contribute to healthier nutrition among the customers of their restaurants. Additional research is needed to evaluate food service managers' knowledge and attitudes regarding healthy food, and to examine strategies of promoting this important concern.

P012

Association Between Dietary Phylloquinone Intake and Peripheral Metabolic Risk Markers Related to Insulin Resistance and Diabetes in Elderly Subjects

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Background and Objectives: Vitamin K has been related to glucose metabolism, insulin sensitivity and diabetes. Because inflammation underlies all these metabolic conditions, it is plausible that the potential role of vitamin K in glucose metabolism occurs through the modulation of cytokines and related molecules. The purpose of the study was to assess the associations between dietary intake of vitamin K and peripheral adipokines and other metabolic risk markers related to insulin resistance and type 2 diabetes mellitus.

Methods: Cross-sectional and longitudinal assessments of these associations in 510 elderly participants recruited in the PREDIMED centers of Reus and Barcelona (Spain). We determined 1-year changes in dietary phylloquinone intake estimated by food frequency questionnaires, serum inflammatory cytokines and other metabolic risk markers.

Results: In the cross-sectional analysis at baseline no significant associations were found between dietary phylloquinone intake and the rest of metabolic risk markers evaluated, with exception of a negative association with plasminogen activator inhibitor-1. After 1-year of follow-up, subjects in the upper tertile of changes in dietary phylloquinone intake showed a greater reduction in ghrelin (−15.0%), glucose-dependent insulinotropic peptide (−12.9%), glucagon-like peptide-1 (−17.6%), IL-6 (−27.9%), leptin (−10.3%), TNF (−26.9%) and visfatin (−24.9%) plasma concentrations than those in the lowest tertile (all $p < 0.05$).

Conclusion: These results show that dietary phylloquinone intake is associated with an improvement of cytokines and other markers related to insulin resistance and diabetes, thus extending the potential protection by dietary phylloquinone on chronic inflammatory diseases.

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Background and Objectives: The lack of folate in diet is one of the most common nutritional deficiencies in the world, with serious consequences on human health related. Not only the deficiency, but also a high intake of synthetic folic acid in supplement foods, can cause different damages in health. Nevertheless, this is not expected to occur with the natural level of folate in food. The aim of this work was to study the sensory acceptability of folate-fortified breads (with spinach or Swiss chard) compared to non-fortified ones.

Methods: Sensory evaluation of the bread was conducted by acceptability testing of the fortified and non-fortified breads. Four different combinations were assessed: (1) 20% and 40% spinach-fortified white bread; (2) 20% and 40% spinach-fortified whole-grain bread; (3) 20% and 40% Swiss chard-fortified white bread; (4) 20% and 40% Swiss chard-fortified whole-grain bread. 60 consumers evaluated the intensity and acceptability of colour of the crumb, vegetable odour, vegetable taste, and sponginess of the crumb.

Results: When the taste was analyzed, the majority of consumers (44–61%) scored the 40% vegetable (spinach and Swiss chard) fortified bread in the "just the way I like" category. Regarding white breads (40% spinach and 40% Swiss chard) and whole-grain breads (40% spinach and 40% Swiss chard), most of the consumers considered both odour and taste, indifferent or classified them in the "like" option in all samples. A similar trend was observed in odour, taste, and degree of overall acceptability. Finally, the degree of innovation and intention to buy fortified breads were studied, indicating a preference from those fortified with 40% of vegetables.

Conclusion: Incorporation of 40% spinach or Swiss chard in bread meets the folate RDI for adults in almost 40% without adverse effects on sensory properties.

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Objective: The aim of this study was to investigate the diet quality and nutritional status of a group of university students from Madrid, based on vitamin B_{12}, vitamin D and dyslipemias.

Materials and Methods: The study was conducted on randomly university students from Madrid (n = 70). Dietary intake data were collected for 3-days recall and for this data the diet quality index was calculated. Body mass index was used as criteria to identify underweight, normal weight and overweight-obesity. Food consumption and alcohol intake were registered. Blood analyses were performed during April and May 2010. The statistical analyses were performed with SPSS 17.0, significance level $p < 0.05$.

Results: Males are 24 years old, mean BMI is 23.9 kg/m^2, 71.4% are normal weight and 21.4% presented overweight-obesity. Females are 22 years, mean BMI is 22.8 kg/m^2 and 20.4% presented overweight-obesity. Food eating behavior was different between males and females. With respect females, they have normally 4–5 with meals/day and they sometimes have breakfast. Males have 3 meals/day and have breakfast every morning.

Cholesterol status in males was 180 mg/dL (64%) and 173 mg/dL in females (78.2%). Vitamin D deficiency was observed in 28.6 % of males and 43.6% of females, no deficiency of selenium and vitamin B_{12} was detected in these students.

The diet quality index for males is inadequate (50%) and similar result was observed in females (47.4%).

Conclusions: There was inadequate good diet in 50% of university students, so it is recommended to formulate appropriate intervention programs concerning in dietary behavior habits and improving quality of life.

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Strawberry contains important dietary components including vitamins and minerals, and is a rich source of phytochemical compounds [1, 2]. These substances possess strong antiinflammatory, antioxidant, anticarcinogenic, and photo-protective properties and are able to modulate enzymatic pathways; thus, they can prevent human diseases related to oxidative stress [3–5]. Breeders are focused on the improvement of the content of specific bioactive compounds in strawberry, since higher levels of micronutrients and phytochemicals in fruit may be an important tool to support a higher antioxidant intake [6]. In this study, we tested the effective protection of strawberry extract or strawberry consumption against oxidative damage on several models: in vitro on human dermal fibroblasts stressed through the exposure to UV-A radiation or chemical substances, and in vivo on animals and healthy humans. We found that strawberry compounds were able to protect human fibroblasts, counteracting the intracellular ROS production and resulting effectively in an increase of cell viability and in a reduction of oxidative damage against membrane lipid and DNA. With regard to the in vivo studies, rats fed with strawberry for 10 days showed an increase in the antioxidant enzyme activities, a decrease in gastric lipid peroxidation and a concomitantly inhibition of the development of ethanol-induced gastric lesions. In human healthy volunteers, acute

and medium-term strawberry intake led to significant increases in plasma total antioxidant capacity and in vitamin C serum concentrations as well as significant improvements of the erythrocyte and lymphocyte resistance to ex vivo induced oxidative damage. Future studies are needed to test the bioavailability of strawberry phytochemicals to develop new functional food products and to give the consumers more health benefits from strawberry consumption.

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P016

Monofloral Cuban Honeys Exhibit Antioxidant and Antimicrobial Capacity and Protect Human Erythrocyte Membranes Against Oxidative Damage Thorough their Phenolics

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In the long human tradition, honey has been used as a food and as a medicine. Flavonoids are the most common phenolics in floral honeys, and characteristic profiles could be expected in unifloral honeys depending on the corresponding plant source [1]. Dietary antioxidants possess a beneficial role in improving the human antioxidant defenses against chronic diseases [2, 3]. Five monofloral Cuban honeys were analyzed to determine their total phenolic, ascorbic acid, aminoacid, protein and carotenoid contents and radical-scavenging activity, hydroxyl radical formation using EPR and antimicrobial capacities. Honey phenolic were extracts and analyzed for their in vitro total antioxidant capacity, phenolic composition, free radical scavenging activity and ability to inhibit AAPH-induced hemolysis, protection against lipid peroxidation and cytosolic depletion of GSH and SOD enzyme in human erythrocytes. The total phenolic, flavonoid, carotenoid contents ant total antioxidant activities were highest in amber honey. Ascorbic acid was absent. Hydroxyl radical formation was found in all honeys. The antimicrobial activity was screened using two Gram-positive and Gram-negative bacteria. S. aureus was the most sensitive microorganism while P. aeruginosa presented higher minimum active dilution values. Bacillus subtilis and E. coli were both moderately sensitive to honey antimicrobial activity. Twelve phenolic compounds were identified and quantified by HPLC-DAD-ESI/MS [4]. Important total antioxidant capacity and radical scavenging activity were found (ORAC, DPPH*, ABTS*+ and OH*). All extracts protected erythrocytes against AAPH-induced lysis, lipid peroxidation and cytosolic depletion of GSH and SOD. Quercetin uptake studies suggested that results could be explained by the uptake of some flavonoids, which, once within the cell, donate electrons to the membrane to reduce extracellular oxidants. This property depends on the content of ether-soluble flavonoids in the honeys.

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P017

The Effect of the Food Lipids on Breast Cancer in Batna (Algeria): Case-Control Study

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Background and Objectives: Algeria is among the first countries in Africa and the Arab world that hold a record number of people living with Cancer. Breast Cancer is classified first overall the female cancers. To study the relationship between food and breast Cancer in the wilaya of Batna, we made a case-control study. The objective is to identify fatty acids risk associated with the development of breast cancer.

Methods: 130 incidents of breast cancer diagnosed between January 1, and December 31, 2012 and 360 witnesses were subjected to a quantitative food questionnaire. The subjects have surveyed the Center of cancer of Batna. Statistical analysis of the results was realized through the Epi Info 6 and software XLSTA – 2009.

Results: Bivariate Analysis shows a significant relationship with a decrease in the risk between the consumption less frequently of skimmed milk and half skimmed milk with large quantity. On the other hand, a significant relationship with an increased risk between breast Cancer and certain foods in particular butter and salted butter (OR = 23.74), margarine (vegetal fat) (OR = 2.33), chicken meat, ready-made meal (OR = 8.75), eggs (OR = 4.41), mayonnaise (OR = 6.92), olives (OR = 7.90), fried foods (OR = 9.89), the repeated use of oils for frying 4 times with reuse in cooking.

Multifactor Analysis of Correspondence showed that consumption of margarine, olives, yoghurt, eggs and ready-made meal is significantly related to the development of breast Cancer. The association between the uses of oils for frying 4 times with reuses is very related to studied cancer. Finally Frying food has shown a significant link with the appearance of breast Cancer.

Conclusion: As a conclusion, we advise the region of Batna consumers to change their eating habits by reducing the consumption of fatty foods as butter, fried foods, eggs and ready-made meals.

P018

Evaluation of the Acceptance of Oral Hospital Diets Prescribed to the Interned Patients in a Brazilian Hospital

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Background and Objectives: Besides nutrients, the oral hospital diets contain functional compositions that help with patient's recovery. To know and to monitor the acceptance of the oral diet among patients is essential for the nutritional caring of them. The objective of this study was to evaluate the patient's food consumption according to each type of oral diet (regular, blend, soft) given isolated or in conjunction with a complementary artisanal snack (CAS).

Methods: Each diet was composed of 6 meals, which were evaluated within 6 non-consecutive weeks days, without repeating the menu in any day. The CAS was prescribed to the patients with higher nutritional needs. In order not to compromise the results, the participant patients were not informed of the study. The research was approved by the ethic committee (CAE:0001.0.261.238–11). The acceptance of each meal and/or CAS per diet was determined by subtracting the leftover weight of the initial weight submitted, both taken from a digital scale with precision of 2g.

Results: About 163 patients participated, 77.3% under regular diet, 16.6% blend and 6.1% under soft diet and 23.0, 30.7 and 40.0% of the patients had received the CAS beyond the respective diet. The regular (76.3%) and blend (72.9%) had the higher consumption than the soft diet (60.9%). By analyzing the patient's consumption under diet with and without CAS, it was noted that there was a lower ingestion among the first in all diets (regular: 74.9 and 80.4%; blend: 72.0 and 83.0%; soft: 62.4 and 78.9%). The meals with less consumption within all diets were lunch and dinner (~57.0%).

Conclusions: The CAS reduced the consumption of meals. Menu modifications on the blend diet and on the main meals for the regular and soft diets should be implemented in view of the lower consumption by the patients.

P019

Nonculturable Forms of Lactococcus Lactis

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Background and Objectives: Viable but nonculturable bacteria that are formed under stress can play an important role in manufacturing and quality control of foodstuff. Therefore studying conditions of formation of nonculturable lactic acid bacteria may help better understand their role in ripening of fermented foods more deeply. Disadvantageous consequences of undetected contamination with opportunistic or pathogenic bacteria indicate the necessity of research in this direction.

Methods: We conducted monitoring of viability and formation of nonculturable forms during 5,5 months of three strains of Lactococcus lactis (MGU, 729, F116) – producers of nisin in a synthetic medium under carbohydrate starvation stress. Medium was inoculated with cells either washed or unwashed with normal saline for each strain (final concentrations $6.37\pm0.7\times10^7$ – $1\pm0.11\times10^8$ cells/ml). Detection of nonculturable cells was conducted by comparison of total cell counts in Thoma counting chamber, percentage of viable cells in luminescence microscope after staining with Live/Dead® kit and CFU/ml.

Results: Unwashed cultures showed active growth after inoculation (up to $1.46\pm0.16\times10^9$ – $2.4\pm0.26\times10^9$). For washed variants cell density remained fairly constant. However by day 12 washed MGU underwent colony dissociation and started growing. Other two washed cultures showed no growth throughout the experiment. We presumed that these two cultures had lower metabolism level than others.

After 5.5 months of incubation cuturability dropped by 3–5 orders of magnitude (99,9% nonculturable cells) while total viable cell counts did not change significantly. We observed that the more metabolically active the initial culture is, the higher the rate of culturability and total viability loss. Total viability of unwashed MGU, 729 and washed MGU dropped by up to 25%. Washed 729 and interestingly both F116 remained nearly 100% viable.

Conclusions: Specific features of dynamics of growth and formation of nonculturable cells of 3 strains are revealed.

P020

Mediterranean Diet as the Prevention for Obesity in Children

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Obesity has become widespread among both, adults and children even in developing world, including our country too.

Objective: To investigate the prevalence of obesity in schoolchildren in our area and 2. To stress the role of Mediterranean diet in the prevention of obesity.

Material and Methods: In this study are included 500 school-children, selected at random, from Elementary and Secondary schools (7–18 years) in Prishtina. The study is conducted between September 2010/September 2012. In all participants obesity screening techniques, such as: height, weight, body mass index, skin fold thickness, etc were monitored. In order to make comparisons, the results of obesity in schoolchildren from twenty years ago were also used.

Results: Of 500 participants, 51 of them (10.9%) were over-weight or obese. Regarding to results of questionnaires, they revealed a number of unhealthy life style habits, like: fatty, salty, sugary foods, carbonated beverages. Low consumption of healthy foods, especially: olive oil, fish, fruits, vegetables, fibres is also found in approximately 82% of interviewed children. Other faulty nutritional habits such as: skipped breakfast, low number of daily meals are also found.

Discussion and Conclusion: This study suggests the prevalence of overweight and obese children is significantly increasing (p < 0.01) in comparison with results twenty years ago (10.9% vs 2.0%). It means a lack of primary prevention of obesity, in which the nutrition's role is a big one. So, implementation of the Mediterranean diet in the children's nutrition as early as possible is one of the key factors in the prevention of the obesity in children.

P021
Carotenoids and Health

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Carotenoids are naturally occurring pigments found in plants, fungi, algae and bacteria. Carotenoids protect plants from sun damage. Hundreds of plant carotenoids have been identified, of which around 50 are present in edible vegetables and fruits. Astaxanthin, Beta-carotene, Crocetin, Lycopene, Lutein, Zeaxanthin are the most important carotenoids that have beneficial effects on human health.

The consumption of Carotenoids has been associated with reduced risks of cancers, cataract and age related macular degeneration. The primary benefit of carotenoids lies in their antioxidant potential. Antioxidants are compounds that protect the body's cells from damage by unstable oxygen molecules called free radicals. Carotenoids guard against certain types of cancer, apparently by limiting the abnormal growth of cells. For instance, lycopene appears to inhibit prostate cancer formation. Researchers at Harvard University found that men who ate 10 or more servings a week of tomato-based foods – tomatoes being the richest dietary source of lycopene – cut their risk of prostate cancer by nearly 45 per cent. In addition, carotenoids fight heart disease by blocking the formation of LDL ('bad' cholesterol) which leads to heart attacks. The carotenoids lutein and zeaxanthin both reduce the risk of macular degeneration (MD).This article analyzes the health benefits of Carotenoids on human health.

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P022
Dietary Intake of Phylloquinone in Relation to All-Cause Mortality in a Mediterranean Population at High Cardiovascular Risk

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Background and Objectives: Vitamin K has been associated with a reduced risk of CHD and fatal cancer. Dietary menaquinones intake has been associated with cancer mortality. However, the association between the dietary intake of vitamin K and all-cause mortality has not been evaluated in a Mediterranean population at high cardiovascular risk.

Methods: A prospective analysis was conducted in 7216 participants in the framework of the PREDIMED cohort (median follow-up: 4.8y). Energy and nutrient intakes were evaluated using a previously validated 137-item food frequency questionnaire. Dietary phylloquinone and menaquinone intake was calculated using the USDA database and previous published data,

respectively. All-cause mortality was verified by medical records and consultation of National Death Index. Cox proportional hazard models were fitted to assess the relative risk of all-cause mortality.

Results: At baseline, energy-adjusted dietary phylloquinone intake was associated with a significantly reduced risk of all-cause mortality after controlling for potential confounders (HR: 0.64; 95% CI: 0.43, 0.96). No significant associations were found between quartiles of energy adjusted dietary menaquinones intake and risk of all-cause mortality. In a longitudinal manner, subjects who increase their consumption of vitamin K, phylloquinone or menaquinone, had a lower risk of all-cause mortality (HR: 0.58; 95% CI: 0.45, 0.74 and HR: 0.59; 95% CI: 0.45, 0.78, respectively) compared with subjects who decrease their consumption.

Conclusion: The results showed that an increase of dietary intake of vitamin K is related with a reduced risk of all-cause mortality in a Mediterranean population at high cardiovascular risk.

P023

Designing a System to Familiarize General Public with Different Types of Bread (Public Educational Booklet on Bread)

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Background and Objectives: Bread has been always known as the main Iranians' staple food and the most important source of energy, protein and some vitamins and minerals. In spite of increasing prices, there are considerable amounts of bread waste due to consumers' insufficient knowledge. This study was conducted to design a system to familiarize the general public with different types of bread through a booklet. The study was sponsored by Cereal Research Center, Iran's state-owned parent company in specialized commerce, in 2010–2011.

Methods: The educational content of the booklets were provided according to the educational needs of primary students (grade 4) and adults (grade 8), and was approved by nutritionists and educational technologist. The educational content was then designed into booklets and published. The effectiveness of booklets in increasing the audience knowledge was assessed through a before-after study on 246 4th grade students and 105 adults. The knowledge questionnaire was a valid and reliable instrument and applied to the same participants before and one week after the distribution of booklets. Data was analyzed using t-test by SPSS 17.

Results: Findings indicated a significant increase in the knowledge score of students (9.4±3.89 vs 16.19±5.42) and adults (19.22±3.84 vs 25.08±3.89) after receiving the educational material (P < 0.001).

Conclusion: It is concluded that indirect educational methods such as booklets can have an important role in increasing the nutritional knowledge of the community regarding different types of bread and improving the consumption pattern of bread as a staple food.

P026

Diet Supplementation with Docosahexanoic Acid Influences the Peripheral Mononuclear Cells Inflammatory Response to Intense Exercise

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Regular exercise exerts a protective effect against diseases associated to a chronic inflammation. The aim was to investigate the effects of docosahexanoic acid (DHA) on the inflammatory response to exercise.

Fifteen male football players volunteered to participate in this study. 6 subjects took one liter five times a week of a placebo beverage and 9 an experimental beverage rich in DHA, for 8-week period of during the training season. A blood sample was taken in basal conditions at beginning of the nutritional intervention and another two blood samples were taken at the end of the nutritional intervention, in basal conditions and after a training session. Erythrocyte DHA composition was determined. Toll-like receptor 4 (TLR-4) protein levels were determined in peripheral mononuclear cells (PMN cells). An aliquot of PMN cells were activated by addition of LPS and were incubated at 37ºC for 2 hours. Cytokine were determined in supernatants of the culture medium using the Randox Biochip Array technology.

No significant differences were reported between both placebo and supplemented football players characteristics and nutrient intake. DHA levels were increased after 8-weeks of training and supplementation mainly in the supplemented group. The cytokine production by PMN cells after activation with LPS was significantly affected by both exercise and in some cytokines by DHA diet supplementation and these changes was more attenuated in the supplemented group. Acute exercise significantly increased the TLR-4 protein levels in PMN cells and this increase was more pronounced in the placebo group.

Diet supplementation with a functional beverage enriched with DHA influences the PMN cells inflammatory response to intense exercise reducing the TLR-4 protein levels and the cytokine production after LPS stimulation.

P027

DHA Diet Supplementation Changes the Erythrocyte Membrane Composition and Modulates the Erythrocyte Antioxidant Defenses

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Specific supplementation with the docosahexaenoic acid (DHA, C22:6n3) increases blood levels of this essential fatty acid, with beneficial effects for the maintenance of antioxidant status. To assess the effects of 8 weeks of DHA supplementation on the erythrocyte antioxidant response to training season in football players.

Subjects were randomly included into two groups: placebo and experimental groups. The placebo group took one liter five times a week of a placebo drink and the experimental group consumed the experimental drink enriched with DHA (1.14 g/L). Blood samples, used to purify erythrocytes, were collected before and after the supplementation period in basal conditions.

The supplementation with the experimental drink significantly increased the erythrocyte levels of DHA. Although nitrosative damage decreased and MDA increased at the end of the experimental period, no significant differences were reported between groups. The carbonyl index was unchanged. Antioxidant enzyme activities – catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione reductase (GRd)- were increased at the end of the training season. The experimental group presented significantly higher SOD activity and lower GRd activity than placebo group at the end of the supplementation and training season. The CAT protein level seems increase along the eight weeks but not significantly. The protein levels of Cu/Zn-SOD and GPx were not affected. GRd protein level reported an interaction between DHA diet supplementation and training, with higher values in the experimental group at the end of the training season.

The consumption of an enriched DHA beverage for eight weeks changed the erythrocyte membrane composition in professional footballers. DHA diet supplementation does not alter the oxidative damage markers of the erythrocytes but increases the antioxidant enzyme activities.

P028

In Comparison with Palm Oil, Dietary Nut Supplementation Delays Progression of Atherosclerotic Lesions in Female Apoe-Deficient Mice

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Background and Objectives: Epidemiological studies have demonstrated benefits of nut consumption on cardiovascular risk factors and coronary heart diseases, attributed to their fatty acid profile, rich in unsaturated fatty acids, and also to other nutrients.

Methods: The effect of nuts on the atherosclerotic lesion was studied in female and male ApoE-knockout mice fed a diet supplemented with 3% (w/w) mixed nuts (mix: almonds, hazelnuts and walnuts in a proportion of 0.25:0.25:0.50, respectively), and compared with mice receiving an isocaloric diet of similar fat content provided as palm oil. After 12 weeks, plasma lipid parameters and aortic lesion were measured.

Results: Males receiving nuts had lower plasma cholesterol than the palm oil group and both sex groups had lower plasma non-HDL cholesterol and lower content of reactive oxygen species in LDL than mice receiving the palm oil diet, the latter decrease being more pronounced in females than in males. Females consuming the nut diet showed a smaller aortic lesion area than those consuming palm oil, whereas no differences were observed in males. In females, hepatic Pon2 mRNA increased, and no change was observed in Pcyox1 expression after the consumption of the nut-containing diet. In addition, aortic atherosclerotic lesions correlated directly with total plasma cholesterol and inversely with hepatic Pon2 expression.

Conclusions: Our results suggest that the beneficial effect of nut intake in female ApoE-deficient mice may be attributed to reduced non-HDL cholesterol levels and enhanced PON2 antioxidant activity.

P030

Positive Changes in Diet Quality during Pregnancy in Women with Type 1 Diabetes Mellitus

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Background and Objectives: Few studies of the quality of nutrition during pregnancy have used indices of adherence to the Mediterranean diet. We compared self-reported diet quality in pregnant women with type 1 diabetes (T1D) and female controls with normal glucose tolerance (NGT), at the beginning and near the end of their pregnancy.

Methods: This prospective observational study included 41 pregnant women (12 with T1D and 29 with NGT). Responses to a 14-item questionnaire (MedDiet) were used to categorize diet quality, both at the beginning and near the end of gestation. Evaluation of diet quality was done by counting the number of positive responses: low quality (0–3), medium quality (4–7), good quality (8–11), very good quality (>12).

Results: The MedDiet scores were higher in the T1D women compared to controls at the study's beginning (10.08+0.90 vs. 7.86+2.12; p < 0.001, respectively) and at the end (11.0+1.3 vs. 7.72+2.4; p < 0.001, respectively). (Table 1) Initially, all T1D women received a good quality score, as compared to 51.7% of NGT controls, of whom another 41.4% received a medium qual-

Table 1. Differences in Adherence to the Mediterranean diet at the beginning and at the end of gestation between control and diabetes group (for Abstract P030)

Weeks gestation	Group	Mean + SD	Mean difference	CI 95% (Lower; Upper)	p-value
13th week (13.2–13.3)	CONTROL T1D	7.86 ± 2.12 10.08 ± 0.90	−2.22	(−3.17; −1.27)	<0.001*
33th week (33.3–34.4)	CONTROL T1D	7.72 ± 2.4 11.0 ± 1.3	−3.28	(−4.79; −1.76)	<0.001*

* Significant difference between control and diabetic group: p<0,001.

ity score. The initial score distribution differences were significant (p < 0.021). The quality of the diet score improved in both groups the end of pregnancy: 50% of the T1D women received a very good quality score and 50% a good quality score. In the NGT controls, 65.5% reported a good quality diet while 27.6% maintained a medium quality score. In both groups, the shift in score distribution was significant (<0.001) (Table 2).

Conclusions: During pregnancy, T1D women indicated greater acceptance of the Mediterranean diet than women with NGT. As gestation progressed, both groups increased the quality of their diet, the T1D women significantly more so.

P031

Tumour Cell Membrane Microdomains Can Be Modified by Dietary Lipids on Experimental Breast Cancer

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Background and Objectives: Experimental and epidemiological evidence support the relationship between dietary lipids and breast cancer, the incidence of which is relatively low in Mediterranean countries. We investigated whether the previously demonstrated stimulatory effect of high corn oil –HCO- diets and potentially protective effect of high extra virgin olive oil – HEVOO- diets in experimental breast cancer is mediated, at least in part, by changes in tumour cell membrane composition.

Methods: Female Sprague-Dawley rats were induced with 7,12-dimethylbenz(a)anthracene (DMBA) and fed a low fat -LF-, a HCO or an HEVOO diet. Different membrane domains from tumours were isolated through a sucrose density gradient and characterized for the protein markers Caveolin-1 and Flotillin-1, for caveolae and lipid rafts respectively, and for the lipid markers cholesterol and sphingomyelin. Relative expression of these proteins and the content in nine different types of lipids were analyzed.

Results: A significant decrease in Caveolin-1 content due to the HEVOO diet was observed in caveolae, while Flotilin-1 ex-

Table 2. Categorized diet quality at the beginning and end of gestation between control and diabetes group 1 (for Abstract P030)

Rating quality diet	33th week (33.3–34.4)			13th week (13.2–13.3)		
	CONTROL	T1D	x^2*; p-value	CONTROL4	T1D	x^2; p-value
Low (0–3)	1 (3.4%)	0 (0%)		2 (6.9%)	0 (0%)	
Medium (4–7)	12 (41.4%)	0 (0%)	5.29 (0.021)*	8 (27.6%)	0 (0%)	13.42 (<0.001)**
Good (8–11)	15 (51.7%)	12 (100%)		19 (65.5%)	6 (50%)	
Very good (> 12)	1 (3.4%)	0 (0%)		0 (0%)	6 (50%)	

1n=number of cases (%). *Fisher Statistic.Significant difference between control and diabetic group, p<0.05. **Fisher Statistic. Significant difference between control and diabetic grop, p<0,001

pression in lipid rafts did not change by the effect of dietary lipids. Moreover, levels of cholesterol, sphingomyelin and phosphatidylcoline in lipid rafts increased with the HCO diet, whereas the HEVOO diet associated to a higher ceramide/sphingomyelin ratio in this same membrane microdomain.

Conclusions: The differential modulatory action of HCO and HEVOO diets on experimental breast cancer may be related with specific changes in tumour membrane composition as the increased formation of cholesterol and sphingomyelin-enriched lipid rafts, which are related with proliferation signals, in the first case, and the increased ceramide-enriched lipid rafts formation in the second case. This latter effect could account for the apoptotic effect previously demonstrated of the HEVOO diet.

P032
Dietary Lipids may Modulate the Liver and the Mammary Gland Xenobiotic Metabolism in Experimental Breast Cancer

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Background and Objectives: Breast cancer is an important death cause in women worldwide. Several studies demonstrate that diet, especially lipids, has an important role in its aetiology. The influence of a high corn oil (HCO) and a high extra-virgin olive oil (HEVOO) diets on xenobiotic metabolism enzymes expression has been investigated as a possible modulating effect during breast cancer initiation.

Methods: Female Sprague-Dawley rats were fed two high fat diets (HCO and HEVOO) and a control normal fat diet from the weaning onwards. Breast cancer was induced by 7,12-dimethylbenz(a)anthracene administration at 53 days of age. Protein and mRNA extracts from liver and mammary gland were carried out and used to analyze the expression of diverse xenobiotic enzymes and that of their regulatory transcription factors.

Results: In the liver a reduction in mRNA expression and protein abundance of the phase I enzymes (CYP1 family) was observed all through the time. It correlated with the AhR transcription factor expression and cytoplasmic retention. Moreover the HEVOO diet, in contrast with the HCO, tended to decrease the mRNA and protein levels of phase I enzymes. In a less clear manner it increased the phase II enzymes expression. In the mammary gland the enzymes expression did not seem to be modified by diet as clear as in the liver. A good balance between phase I and phase II enzymes due to the HEVOO diet could be promoting a more effective xenobiotic phase I modification and phase II inactivation, thus reducing the mutagenic effect of the carcinogen reactive metabolites.

Conclusions: The stimulatory action of the HCO diet and the potentially chemopreventive one of the HEVOO on experimental

mammary carcinogenesis may be related to a different modulatory effect on the expression of the xenobiotic metabolism enzymes.

P034
Improving Nutrition Knowledge and Feeding Practices among Rural Women in Guatemala

Claudia Asensio

Independent

Objective: Mother's education levels and knowledge of nutrition and feeding practices influence child malnutrition. An educational intervention, delivered by local field technicians, aimed at improving nutrition knowledge, feeding practices and nutritional status was developed.

Design: Two townships in San Juan Sacatepéquez, a rural area in Guatemala were selected to an educational intervention or control group. A total of 51 children aged 0–5 years were included for anthropometric measures and followed up for 6 weeks. In the intervention group, a total of 58 women participated. They received anti-parasitic medication, multivitamins, educational messages, and home-prepared recipes. Questionnaire surveys were taken at baseline and follow-up in participants' homes.

Results: It was found that use of hygiene practices, positive feeding behaviours, and consumption of diverse foods including fruits and vegetables was moderately improved. There existed a 61% prevalence of stunting (height-for-age z-score, HAZ, less than –2 SD from the mean) at baseline in the case group. An equal variances t-test failed to reveal a statistically reliable difference between the mean HAZ-scores of children weighed at baseline (M = –2.06, sd = 0.84) and after the intervention (M = –2.04, sd = 1.04), where t(17) = 0.102, P = 0.920, and alfa = 0.05.

Conclusions: Findings from the study suggest that an educational intervention delivered through local field technicians can provide some improvement in mother's nutrition knowledge and feeding practices, but no improvement in nutritional status of children, as this requires more monitoring and long term follow up.

P035
Resveratrol Metabolites Modify Adipokine Expression and Secretion in 3T3-L1 Mature Adipocytes

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Background and Objective: Resveratrol, a polyphenol present in different fruits and derivative drinks, undergoes rapid and extensive metabolism into enterocytes and liver. Consequently, gluc-

uronide and sulfate metabolites are produced and high concentrations of them reach plasma and tissues. However, very little data exists concerning their biological activity. The aim of the present study was to determine whether resveratrol metabolites have any effect on the expression and secretion of adipokines involved in the glycaemic control in 3T3-L1 mature adipocytes.

Methods: 3T3-L1 pre-adipocytes were cultured in DMEM containing 10% fetal bovine serum. Two days after confluence (day 0), differentiation was induced by 10 μg/mL insulin, 0.5 mM isobutylmethylxanthine (IBMX) and 1 ?M dexamethasone. On day 2, medium was replaced by FBS/DMEM medium containing 0.2 μg/mL insulin. At day 12 cells were treated for 24 hours with 10 nM of resveratrol or its metabolites (trans-resveratrol-3-O-glucuronide, trans-resveratrol-4'-O-glucuronide and trans-resveratrol-3-O-sulfate). Adipokine (leptin, adiponectin, visfatin and apelin) gene expression and secretion were analyzed by Real Time RT-PCR and ELISA respectively. The statistical study was performed by using Student 's t test.

Results: Resveratrol reduced mRNA levels of leptin and increased those of adiponectin. Trans-resveratrol-3-O-glucuronide, trans-resveratrol-4'-O-glucuronide and trans-resveratrol-3'-O-sulfate increased apelin and visfatin mRNA levels and reduced those of leptin. Leptin secretion to the media was reduced by resveratrol and all the tested metabolites.

Conclusion: The present study shows for the first time the regulatory effect of resveratrol metabolites on adipokine expression and secretion in mature adipocytes. Taking into account that resveratrol has demonstrated in vivo to improve insulin sensitivity, and considering that these adipokines are involved in insulin function, it may be proposed that resveratrol metabolites contribute to this beneficial effect of resveratrol.

P036

Effects of Quercetin on Body Fat in Rats Fed on an Obesogenic Diet

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Background and Objectives: Quercetin exhibits a wide range of biological functions, including anticarcinogenic, anti-inflammatory and antiviral activities. It inhibits lipid peroxidation, platelet aggregation and capillary permeability. With regard to obesity, few studies have been carried out to date. The aim of the present work was to gain more insight concerning the effects of Quercetin on body fat in rats fed on an obesogenic diet, in order to know if this molecule can be useful in the prevention of obesity.

Methods: Eighteen rats were fed on a commercial high-sucrose high-fat diet for 6 weeks, supplemented or not with Quercetin. This flavonoid was daily added to the diet in amounts that assured a dose of 30 mg/kg body weight/d. Adipose tissue from epididymal, perirenal, mesenteric and subcutaneous regions, as well as gastrocnemious muscles, were dissected and weighed. Lipogenic enzymes and lipoprotein lipase (LPL) in adipose tissue,

and carnitine palmitoyl-transferase Ib in skeletal muscle were analyzed by spectrophotometry.

Results: Quercetin reduced adipose tissue weights (–11.2%) but this change did not reach statistical significance. Epididymal fat pad was the anatomical location most strongly affected. No changes were observed in the activity of lipogenic enzymes and LPL in adipose tissue. By contrast, the capacity of carnitine palmitoyl transferase Ib was increased in muscle.

Conclusions: The reduction in body fat was not due to a direct effect of Quercetin on adipose tissue. Due to the fact that skeletal muscle represents a great percentage of total body mass, an increased oxidation in fatty acids in this tissue can importantly contribute to total triacylglycerol balance in the body. Thus, it can be proposed that in the present study this metabolic feature could be responsible, at least in part, for the reduction of observed in body fat accumulation.

P037

Experimental Western Style-Diet (High in Sugar, Lipids, Sodium and Poor in Fiber) Cause Cues of Metabolic Disease in Rats

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Introduction: Overweight and metabolic diseases are major public health. The western-style diet has low fruit, whole grain, fish and vegetables levels, but high sugars, sodium, saturate fat and industrialized foods, important factors risk by body mass gain and metabolic disturbs.

Objective: The aim was analyze the effects of a westernized diet on body weight, visceral fat and cues of metabolic disorders.

Methods: During pregnancy and lactation, wistar rats were fed casein (C = 6) or westernized diet (W = 6). At weaning, male (22d post-partum) were randomly allocated fed either standard rodent laboratory chow diet or westernized diet. The offspring born to W dams are referred to as WW(11); born to C dams as CC(9), or WC (9), according post-weaning diet. The final composition of diets in kcal%, C = 19.5% protein, 61.9% carbohydrate; 17.7% lipids, 3.6 kcal/g and 5.0 g fiber; W = 19.9% protein; 49.3% carbohydrate and 31.5% lipids and 4.2 kcal/g and 2.4 g of fiber. Rats were kept under 12 h light–dark cycles at constant temperature ($22\pm2°C$), free access to water and diets. The visceral fat pads, body weight were obtained and fasting glucose and hormones analyzed by radioimmunoassay. One-way or two-way ANOVA was used followed Bonferroni's post hoc test. Significance was $P < 0.05$. Data analysis was performed using the statistical program Graphpad Prism 5®. This work was approved by Ethical Committee of Animal Experimental of Federal University of Pernambuco, Brazil. Data expressed as means±SEM.

Results: At 120d old, WW and CW had body mass 16% more that CC ($P < 0.001$) and 2.5 more visceral fat ($P < 0.05$). The glucose tolerance test showed difference in CW and WW at 30 and 60 min ($P < 0.001$). In addition, CW and WW was hyperinsulinemic in comparison to CC. However, only CW showed high cor-

ticosterone and leptin. Conclusion.The westernized diet caused different cues of metabolic disorder according life period.

P038

Relationship Between Diet and the Thickness of the Intima-Media Complex of the Carotid Artery in Adolescents

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Background and Objective: The atherosclerosis is a progressive disease that begins in childhood. The measurement of carotid intima-media thickness (CIMT) as a subclinical atherosclerosis marker has been seldom studied in children.

We analyzed whether dietary nutrients and its quality assessed by the test of Mediterranean Diet (MD) among adolescents are associated with the IMTC and other cardiovascular risk factors.

Methods: Nutritional data came from a seven-day cross-sectional survey. Estimation of the macro and micronutrients were obtained and the MD was also scored. IMTC was measured by ultrasonography according to the AHA's protocol. Other outcomes: body mass index (BMI), blood pressure (BP), total body fat (TBF), body fat percentage (BF%).

Results: 128 adolescents aged 14.65 ± 0.94 years. Sex proportion: 39.8% females; 60.2% males. IMTC: 0.405 ± 0.04 mm. BPsystolic: 108.3 ± 11.17 mmHg. BPdiastolic: 61.7 ± 7.0 mmHg. Pulse Pressure (PP): 46.61 ± 9.38 mmHg. TBF: 12.559 ± 4.276 kg. BF%: 21.799% ± 4.608. MD score: 5.9 ± 2.0 (mild quality). Daily energy intake: Protein 17.8% ± 2.7, Fat 35.1% ± 4.7, carbohydrates 46.8% ± 5.1.

Correlation studies:

IMTC: mixed fat (r = 0.224 p = 0.022),♣ saturated fat (r = 0.226 p = 0.020), mono-unsaturated fat (r = 0.208 p = 0.034), cholesterol (r = 0.265 p = 0.006), PP (r = 0.192 p = 0.033) and BF% (r = -0.207 p = 0.028).

MD score: PP (r = -0.246 p = 0.009)♣

ANOVA:

IMTC:♣ saturated fat (p = 0.037); cholesterol (p = 0.04), BMI (p = 0.032), and GCT (p = 0.044).

Conclusions:

- The diet of adolescents is of mild quality.
- Higher intake of saturated fat and cholesterol in adolescence is associated with an increased IMTC.
- The IMTC could be modified in young people by dietary influences prematurely.

P039

Ten Years Trends in Compliance with the Current Spanish Nutritional Objectives in Balearic Islands Adult Population (1999–2010)

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Background and Objectives: Nutrition is recognized as one of the major health determinants. A healthy diet may contribute to the delaying or prevention of an important number of chronic diseases. The aim of this study was to assess trends in compliance with the current Spanish nutritional objectives (1999–2010) in Balearic Islands adult population, Spain.

Methods: Two independent cross-sectional dietary surveys were carried out in random samples of the Balearic Islands adult population (16–65 years) in 1999–2000 (n= 1200) and in 2009–2010 (n = 1388). Dietary habits were assessed by means of two non-consecutive 24 h diet recall periods and a semi-quantitative food-frequency questionnaire.

Results: The trends highlighted over the 10-year period showed that the percentage of compliers for dietary fibre, folate, iodine, SFA, cholesterol, carbohydrate and fruit requirements has increased; however, just >25% of subjects met the current folate and cholesterol nutritional objectives in 2009–2010. Contrarily, the percentage of compliers for vegetables decreased. The percentage of compliers for calcium, total fat, MUFA and PUFA intakes did not change.

Conclusions: The percentage of compliers with the Spanish nutrition objectives has increased for 7 to 12 nutrients and food items over the 10-year period. However, a reduction in SFA and cholesterol, and an increase in the dietary fibre, carbohydrate, fruit, vegetables, folate, calcium and iodine intakes must be still recommended.

P040

Feeding Behavior and Digestive Cancer in the Wilaya of Batna (East Algeria): Case-Control Study

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Background and Objectives: Algeria is the first record holder in Africa and the Arab world in terms of number of people living with cancer. For the purpose of determination of the effect of some food factors involved at different stages of the digestive

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carcinogenesis, a case-control study was carried out in wilaya of Batna.

Methods: An epidemiological survey was carried on 115 cases incidents of digestive tract cancers (esophagus, stomach, colon, pancreas, liver, and gallbladder) diagnosed from 1St January 2006 until 31 December 2007 and on 230 witnesses. The participants were submitted to a semi – quantitative questionnaire of the food history describing food habits of subjects (food consumption frequencies during the 4 meals of the day, cooking modes and preservation modes, fats used in cooking and frying oils). The cases and the witnesses were interrogated in the same period at the University Hospital Center or in the witnesses 'homes.

Statistical analysis was realized by the Epi Info 6 and software XLSTA – 2009.

Results: The bivariate and multivariate analysis of our results has shown, on the one hand a significant link with risk decrease between the consumption of tea, milk and its derivatives, consumption of raw vegetables and studied cancers. On the other hand, a significant relationship with a risk increase has been observed between these cancers, some factors related to foodstuff such as the consumption of Gueddid (dried salted meat), adding salt to cooked food, the use of salted butter or Smen (mix vegetable fat) in cooking, the use of oil frying more than 4 times with reusing for to cooking other foods.

Conclusions: We recommend for the local population to reduce the consumption of foods preserved by salting and drying and avoid the reuse of the frying oil.

P041
A Computer Program Developed to Perform Personalized Nutrition and Health Assessment

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Due to the emergence of new computer instrument, the number of software programs to be used in nutritional assessment, clinical research and education has increased. The aim of this study is the design of a new program in which the new tools of nutritional and health status, indices and approaches that have been developed in recent years would be included. For that purpose it was carried out a simultaneous search of key words such as: nutritional assessment, questionnaire, quality of life, healthy eating index, genetic risk, fitness… within the main databases and websites of nutrition and medicine.

The result is a program that is made up of ten modules that are part of five blocks. The main difference from other programs is that it includes a great number of criteria and questionnaires. As the user enters the information requested, the application makes a prognosis of the individual nutritional status based on his/her genetic predisposition and his/her phenotype or lifestyle. The software also has specific modules to assess the quality of life, the fitness, and can help to carry out energy calculations (equations, activity record, and questionnaires) and design diets.

UNYDIET is a computer program, which provides a great number of possibilities for educational purposes and for clinical or nutritional studies as well. It also offers the possibility of creating new and customized utilities.

P042
Advances in Our Understanding of the Health Benefits of Sun-Dried Raisins

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Research suggests that diets based on plant foods, such as traditional Mediterranean diets, are consistently associated with a lower risk of chronic disease including heart disease, stroke and diabetes. Grapes and raisins have been an integral part of the Mediterranean diet for millennia.

While grapes have been studied extensible, sun-dried raisins have received comparatively little attention, until recently. This comprehensive literature review on health effects of raisins includes recent data presented at major nutrition meetings. Human intervention studies show that raisins can affect cardiovascular disease risk indicators such as blood pressure, inflammatory cytokines and plasma lipids. Recent studies show that feeding raisins lowers LDL cholesterol and increases LDL receptor expression, without changing HDL or triglyceride levels; lowers plasma TNF-alpha and sICAM-1, and raises antioxidant capacity. Routine consumption of raisins reduces diastolic blood pressure and lowers postprandial blood glucose compared to other isocaloric snacks. Sun-dried raisins have a low glycemic and insulin index so glycemic response to a serving of raisins is similar to that of fresh fruit. Raisins promote satiety via leptin and ghrelin. Raisins have a role in intestinal health. Adding raisins to the diet shortens transit time, lowers colonic pH, and increase fecal weight. Raisins also bind bile acids as effectively as wheat bran. In vitro studies show that raisin extracts inhibit colon cancer cell lines. Raisins' health effects may be explained by their nutrient composition and distinctive phenolic profile.

Raisins are high in potassium and provide fiber at levels that represent a meaningful contribution to daily intake and at levels that benefit cardiovascular health. Raisins are rich in quercetin, isorhamnetin and kaempferol, and caftaric and coutaric acid. Preliminary studies indicate key phenolic acids in raisins are highly bioavailable. Emerging data indicates that including raisins in daily diets can contributes to overall health and disease prevention.

Abstracts

P043

Increasing Long-Chain n-3PUFA Consumption Improves Small Peripheral Artery Function in Patients at Intermediate-High Cardiovascular Risk

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Background and Objectives: Endothelial dysfunction is critical to the pathogenesis and progression of atherosclerosis. Dietary long-chain n-3 polyunsaturated fatty acids (LCn-3PUFA) decrease inflammatory cytokine production and increase endothelium-dependent vasodilatation in medium-large size arteries, but effects on small peripheral arteries, responsible for most arterial resistance, remain unknown. Accordingly, we investigated the effects of increasing fish-derived LCn-3PUFA intake upon variation in small artery reactive hyperemia (saRHI, a surrogate marker of endothelial function) in subjects at intermediate-high cardiovascular risk.

Methods: This is a sub-study of a randomized clinical trial evaluating 1-y effects of intensive lifestyle intervention versus standard care on cardiovascular risk markers in subjects at intermediate-high cardiovascular risk (Nutr Metab Cardiovasc Dis 2012;22:95–102). Regardless of treatment allocation, we selected 108 participants who changed dietary LCn-3PUFA intake (74% men, mean age 56-y). None of the participants used LCn-3 PUFA supplements. saRHI was assessed by the ENDO-PAT 2000 device. Biochemical, dietary and vascular data were obtained at baseline and after follow-up.

Results: Subjects who increased dietary LCn-3PUFA (n = 53) displayed significant reductions in sICAM-1 (median [interquartile range] −38 [−101 to 2 ng/ml], P = 0.028), sVCAM-1 (−253 [−765 to108 ng/ml], P = 0.003) and oxidized LDL (−6.6 [−10.1 to −4.6 U/mmol], P = 0.037) compared with those who decreased LCn-3PUFA intake (n = 55). 1-y changes in dietary LCn-3PUFA related directly to changes in saRHI (r = 0.307, P = 0.030) and inversely to changes in mean carotid intima-media thickness (IMT) (r = −0.276, P = 0.042). Multivariate analyses showed that dietary LCn-3PUFA change was an independent predictor of changes in saRHI (b 0.179 [95%CI, 0.072; 0.286]) but not of IMT (b-0.099 [95%CI,−0.170; 0.051]).

Conclusions: Increased dietary LCn-3PUFA intake improved both peripheral small artery function and biochemical modulators of endothelial function. Our data reinforce the concept of LCn-3PUFA as plietropic vasculoprotective agents, wich may help explain the lower cardiovascular event rates observed in countries with high fish consumption.

P044

Cross-Sectional Assessment of Nut Consumption and Obesity, Metabolic Syndrome and Other Cardiometabolic Risk Factors: The Predimed Study

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Background and Objectives: Prospective studies have consistently suggested that nut consumption is inversely related to fatal and non-fatal coronary heart disease. Limited data are available on the epidemiological associations between nut intake and cardiometabolic risk factors. The aim of our study was to evaluate associations between frequency of nut consumption and prevalence of cardiometabolic risk factors [obesity, metabolic syndrome (MetS), type-2 diabetes, hypertension, and dyslipidemia] in a Mediterranean population at high cardiovascular risk.

Methods: Cross-sectional study of 7,210 men and women (mean age, 67 y) recruited into the PREDIMED study. MetS was defined by the harmonized ATPIII and IDF criteria. Diabetes and hypertension were assessed by clinical diagnosis and dyslipidemia (high triglycerides, low HDL-cholesterol, and hypercholesterolemia) by lipid analyses. Nut consumption was assessed using a validated food frequency questionnaire and categorized as <1, 1–3, and >3 servings/wk. Control of confounding was done with multivariate logistic regression.

Results: Compared to participants consuming <1 serving/wk of nuts, those consuming >3 servings/wk had lower adjusted odds ratios (OR) for obesity (0.61, 95% confidence interval 0.54 to 0.68; P-trend <0.001), MetS (0.74, 0.65 to 0.85; P-trend<0.001), and diabetes (0.87, 0.78 to 0.99; P-trend = 0.043). Higher nut consumption was also associated with lower risk of the abdominal obesity MetS criterion (OR 0.68, 0.60 to 0.79; P-trend<0.001). No significant associations were observed for the MetS components high blood pressure, dyslipidemia, or elevated fasting glucose.

Conclusions: Nut consumption was inversely associated with the prevalence of general obesity, central obesity, MetS, and diabetes in subjects at high cardiovascular risk.

P045

Cross-Sectional and Longitudinal Analysis between Dietary Phylloquinone Intake and Type 2 Diabetes Incidence in Elderly Mediterranean Individuals at High Cardiovascular Risk

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Background and Objectives: Conflicting results from human and animal studies suggest that phylloquinone has a potential beneficial role in glucose metabolism and insulin resistance. To examine the associations between dietary phylloquinone intake and type 2 diabetes mellitus (T2DM) in elderly individuals at high cardiovascular risk in a cross-sectional and longitudinal analyse.

Methods: Cross-sectional associations were conducted in elderly Mediterranean men and women at high cardiovascular diseases (n= 1925). In the longitudinal analysis were included 1,069 individuals free of diabetes at baseline with a median of follow-up of 5.5 years. Biochemical and anthropometric variables were obtained yearly. Food frequency questionnaire (FFQ) was used to collected dietary variables during each annual visit. Dietary phylloquinone intake was estimated using the USDA database. New onset of T2DM during follow-up was assessed using American Diabetes Association criteria.

Results: New onset of T2DM presented lower levels of phylloquinone intake at baseline. We observed a 17% lower risk for each 100 μg/day of phylloquinone intake after adjusting for potential confounders. Moreover, those subjects who increased their dietary intake of vitamin K during the follow-up had a 51% reduced risk of incident diabetes compared to those who decreased or did not change the amount of vitamin K intake.

Conclusion: Phylloquinone intake was associated with a reduced risk of type 2 diabetes mellitus in elderly Mediterranean subjects at high cardiovascular risk. Further studies are needed to confirm this association.

P046

Effect of Cooking on Sensorial Quality and Antioxidant Capacity of Cauliflower

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There is a consumer demand for fresh products that are ready to use. In this way, cauliflower can be marketed as a minimally processed vegetable, cut in florets, packed and kept under refrigeration until their purchase. Nowadays the consumption of diets rich in antioxidant compounds is promoted as an effective way to keep healthy. Cauliflower has a high content of vitamin C, mainly in ascorbic acid form, and also polyphenols mainly as flavonoids. It is of interest to know the effect of the processes that are applied to products in the content of these compounds

The aim of this work was to evaluate the effect of cooking in water on the sensorial quality, composition and antioxidant activity of cut cauliflower, packed in modified atmosphere, and kept under refrigeration for up to 13 days.

Cauliflowers were cut in florets and placed in polystyrene trays and overwrapped with polypropylene oriented microperforated film. The cauliflower packages were stored at 5ºC and 50% relative humidity for up 13 days. Samples of cauliflower were introduced in boiling water (100ºC±1) for 10 min in order to study the effect of cooking.

The following determinations were carried out: CO_2 and O_2 concentrations inside the packages, colour, texture, sensorial appearance, ascorbic acid content, total polyphenols and antioxidant activity.

The storage of cauliflower produced some changes of colour (an increase in b* parameter from 19 to 20.9) and texture (an increase in shear force from 1948 N to 2375 N). The sensorial acceptability for colour and taste of cooked stored cauliflower has been lower than that of the cooked cauliflower at harvest day, but inside acceptable levels.

An increase of ascorbic acid (18%), phenolics (74%) and antioxidant activity (21%) has been observed in stored cauliflower. But the cooking treatment has produced a loss of these compounds by leaching.

P047

Does Young Spaniard from Region of Murcia Follow the Pattern of Mediterranean Diet?

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Background and Objectives: It is known that the population feeding has changed during last years, increasing the intake of meat products and decreasing vegetable foods like legumes and fruits. This change has lead to a diet more closely related with Western countries than to the Mediterranean diet, which is widely

recognized as healthy. The aim of this study was to analyze how the students from the University of Murcia (Spain) follow the Mediterranean diet.

Methods: 213 volunteers were recruited from 1st year nursing students from the University of Murcia and were ranged between 18–24 years old and mainly women (78%). Anthropometric measurements were taken, and students were also asked about their eating habits related to Mediterranean diet.

Results: Approximately 20% of the recruited people were overweight and only one third showed a good pattern of Mediterranean diet. Data revealed some positive aspects as most of the volunteers consume olive oil and legumes, 89% have breakfast with a dairy product, 78% eat a piece of fruit along the day and 68% usually consume vegetables. However, the negative aspects were that, most of volunteers do not eat a second fruit neither a portion of vegetable during the day and only half of the recruited people usually consume fish. The results also showed a high intake of "fast food" and approximately 20% of people do not have breakfast. It was also found a positive relation between age and the consumption according a pattern of Mediterranean diet, but there were no differences regarding to the actual body mass index.

Conclusion: Nursing students from Murcia do not adequately follow properly Mediterranean diet. Therefore, it is necessary to introduce new educational activities aimed to change the intake patterns of the young people in order to prevent future chronic diseases.

P048

Breakfast Habits and Body Weight in a Group of Spanish University Students

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Background and Objectives: Breakfast has been labeled the most important meal of the day and has been correlated with a high prevalence of overweight and obesity. A suitable breakfast related to nutritional adequacy it's supposed to must include dairy products, cereals and fruits. The aim of this study was to give an overview of the breakfast behavior and practice in a group of Spanish university students and the relationship with weight.

Methods: A total of 215 participants were recruited from the bachelor in Nursing from the University of Murcia (73% females, 23% males; median = 19 years, 81% were 18–22 year old students). Data about breakfast behavior, perception about suitable breakfast and anthropometric data were collected.

Results: Skipping breakfast is more prevalent in girls (P = 0.028). 19.8% of females and 6.3% of males reported that they habitually skip breakfast and only the 13.8% of females and 16.7% of males consume an optimum breakfast. The analysis of breakfast behavior shows that 75% spend less time of recommended to the breakfast and the 65% take breakfast alone. 38% of participants know what types of foods are part of a suitable breakfast. Although the 93% think that cereals must be part of the breakfast only the

20.5% include it. A high intake of cereals and low of fruits is associated with a high age. No differences between skipping breakfast and body mass index and between live in big cities or small village were found in this group of age.

Conclusions: Substantial evidence that breakfast consumption is associated with the health were reported by others authors. Data shows that a suitable breakfast is not consumed in the group studied and optimal breakfast consumption should be encouraged in this range of age with the aim to prevent chronic diseases in the future.

P049

Nut Intake and Adiposity: Meta-Analysis of Clinical Trials

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Background: Epidemiological studies have shown an inverse association between frequency of nut consumption and body mass index and risk of obesity. However, clinical trials evaluating nut consumption on adiposity are scarce and inconclusive.

Objective: We performed a systematic review and meta-analysis of published randomized nut-feeding trials to estimate the effect of nut consumption on adiposity measures.

Design: MEDLINE and the Cochrane Central Register of Controlled Trials databases were searched for relevant clinical trials of nut intake that provided outcomes of body weight, body mass index or waist circumference measurements and were published before December 2012. There were no language restrictions. Two investigators independently selected and reviewed eligible studies. The weighted mean difference (WMD) between nut or control diets was estimated using a random effects meta-analysis with 95% confidence intervals (CI).

Results: Thirty-one clinical trials met our inclusion criteria. Pooled results indicated a non-significant effect on body weight [WMD = –0.64 kg (95% CI: –2.32, 1.05; I2 = 99%)], body mass index [WMD = –0.30 kg/m^2 (95%CI: –0.92, 0.32 kg/m^2; I2 = 99%)] or waist circumference [WMD= –1.10 cm (95%CI: –3.34, 1.14 cm; I2 = 96 %) of diets including nuts compared with control diets. These findings were remarkably robust in the sensitivity analysis. No publication bias was found.

Conclusions: Compared with control diets, diets enriched with nuts did not increase body weight, body mass index or waist circumference in controlled clinical trials.

P050

Effect of Hydroxytyrosol on Cell Signalling, Cell Cycle and Proliferation of Intestinal Epithelial Cancer Cell

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Background and Objectives: Mediterranean countries have lower morbility/mortality rates of colorectal cancer than Northern European or other Western countries. This has been attributed, at least in part, to the Mediterranean diet, which is composed of specific local foods, including olive oil. It is becoming increasingly that many of the benefits associated with the ingestion of extra virgin olive oil are due to its minor components such as polyphenols, being hydroxytyrosol (HT) a representative one of these compounds. The aim of this study was to analyze the effect of HT on cell cycle and proliferation of intestinal epithelial colon adenocarcinoma Caco-2 cells as well as to study the effect of this polyphenol on cell signaling pathways involved in the growth of these cells.

Results and Conclusions: Our results show that HT (0.1–10 μM) inhibits Caco-2 cell growth in a concentration-dependent manner as well as DNA synthesis induced by fetal bovine serum. being these effects higher than those obtained with tyrosol. Moreover, we observed that the impairment of Caco-2 cell proliferation was not consequence of cytotoxicity or apoptosis induced by the polyphenol. Finally, we observed that HT reduced the activation of cell proliferation signaling pathways induced by fetal bovine serum such as ERK and CREB phosphorylation. In conclusion, our findings suggest that minor components of olive oil as HT reduces colon adenocarcinoma cell proliferation.

P051

Effects of Olive Oil Minor Components on Intestinal Epithelial Cancer Cell Growth Induced by Oleic Acid

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Background and Objectives: Colorectal cancer etiology involves environmental factors such as diet. Despite high fat intake being associated with increased risk of cancer, there are little information related with the role of fatty acid composition. It has been shown that oleic acid promote human colon cancer growth [1] whereas other authors propose that olive oil was benefic in colon carcinogenesis [2]. Considering these apparent discrepancies, the aim of this study was contributed to clarify the role of oleic acid and minor components of virgin olive oil on colon adenocarcinoma cell growth.

Results and Conclusions: Oleic acid in absence of growth factors was able to induce Caco-2 proliferation. Then, we studied the effect of several representative minor components of virgin olive oil on Caco-2 growth. We studied oleuropein and hydroxytyrosol as phenolic compounds, pinoresinol as lignan, maslinic acid as triterpene and squalene as hydrocarbon, all present in virgin olive oil. Hydroxytyrosol and oleuropein had similar antioxidant effect than Trolox, pinoresinol had 4-fold more antioxidant action whereas maslinic acid and squalene present a little antioxidant capacity. Our results show that olive oil minor components with antioxidant activity reduced cell proliferation and DNA synthesis in Caco-2 cell cultures induced by oleic acid.

In conclusion, these findings suggest that oleic acid can induce colon cancer cell growth whereas this effect was completely reverted by the presence of minor components with antioxidant activity.

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P053

Polyphenols of Olive Oil Modulated the Effects of Hyperglycemia and Free Fatty Acids on Endothelial Dysfunction

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Background and Objectives: Epidemiological studies have reported that olive oil decrease the incidence of cardiovascular disease. Recently, PREDIMED Study, a large-scale, multicenter, randomized trial demonstrated that extra virgin olive oil or nuts supplementation to traditional Mediterranean diet reduced blood pressure in individuals with metabolic syndrome. However, the mechanism involved in this beneficial effect has not been delineated. We must consider that endothelium plays an important role in the regulation of blood pressure through the release of potent vasodilator and vasoconstrictor agents such as nitric oxide and endothelin-1, respectively. Events disrupted by insulin resistance, hyperglycemia and the enhancement of serum free fatty acids. Taken together the above mentioned and that olive oil contents polyphenols, compounds with biological action. This study aims to analysis the effects of olive oil polyphenols on endothelial dysfunction using an in vitro model that simulated metabolic syndrome conditions.

Results and Conclusions: Our results shown that oleic acid (0–100 μmol/L) reduced NO and increased ET-1 release by ECV304 cells. This effect was more marked with linoleic acid. Moreover, high glucose potentiated the effects of these free fatty acids on NO/ET-1 release. These events can be related with the stimulation of oxidative stress. Hidroxytyrosol and polyphenol extract from extra virgin olive oil were able to revert the above events. Moreover, we observed that high glucose and free fatty

acids reduced nitric oxide and increase endothelin-1 released by acetylcholine through the modulation of intracellular calcium concentrations and endothelial nitric oxide synthase phosphorylation, events also reverted by hydroxytyrosol and polyphenol extract.

In conclusion, our results suggest a protective effect of olive oil polyphenols on endothelial dysfunction induced by hyperglycemia and FFAs. Findings that support that extra virgin olive oil could be more effective than high oleic seed oils in the dietary treatment of hypertension.

P054
The Effect of Traditional Mediterranean and Low Fat Diets on Atherosclerosis Related Genes: A Nutrigenomic Approach

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Background and Objectives: Some of the benefits associated with healthy diets could be explained by a modulation on atherosclerosis-related genes. Within the frame of a global transcriptomic response to a Traditional Mediterranean Diet (TMD), we explored changes in gene expression related to lipid metabolism, inflammation, and CD40 signalling.

Methods: The PREDIMED study is a large, parallel, multicentre, randomised, controlled trial aimed at assessing the TMD effect on primary cardiovascular prevention. High cardiovascular risk participants were recruited and assigned to one of the following interventions: 1) TMD plus virgin olive oil (VOO); 2) TMD plus mixed nuts; or 3) low-fat diet (LFD, control group). In a sub sample of 30 volunteers of the PREDIMED, gene expression changes in peripheral blood mononuclear cells, after 3 months of intervention, was assessed by microarray analysis (Affymetrix). Genes that were differentially expressed in the microarray and were related to lipid metabolism, inflammation, and CD40 signalling were included in the RT-PCR analysis (N = 60).

Results: Genes related with lipid oxidation, were downregulated: NAMPT and MSR1 after both variants of TMD (with VOO and Nuts), and CCR3 after TMD+VOO. Genes related with lipid metabolism such as HBEGF and NR4A2 were downregulated by TMD+ Nuts and IGF2R by LFD. Genes involved in inflammation were mostly downregulated after TMD+Nuts and LFD: PTGS2, PTX3, CCL3, CXCL2, IL1B and IL8. In agreement with these results, systemic levels of IL8 and C-Reactive Protein decreased after TMD+Nuts.

Conclusions: A TMD rich in Nuts decreased IL8 at pre- and post-translational levels. TMD rich in VOO and Nuts, together with a complementary fat reduction, could be a useful tool for the modulation of the cardiovascular risk transcriptomic response towards a protective mode in humans.

P055
Mediterranean Diet with Virgin Olive Oil or Nuts Modulate Nitric Oxide, Endothelin-1 and Blood Pressure in Hypertensive Women

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Background and Objectives: Randomized clinical trials have shown that the traditional Mediterranean diet reduces blood pressure. However, the mechanisms involved in this beneficial effect have not yet been elucidated. The reduction in nitric oxide concomitant with increased endothelin-1 in various pathophysiological circumstances suggests a link between these two mediators in endothelial dysfunction and hypertension development that was observed in our population at baseline. We compared the 1-year effect of 2 behavioral interventions to implement the traditional Mediterranean diet (one supplemented with virgin olive oil and the other with nuts) versus a control group (advice on a low-fat diet) on hypertension, as well as vasculature stable nitric oxide metabolites and endothelin-1 levels, among non-smoking women with essential resistant moderate hypertension.

Results and Conclusions: Our findings show a reduction of systolic and diastolic blood pressure after both traditional Mediterranean diets. An inverse association was observed between changes in blood pressure and serum stable nitric oxide metabolites concentrations after the intervention with Mediterranean diet supplemented with extra-virgin olive oil. On the other hand, we observed that the reduction of blood pressure induced after 1-year follow intervention with Mediterranean diet supplemented with nuts was related with an impairment of serum endothelin-1 concentrations. The present data support underlying mechanisms involved nitric oxide and endothelin-1 to explain, at least partially, the effect of extra-virgin olive oil and nuts on lowering blood pressure among hypertensive individuals.

P056

Virgin Olive Oil-Rich Mediterranean Diet Improves Cognition: The Predimed-Navarra Randomized, Prevention Trial

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Background and Objectives: Previous observational studies have reported beneficial effects of the Mediterranean diet (MedDiet) on cognitive function, but the results are inconsistent. We assessed the effect on cognition of a randomized controlled feeding trial testing two Mediterranean diets (MedDiet) (supplemented with extra-virgin olive oil [EVOO] or mixed nuts) in comparison with a control low-fat diet.

Methods: A random subsample of 268 participants at high vascular risk (44.8% men, 74.1±5.7 years) enrolled in the PRE-DIMED-NAVARRA trial were evaluated after 6.5 years of nutritional intervention comparing two MedDiets. Participants received intensive education to increase adherence to the intended intervention. Participants allocated to MedDiet groups received EVOO (1 l/week) or 30 g/day of mixed nuts. Nutrition status was evaluated with a 137-item food frequency questionnaire and a 14-item questionnaire to evaluate adherence to MedDiet pattern at baseline and yearly thereafter. Cognitive performance as a main outcome and cognitive status (normal, mild cognitive impairment [MCI] or dementia) as a secondary outcome were evaluated by two neurologists blinded to intervention assignment

Results: Better post-trial cognitive performance versus control in all cognitive domains and significantly better performance across fluency and memory tasks were observed for participants allocated to the MedDiet+EVOO group. After adjustment for sex, age, education, Apolipoprotein E genotype, family history of cognitive impairment/dementia, smoking, physical activity, body mass index, hypertension, dyslipidaemia, diabetes, alcohol and total energy intake, these participants also showed less MCI (OR = 0.34 95%CI: 0.12–0.97) compared versus controls. Participants assigned to MedDiet+Nuts group did not differ from controls.

Conclusion: A long-term intervention with an EVOO-rich MedDiet resulted in a better cognitive function in comparison with a control diet. However, non-significant differences were found for most cognitive domains.

Trial Registration: ISRCT: 35739639.

P057

Design of a Study on Adherence to Mediterranean Diet and Local Foods Consumption

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The adherence to the Mediterranean Diet in people of all Countries of the Mediterranean basin may represent a protective factor against the development non communicable disease. This study is aimed to relate the Mediterranean Diet Pyramid (MDP) and the Mediterranean Filiere (MF) to the natural and cultural heritage of selected geographical areas The bioactive compounds available in local foods are analyzed and, at the same time, epidemiological surveys are carried out on the population in order to assess the food habits and analyze those biomarkers which evaluate the adherence to the Mediterranean diet.

The project will be developed by a multi-disciplinary research group. Researchers with different scientific background will be organized in three working groups, each focusing on a particular aspect of the food-related characteristics of the selected geographical area and of the relevant sample: major production chains in relations with the MDP filiere, tradition, behavior and cultural heritage. The data will be collected using a food survey and clinical history. To evaluate the adherence to the MD of the sample the following parameters will be considered: quality and quantity of antioxidant typical of local foods (cereals, olive oil, legumes, nuts, fruits and vegetables) and the concentration of the same antioxidant in plasma and urine of the sample.

A study algorithm will be designed to elaborate the data collected from different sources into a comprehensive analysis reflecting the project goal. Furthermore, a Taxonomy, interpretative model and a perspective model will be prepared.

On the basis of the data collected in all working groups, it will be possible to prepare different scenarios of development and trends of food production and consumption and to understand the consequences on the environment, agriculture, social and economic conditions of Mediterranean areas.

P059

Cross-Cultural Study of Behavioural Factors Associated to the Mediterranean Diet in Chilean and Spanish Youth Samples

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Background and Objectives: Little is known about the social, cultural and behavioural factors associated to the Mediterranean Diet. Some examples of these factors are mealtime socialization, food moderation, meal preparation, or the practice of physical activity. The aim of the present study is to analyze behavioural factors associated to the Mediterranean Diet in Chilean and Spanish youth samples.

Methods: Participants of the present study were 443 young adults, who completed the e-tona self-report. The sample was composed by 168 Chilean and 275 Spanish participants, and the 77% of the sample were women. The mean age and BMI was 21.9 years (SD = 3.3) and 22.6 kg/m^2 (SD = 3.6), respectively.

Results: The mean BMI of both groups was allocated in the normal weight category. However, statistically significant differences were found between groups (p < .0001), with Chilean participants showing higher BMI. Results showed that both groups followed some of the recommendations of the Mediterranean Diet, such as mealtime sharing with family and friends or food size moderation. However, Chilean participants showed less regularity in serving meals, more snacking between meals, more fast food consumption and less consumption of homemade meals. Also, they showed a higher frequency eating while doing other activities, and less hours of exercise per week. All differences were significant at p < 0.0001. Moreover, Spanish participants tended to consider food's nutritional value when shopping (p = 0.039).

Conclusions: Recommendations of the Mediterranean Diet are highly followed by Spanish participants of the present study compared to the Chilean group, which could explain the lower mean BMI of the former group. Therefore, further research of behavioural factors of the Mediterranean Diet is required. Encouraging people to incorporate these factors in their lifestyle will be a tool for preventing and treating the obesity epidemic.

P060

Long-Term Consumption of Complementary Phenol-Rich Olive Oil Improves HDL Subclass Distribution in Humans

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Background and Objectives: Several studies show that olive oil (OO) phenolic compounds (PC) have beneficial effects on the lipid profile. However, PC-rich foods could have a dual action because antioxidants can also act as pro-oxidants. Functional food with complementary antioxidants, according to their structure/activity relationship, could be a suitable option to avoid harmful effects. Our aim was to test whether enriched OOs (500 ppm), one enriched with its own PC (FOO1) and an other with them plus additional complementary PC from thyme (FOO2), could improve lipid profile and high-density lipoprotein (HDL) subclass distribution.

Methods: A crossover, randomized, double-blind, controlled trial was performed with 33 hyperlipidemic volunteers (19 men), aged 35 to 80. Subjects were randomized to one of 3 orders of administration of 25 mL/day of raw virgin OO (VOO), FOO1, and FOO2, in 3 periods of 3 weeks. Washout periods were of 2 weeks with a common OO between interventions. Glucose and lipid profile, glutathione peroxidase activity (GSH-Px), and HDL subclass distribution (Lipoprint) were measured. HDL2 and HDL3 subclasses include from 1 to 3 and from 4 to 9 Lipoprint bands, respectively.

Results: A trend to increase HDL-cholesterol was observed after FOO2 intake. A rise in the large HDL2 subclass and a decrease in the small HDL3 subclass were observed after FOO2 (p < 0.05). FOO2 consumption improved GSH-Px versus FOO1 (p < 0.01). No differences were observed in other biomarkers of lipid and glucose profile.

Conclusions: Complementary PC in OO improved antioxidant status, increased the large HDL2 subclass, and decreased the small HDL3 one, a fact related to an improvement of cholesterol efflux. Therefore, an FOO2 could be a useful tool in the management of high cardiovascular risk patients.

P061

Correlation Between Preferences for Typical Foods of the Mediterranean Diet and their Consumption in a Mediterranean Population

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Introduction: The Mediterranean Diet (MedDiet) is characterized by a high consumption of fruit, vegetables, pulses, fish, olive oil and nuts. Food preferences may have an influence on adherence to the MedDiet, but there are still few studies that have analyzed them. Our aim was to study the association between preferences for typical foods of the MedDiet and their consumption.

Methods: 131 individuals (aged 18–75 y) were recruited form the general population (Valencia) (48.9 % men, 51.1% women). A food frequency questionnaire and another on food preferences were administered. The degree of preference was evaluated on a scale of 0 (aversion) to 3 (top preference). Correlations were analyzed using Spearman's rho.

Results: Favorite foods were olive oil, citrus and other fruits, with scores of 2.63±0.68, 2.49±0.72 and 2.40±0.78, respectively. We detected interesting correlations between preferences for typical MedDiet foods and their consumption. We did not observe any statistically significant correlation between the preference for olive oil and its consumption (rho = 0.10; P = 0.295), perhaps due to its high cost in comparison to other oils. In contrast, we did observe significant correlations between the preference for nuts and their consumption (rho = 0.27; P = 0.006 for almonds and hazelnuts, and rho = 0.026; P = 0.007 for walnuts). Higher correlations were obtained fruits (oranges rho = 0.47; P = 0.001, other fruits rho = 0.40; P = 0.001). Particularly outstanding for its great magnitude is the correlation between the preference for certain vegetables and their consumption. Thus we have coefficients >0.50 (P = 0.001) for green beans, broccoli, cauliflower, cabbage, artichokes, spinach and chard. In the case of fish, no association was found between preferences and consumption.

Conclusion: In general we observed a significant correlation between preferences for typical foods of the MedDiet and their consumption. However, socio-economic factors may have an influence.

P062

A Concentrated Polyphenolic Extract from Carob Insoluble Fiber Prevents Atherosclerosis: Mechanisms Involved

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Background and Objectives: Atherosclerosis is a leading cause of death which is influenced by many cardiovascular (CV) risk factors. Several studies showed that a high-fiber diet is linked to a decreased risk of CV disease, although the mechanisms involved are not well-known. Polyphenols are bioactive compounds from vegetable sources with antioxidant and anti-inflammatory properties. One of the best known polyphenols, Resveratrol, is able to stimulate SIRT1/PGC-1 alfa; cascade, which is related with metabolic and CV diseases.

Our objective was to evaluate the effects of a natural insoluble dietary fiber (comprised of 80% insoluble polyphenols) from carob pod (ICFP) on the biochemical and molecular alterations associated with atherosclerosis in rabbits.

Methods: Male New Zealand rabbits were divided into 3 groups: C: normal chow; D: 0.5 % cholesterol+ 14% coconut oil diet (8 weeks); DF: dyslipidemic diet +ICFP (1 g/kg/day; 8 weeks). At the end of the experiment, serum lipid profile, atherosclerotic markers, SIRT1 and PGC-1 alfa were evaluated.

Results: Total serum cholesterol and triglycerides were higher (p<0.05) in D than in C, and were reduced by ICFP. Atherosclerotic lesion area was 14.01 ± 2.55% in DL and ICFP reduced (p < 0.05) it. Acetylcholine-induced relaxations in aortic rings were lower (p < 0.05) in D than in C and were normalized with ICFP. Aortic expression of fibrotic (collagen I and TGF Beta;) and inflammatory (CD36, PAI-1 and TNF alfa;) factors were higher (p < 0.05) in D than in C. Administration of ICFP reduced these parameters. Expression of eNOS, SIRT1 and PGC-1 alfa; were lower (p < 0.05) in D than in C, and ICFP enhanced them.

Conclusions: ICFP reduced atherosclerosis development in rabbits fed a dyslipidaemic diet. This effect seems to depend on serum lipids reduction, but also probably on the beneficial effects of its polyphenols on endothelial function, inflammation and fibrosis. SIRT1 and PGC-1 alfa; could be relevant mediators of the mentioned beneficial effects.

P063

The Healthy Start Project: A Randomized, Controlled Intervention to Prevent Overweight among Normal Weight, Preschool Children Predisposed to Future Obesity

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Background: Obesity is present already in childhood, and prevention therefore has to start early. However, among controlled intervention studies in children, less than 25% prevented weight gain (Cochrane, 2011). Almost all interventions improved diet and/or activity, but none focused on sleep and stress management.

The objectives of the Healthy Start intervention were to prevent development of overweight among normal weight children who all were predisposed to future weight gain.

Methods: Children, aged 2–6 years, with high birth weights (>4000 g), maternal pre-pregnancy overweight (BMI>28 kg/m^2), or familial low socioeconomic status were selected from the Danish National Birth Registry and administrative birth forms. Subsequently, children were randomized into intervention (n = 271) and control (n = 272) groups.

The intervention consisted of up to 10 optional individual consultations guiding parents in optimizing diet and physical activity habits, reducing chronic stress and stressful events and improving sleep quality and quantity. Families could also participate in cooking classes and play arrangements.

Changes in weight and body composition from impedance, were measures before and after 1½ years of intervention.

Results: In total 156 and 198 children from the intervention (I) and control (C) groups completed the study. Average age at baseline was 4 years. Weight change was not different between groups (p=0.29). However, percentage body fat (BF%) improved in both groups. At baseline BF% was I:22.2+10.1% and C:21.2+8.2%. After the intervention BF% was I:20.3%+7.8 and C:20.7+7.0%.

Conclusion: These first results of the Healthy Start study suggest that the intervention was effective in preventing gain in BF% in the intervention compared to the control group. These results are encouraging because they suggest that even among individuals with a strong predisposition for developing obesity, an early intervention may be successful if, in addition to diet and physical activity, it focuses on reducing stressful behavior and improving sleep.

P065

Determination by HPLC-MS of Plasmatic Maslinic Acid, a Bioactive Compound from Olea Europaea L

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Background and Objectives: Maslinic acid is a pentacyclic triterpene found in the leaves and fruits of Olea europaea L. It has been reported as a bioactive compound with hypoglycemic, antioxidant, cardioprotective and antitumoral effects. Here, a liquid chromatography-tandem mass spectrometry method to determine maslinic acid in rat plasma is described.

Methods: Maslinic acid was extracted from plasma samples of Sprague-Dawley male rats with ethyl acetate, and separated on a Phenomenex Luna C18 column (150 mm x 2.0 mm, 5 μm) using a gradient elution of water and acetonitrile at a flow rate of 0.8 mL/min. Quantification was performed using an atmospheric pressure chemical ionization source and in the selected ion monitoring mode using target ions at [M-H]- m/z 471.3 for maslinic acid and [M-H]- m/z 455.3 for betulinic acid as the internal standard.

Results: The method was validated by the analysis of plasma samples spiked with pure maslinic acid, obtaining an average coefficient of correlation of 0.997 for the calibration range between 0.005 and 10 μM. The mean recovery of maslinic acid from plasma was 99.2 ± 1.32%. The intra-day precision ranged from 1.44% to 5.45% while the inter-day precision was between 2.49% and 8.38%. The accuracy of the method varied from 0.10 to 4.82%. The lower limit of quantification was 5 nM, yielding a precision of 6.22% and accuracy of 0.50%. After 24 h of the administration of 10, 25 and 50 mg/kg of maslinic acid, plasmatic concentrations were 10.8, 20.2 and 39.3 nM/L, respectively.

Conclusions: The HPLC-MS method described has the sensitivity, precision and accuracy suitable for its use in pharmacokinetic studies.

P066

Moderate Beer Consumption Increases the Number of Circulating Endothelial Progenitor Cells in High Cardiovascular Risk Males

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Background and Objectives: Moderate alcohol consumption is inversely associated to cardiovascular risk factors and cardiovascular events. Nevertheless, the contribution of each type of beverage (fermented or distilled) in these protective effects still remains unclear. Endothelial progenitor cells (EPC) are known to repair endothelial damage and in patients at an increased risk of cardiovascular disease the peripheral EPC number is reduced. Therefore, increasing the number of circulating EPC could be a mechanism by which moderate alcohol consumption decreases cardiovascular events. The aim of this work was to analyze the effects of moderate beer consumption and its fractions in the number of circulating EPC.

Methods: Thirty-three high cardiovascular risk male volunteers were included in a randomized, crossover and controlled feeding trial. After a run-in period of two weeks, in which subjects were asked to avoid alcohol consumption, all subjects received the same amount of alcohol in two different treatments: Beer (660 mL–30 g of ethanol/day -fermented alcoholic beverage-) and Gin (100 mL–30 g of ethanol/day -distilled alcoholic beverage-). Before and after each intervention period, EPC (CD34+/CD133+/CD39+)/500000 peripheral blood mononuclear cells (PBMC) were analyzed with a FACSCalibur after excluding cell debris (7AAD+).

Results: After beer consumption, the number of EPC/500000 PBMC increased in 8 units, (P = 0.020, t test for paired samples), while after gin consumption the number of EPC/500000 PBMC decreased in 5 units (P = 0.099). Therefore the differential effects between the beer and gin interventions were statistically significant (P = 0.007).

Conclusions: Moderate beer consumption, but gin increases the number of circulation EPC.

P067

The Effects of 2 Common Polymorphisms of Key Genes in Folate and Cobalamin Metabolism Depend on Riboflavin Status

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Background and Objectives: Methylenetetrahydrofolate reductase (MTHFR) (cofactor FAD) and methionine synthase reductase (MTRR) (flavoprotein) affect homocysteine remethylation to methionine. Given the functional riboflavin component of these enzymes, we investigated whether riboflavin status alters the associations between polymorphisms affecting them, and fasting plasma total homocysteine (tHcy).

Methods: Transversal study of 782 adults from Tarragona province (18–75 years). B vitamin supplement users were excluded. Fasting riboflavin status (erythrocyte glutathione reductase activation coefficient (EGRAC)), plasma folate (PF), cobalamin and tHcy and the MTHFR 677C>T, MTRR 66A>G and 524C>T polymorphisms were determined. Associations between EGRAC, the polymorphisms and tHcy and interactions between EGRAC and the polymorphisms were determined. Multiple linear regression models (MLRM) including everyone and separate models for cobalamin, pmol/L (low: less than or equal 299; mid: >299–<401; high: grater than or equal 401) and PF, nmol/L (low: less than or equal to 9.1; mid: >9.1–<14.5; high: greater than or equal to14.5) tertiles were designed.

Results: 34.8% of the participants had low riboflavin status (EGRAC greater than or equal to1.4).

PF (mean, SD) was lower in the MTHFR 677CT (13.0, 7.7; p < 0.05) and 677TT (11.7, 7.2; p < 0.01) versus 677CC (14.5, 9.0) genotypes. tHcy (µmol/l) was higher in the 677TT (11.4, 12.6) versus 677CT (9.4, 7.8; p < 0.001) or 677CC (9.0, 1.4; p < 0.001) and in MTRR 66GG (9.9, 1.5) versus 66AA (9.3, 1.4; p < 0.05) genotypes.

Interaction (EGRAC-genotype) effects on tHcy: MTHFR 677C>T: p<0.01; MTRR 66 A>G (high cobalamin tertile): p < 0.001; MTRR 524 C>T (mid & high cobalamin tertiles): p<0.05 & p < 0.001.

PF and cobalamin were negatively associated with tHcy (p < 0.001) in the global MLRM and EGRAC positively associated with tHcy in the models limited to MTHFR 677 TTs (p = 0.057), or MTRR 66 GGs (p < 0.01) or MTRR 524 CCs (high cobalamin tertile) (p < 0.05).

Conclusion: Riboflavin status modifies the effects of polymorphisms in genes that regulate the remethylation of homocysteine to methionine by folate and cobalamin.

P068
Anthropometric Assessment of Patients with Breast Neoplasia

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Breast cancer is the most common type neoplasia diagnosed in women and the second most common in the world. The objective of this study was to evaluate the nutritional status of patients diagnosed with breast cancer using anthropometric measures. This study has a descriptive cross-sectional approach. We assessed weight, height, arm circumference and triceps skinfold of 42 female volunteers undergoing treatment at a health center in Fortaleza, Ceará, Brazil.

Each measurement was performed in triplicate to obtain posterior averages. The inclusion criteria were: 19 years or older, breast cancer diagnosed and being in clinical treatment (chemotherapy, radiotherapy and/or hormonal therapy). Exclusion criteria were: patients with diabetes mellitus, acquired immunodeficiency syndrome, rheumatoid arthritis, thyroidopathies, hepatopathies and older than 75 years. The mean BMI was found to be 27.92 kg/m^2, a prevalence (80.95%) of overweight (BMI greater than or equal to 24.99) in this population was observed. When we assessed adequacy of arm circumference, 47.6% were diagnosed as eutrophic, this result was confirmed when evaluated skinfolds, where 30.9% of the volunteers were diagnosed with eutrophic. Patients diagnosed with breast cancer on adjuvant chemotherapy tend to gain weight due to accumulation of body fat and water, without concomitant increase in lean body mass. The arm muscle circumference showed that 69.1% of the volunteers were considered normal weight, according to the cutoffs, however, this classification does not allow to distinguish from normal individuals who are overweight, causing the two classifications are classified as normal weight. It was observed that patients being treated for breast cancer tend to have overweight when evaluated by anthropometric methods, requiring nutritional care to avoid the risk of comorbidities.

P069
Nutritional Status of Patients with Breast in Neoplasia Treatment

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Given the multifactorial nature of cancer, its importance in the current context of chronic disease and knowing that there is an intrinsic relationship between nutritional status, disease prognosis and response to treatment, one realizes the need to know the nutritional risk patients undergoing treatment for the disease. Therefore, we evaluated the nutritional status and nutritional risk of patients being treated for breast cancer. The study sample comprised 42 female patients, who responded to the Subjective Global Assessment (SGA) questionnaire and had their weight and height measured. Subsequently we calculated the body mass index. Were used as inclusion criteria: 19 years or older, breast cancer diagnosed and being in clinical treatment (chemotherapy, radiotherapy and/or hormonal therapy). Exclusion criteria were patients with diabetes mellitus, acquired immunodeficiency syndrome, rheumatoid arthritis, thyroidopathies, hepatopathies and older than 75 years. The average age of participants was 51 years and 6 months, were 32 adults and 10 elderly (age uper than 60 years). The subtype of cancer was present more invasive ductal carcinoma, found in 38 patients (90.5%). According to BMI, 78.6% of the sample was classified as excess weight. The SGA showed greater number of well-nourished individuals (78.6%). This result was significantly different between groups of adults and the elderly, where they had 20% of thinness while the adult group, nobody framed in this diagnosis. It was also observed that 68.3% of the studied group gained weight during treatment. Due primarily to the effects of treatment, being overweight is a common finding in patients with breast cancer, it is important to emphasize that patients need nutritional care to avoid further complications that can be caused by excess weight.

P070
Mediterranean Diet vs Low-Calorie Diet

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Background: Epidemiological studies suggest that the Mediterranean Diet (MedDiet) may reduce the Metabolic syndrome (MetS) and can help weight loss. We compared the 1 year of 2 behaviorial interventions to implement the MedDiet vs low calories diet. (Lcdiet)

Methods: The study involved 253 patients recruited voluntarily in the normal visits to nutritionist in Iassy and Bucharest.

All patients were followers of Romanian traditional diet high in saturated fat and low in fiber.

Patients in the study had higher BMI values (> 29) and high levels of glucose, LDL cholesterol and homocysteine.

101 patients followed a low-calorie diet and 152 followed the Mediterranean diet'

No patient changed his lifestyle on daily activities.

Results: After 3 months BMI reduction was approximately equal in both groups.

Weight loss after 6 months was 23, 4% higher in the MedDiet but were striking differences at physiological level: in the MedDiet group cholesterol, glucose and homocysteine levels were significantly improved.

After 8 months 82% of patients abandoned LCDiet and weight increased MD patients maintained their weight and only 8% abandoned the diet.

82% of patients have changed foreve Romanian diet in favor of MedDiet and this has led to a substantial improvement in the quality of life of patients.

Conclusion: a traditional MedDiet could be a useful tool in the management of weight control and the MetS.

P071

Long Term Pregnancy Plasma and Red Cell Folate Response to First Trimester Folic Acid Supplementation

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Background and Objectives: We investigated adherence to the recommendation of first trimester supplementation with 400µg/d of folic acid and its effect on folate status throughout pregnancy.

Methods: 443 women (with no illness affecting nutritional status, and <12 weeks pregnant) from the Reus-Tarragona Birth Cohort (NUTCIR phase; University hospitals Sant Joan, Reus and Joan XXIII, Tarragona) were prescribed a daily prenatal supplement containing 400 µg of folic acid and 2 µg of cyanocobalamin (until 13 gestational weeks (GW)). They completed a questionnaire on folic acid supplement use (type, dose, daily frequency) during the 3 months before and the first 4 months of pregnancy, as well as lifestyle/habits at 20GW. Fasting plasma and red cell folate were determined at <12, 15, 24–27 and 34GW, and labor (nonfasting plasma folate).

Results: 47.9% of the participants adhered strictly to, 16.5% adhered sporadically to and 31.2% consumed folic acid supplements in excess of the recommended supplement regime. 4.5% reported no supplement use and were excluded. 34.7% reported preconception supplement use.

Between 15 and 24–27 GW, plasma folate was reduced by (mean(SD)%) 36(38) and 35(41) respectively in the strict and sporadic adherence groups and by 46(33) in the excess group. Plasma folate did not change further in any of the groups, but was highest in the "excess"(geometric mean [95% CI]):15.0 nmol/L [12.6–17.8]; "strict": 9.8 nmol/L [8.4–11.4], "sporadic": 9.1 nmol/L [7.0–11.8] at labor (p<0.001).

Red cell folate increased between <12 and 15GW by (mean(SD)%) 36(49), 29(56) and 41(61) respectively in the excess, strict and sporadic groups. Between 15 and 34GW it was reduced by 22(39)%, 8(41)% and 3(53)% to 977 nmol/L [861–1109], 1223 nmol/L [1071–1397], and 823 nmol/L [646–1047] nmol/L respectively.

Conclusions: First trimester supplementation with 400 µg/d of folic acid improves early pregnancy folate status only. Consumption of higher doses improved second and third trimester folate status.

P072

In Vivo Nutrigenomic Study of Tomato Intake Effects on Genome-Wide Expression and its Link to Cardiovascular Risk Markers

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Background and Objectives: Tomatoes are one of the most consumed vegetables in the Mediterranean diet. Epidemiological studies suggest that tomato consumption may lower cardiovascular diseases (CVD) risk. Most forms of diseases are the product of the interaction of many genes with small effects modified by the environment and other genes. However, it is unknown how tomato consumption modulates genes involved in CVD. We aim to investigate tomato intake effects on the genome-wide expression and link them with cardiovascular risk.

Methods: We performed a cross-over feeding clinical trial in 40 healthy volunteers receiving raw tomato, tomato sauce and

tomato sauce with oil in random order. Participants were instructed to abstain from tomato and polyphenols-rich foods the day before each intervention. To reduce inter-individual differences, seven paired men were select to carry out the whole-transcriptome microarray. Data were normalized using robust multichip analysis and results were analyzed by standard methods. The most differentially expressed genes were validated by individual RT-PCR. Biochemical parameters were also determined.

Results: We detected several differentially expressed genes (up or down regulated) after 6 hours of tomato consumption for non-coding and coding RNAs. We focused in those genes included in a candidate gene list for both susceptibility to atherosclerosis and CVD. More than 20 of these genes (FADS1, PLA2G10, SCD, APOA2, CTSB, SCARNA5, NANOG, DDIT4, DUSP1, ARRDC3, HMGB1…) were differentially expressed. Additionally, we found a statistically significant lineal trend between the expression of some of these genes and markers of cardiovascular risk previously analyzed. Thus, the alteration of some pathways, mainly those involved in the regulation of transcription, DNA-binding and nucleosome, suggest epigenetic mechanisms related to tomato consumption for CVD.

Conclusions: We have reported for first time that acute tomato intake may have significant effects on the transcriptome of CVD.

P073

Highly Gamma-Aminobutyric Acid (GABA) Producing Lactic Acid Bacteria Isolated from Artisanal Spanish Cheeses

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Among lactic acid bacteria, lactobacillus species are widely used as probiotics, especially in fermented dairy products. GABA is a non-proteic amino acid considered as a bioactive component for its numerous physiologycal functions (neuro-transmission, induction of hypotension, diuretic and tranquilizer). Some strains of lactic acid bacteria can naturally synthetize GABA by the irreversible decarboxlation of L-glutamate through the glutamic acid decarboxylase (GAD) enzym which is dependent on the strain. The aims of this study were: (1) Isolate lactobacillus strains from 65 Spanish cheese varieties; (2) evaluate and select cheese-related GABA-producing lactic acid bacteria to be used as starters; (3) analyze the GABA content of these cheeses.

For the isolation and growth of the strains, MRS agar medium incubated under anaerobic conditions was used. Ten colonies per sample were randomly taken for measure the GAD activity which was performed following the pH Indicator Method1. After the extraction and deproteination of GABA from cheeses with chloridric acid and trichloroacetic acid solution2, respectively, RP-HPLC followed by UV detection was used for its determination. Strains were also identified by a phenotypic and genotypic characterization.

Based on the pronounced color-changing profile of the complex pH indicator and the highly pH increase in the biotransformation solution, four potentially GABA-producing strains from four different cheeses were selected among the isolated strains. The highly GAD activity isolated and identified strain was registered in the Spanish Type Culture Center (Centro Español de Cultivos Tipo, CECT) as Lactobacillus brevis CECT 8183. The contents of GABA in cheeses, influenced by the kind of cheese and intensity of proteolysis, varied in the range from 0.01 to 2.05 g/kg. The highly-producing strain was isolated from the highly GABA content cheese.

The findings of this study provide a potential basis for exploiting selected cheese-related lactobacilli to develop health-promoting products rich in GABA.

P074

Inhibition of Circulating Immune Cells Related to Atherogenesis Intervention after 1, 3 and 5 Years with Mediterranean Diet

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Background and Objectives: Adherence to the Mediterranean diet (MD) is associated, in the short term, with a systemic inflammatory status that can delay the onset and progression of atherosclerotic lesions. We analyzed the expression of adhesion molecules on T-cells and monocytes related to vascular wall inflammation and atheroma plaque and evaluated the anti-inflammatory effects of 3 healthy diets for CVD prevention: virgin olive oil (VOO), Nuts and low-fat control diet (LFD).

Methods: 155 participants were recruited from a Primary Care Centre and were randomized into 3 groups: LFD and two types of MD, supplemented with VOO or Nuts, respectively. The expression of adhesion molecules (CD11a, CD11b, CD49d and CD40) were analyzed at baseline and after 1, 3 and 5y. of intervention.

Results: T-cells showed a decreased of CD11a expression after 1y. (P < 0.001, VOO; P = 0.018, Nuts; P = 0.037, LFD) and after 3 and 5y. (P < 0.001, all), CD40 decreased in both MD (P < 0.035 at 1y.; P < 0.01 at 3y. and P < 0.03 at 5y.). CD49d decreased for VOO (P = 0.039, 1y.; P = 0.012, 3y.; P < 0.001, 5y.) and increased for LFD after 3 and 5y. (P = 0.007 and P = 0.013, respectively). CD11a expression on monocyte cells decreased significantly after 1y. (P<0.001, VOO and LFD; P=0.006, Nuts). CD11b and CD40 decreased after 1y. of intervention in the 3 groups (P < 0.001, both MD; P = 0.010, LFD). For both MD, CD11b expression was reduced at 3 (P < 0.01, both) and 5y. (P < 0.001, both).

CD40 improved for the 3 groups at 3y. (P < 0.01) whereas at 5y. only improved for MD (P < 0.001, both).

Conclusions: MD+VOO or MD+nuts exerts a significant anti-inflammatory effect, which is maintained long- term in patients with vascular risk and is manifested by a reduction of adhesion molecules associated with atherosclerosis.

P075
Food Habits in Three Different Areas from North, Centre and South of Italy

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Background and Objectives: The Mediterranean diet (MD) has been widely reported to be a model of healthy eating for its contribution to a favourable health status and a better quality of life. MD is characterized by a nutritional model consisting mainly of olive oil, cereals, fresh or dried fruit and vegetables, a moderate amount of fish, dairy and meat and a low-to-moderate amount of red wine during meals. The aim of this study was to evaluate the different dietary pattern in the Italian population living in three different area (North, Centre, South).

Methods: The total sample consisted in 943 volunteers (approximately 300 per area, age 35.7±11.2 years, 46% men); for each subject weight and height have been measured after that volunteers completed a self-administrated food frequency questionnaire and a questionnaire investigating physical activity, smoking habits and alcohol consumption.

Results: Prevalence of obesity in the South of Italy (23%) in respect to the Centre (16%) and the North (4%) was observed. Frequencies and consumption of MD traditional foods were higher (p < 0.05) among individuals living in the South area in comparison with those of the Centre and North Italy. Concerning socio-economic and lifestyle determinants significant differences (P = 0.001) have been observed between areas: the highest educational levels have been found in the North in contrast with the South and Centre of Italy, at the same time subjects from the South of Italy seem to be more sedentary (58%) when compared to those living in the Centre (50%) and in the North of Italy (31%).

Conclusions: Subjects living in the South of Italy seem to adhere to the MD more than those living in the other areas of the Country although, on average, they appear to be more overweight, more sedentary and having a low educational level.

P076
Food and Agricultural Biodiversity: A Tool to Describe the Relationship Between Dietary Intake and Nutritional Status in Italian Population Groups

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Nutrition, as known, represents one of the most important aspects of health; several researches have shown as nutrition plays a crucial role in prevention of food deficiencies, behavioural disorders and chronic diseases. The Mediterranean diet, supporting agricultural biodiversity, seems to improve dietary variety and food quality and so to sustain the human health. An observational study was conducted on 300 free-living healthy subjects in Northern, Central and Southern Italy to identify the relationship between consumption of specific food groups and nutritional status and to verify the contributions of local and traditional foods to the overall diet quality.

Dietary intake was assessed by food frequency questionnaires. Standardized procedures were used to take anthropometric measurements. On blood samples (serum and plasma) were evaluated: antioxidant status by vitamin A, vitamin E, carotenoids, vitamin C, uric acid, SH groups; lipid blood profile by total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides; total antioxidant capacity by FRAP; pro-inflammatory and/or anti-inflammatory immune status by IL-6 cytokine.

We observed higher total cholesterol levels (P < 0.05) in subjects living in Central Italy (182 ± 4 mg/dl) respect to the Northern and Southern ones (165 ± 3 and 168±3 mg/dl, respectively) and significantly lower triglycerides levels (P < 0.05) in the Southern (92 ± 5 mg/dl) compared with Northern ones (114 ± 5 mg/dl). Moreover it was observed a statistical difference (P < 0.05) in total ascorbic acid plasma levels between subjects living in the Southern (0.84 ± 0.33 mg/dl) versus Central (1.14 ± 0.04 mg/dl) and Northern (1.18 ± 0.03 mg/dl) ones.

These findings could be connected to the content of specific nutrient and non-nutrient bioactive compounds, and so to the food quality.

Our data could improve the knowledge on overall diet quality, contributing to explain the outcomes of certain healing properties of varied and particular phytochemicals present in typical and local traditional foods.

Abstracts

P077
Mediterranean Diet and Healthy Cafeterias at the University of Valencia

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Background and Objectives: Adherence to the Mediterranean Diet (MedDiet) is dropping in Spain, especially among young people, so mechanisms must be found to reverse that trend. The Universitat de València (UV) participates in the "Red Española de Universidades Saludables"(REUS) [Spanish Network of Healthy Universities], one of the aims of which is to promote healthy eating habits. One of the projects underway is the so-called "Healthy Cafeterias". Our main aim was to get to know which healthy foods are on offer in the cafeterias of the UV and the factors that underlie the choice of set meals, as well as the degree of proximity of those set meals to the MedDiet pattern.

Methods: A cross-sectional study was undertaken on 627 users of the UV's cafeterias (218 men and 409 women; 64% students). A questionnaire was designed to assess food preferences, set meal consumption, degree of satisfaction and improvement suggestions.

Results: Eight cafeterias were evaluated. 45% of the population had lunch in the cafeteria two or more times a week. When it came to choosing a set meal, 66.2% chose the option that they most liked instead of choosing the healthiest option. Only 17.4% chose fruit for dessert every day and a 11.5% never chose it. The offer of other foods typical of the MedDiet (vegetables, pulses, etc.), as well as the preferences in the choice of the same were also low. Using an evaluation scale of 1 (min) to 5 (max) for whether the set meals of the cafeterias lived up to what is known as a MedDiet, only 2.5% of those questioned responded with a score of "5" whilst the majority (54% of the population) responded with a "3".

Conclusions: Both the offer and choice of healthy MedDiet set meals are low and must be improved.

P078
Adherence to the Mediterranean Diet and Health-Related Quality of Life among University Workers

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Background: The Mediterranean diet (MedDiet) has been related with reduced morbidity (cardiovascular diseases, obesity, etc); however, there exists little research focusing on quality of life. Our aim was to assess whether the adherence to the MedDiet was associated with physical and mental health related to quality of life among University workers.

Methods: Cross-sectional study on 867 (aged 41±11 years and 44.5% males) workers (including faculty, staff and others) of the University of Valencia, which participates in the Spanish Network of Healthy Universities. Individuals were randomly selected. Interviewer-administered questionnaires were used to assess demographic, clinical, lifestyle, dietary and health-related quality of life (HRQoL) variables. Adherence to the MedDiet was measured by the validated 14-item questionnaire. HRQoL was evaluated using the Spanish version of the 36-item Short Form (SF-36) questionnaire. The SF-36 measures eight dimensions of health status: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. All scores range from zero (worst health) to 100 (best health). Multivariate adjusted regression models were used. Adjusted regression coefficients (B) and their 95% confidence intervals (95% CIs) were calculated.

Results: Mean adherence to the MedDiet in the whole population was 9±2 points. Multivariate models adjusted for age and sex, revealed significant direct associations between adherence to MedDiet (as continuous) and physical functioning (p = 0.010), general health (p = 0.027), and vitality (p = 0.024). No significant results were obtained for the other dimensions. After additional adjustment for smoking, educational level, and physical activity, the highest associations were found with the mental health dimension "vitality"(B:0.73; 95%CI:0.06–1.40; p = 0.032) followed by the physical health dimension "physical functioning" (B:0.47; 95% confidence interval, CI:0.06–87; p = 0.024). Both were significantly better with increasing adherence to the MedDiet.

Conclusions: Higher adherence to the MedDiet was associated with higher scoring for important components of HRQoL.

P079

Modifying Dietary Habits in University Students after an Educational Intervention Program

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Background and Objectives: Obesity is a health problem whose development is influenced not only by biological and inherited factors but also by behavioral factors such as unhealthy dietary habits. In a previous study we concluded that dietary habits in the university students in our campus departed from the recommendations of the health authorities on nutrition. The purpose of this work is modifying the dietary habits in university students of the campus of Soria (Spain) after an educational program.

Methods: Twenty two volunteer students completed the intervention program, which lasted 7 months. This program consisted of educational and training sessions on nutrition and healthy Mediterranean diet with bibliographic and audiovisual support. Data about food consumption of the participants were collected through a one-week nutritional survey which was carried out at the beginning and at the end of the project. Results were included in a database to determine the consumption frequency of each food group. The average of the frequency of consumption of the different food groups was calculated before and after the intervention. The Wilcoxon test was applied to compare both situations and to evaluate if the educational intervention had caused variations in the frequency of consumption of certain kinds of foods.

Results: The number of meals per day ($p = 0.018$), the consumption of fruits ($p = 0.004$), vegetables ($p = 0.007$), fish ($p = 0.003$) and lean meat ($p = 0.052$) significantly increased after the intervention and the consumption of high-fat meat ($p = 0.007$) significantly decreased. The frequency of consumption of the rest of food groups remained unchanged.

Conclusions: An educational program on healthy nutrition in young university students can be effective in order to modify dietary habits.

It is necessary to develop continuing education programs that reinforce the objectives achieved and remember those which are not been reached.

P080

Energy and Micronutrients Intake among College Students

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Background and Objectives: Food is one of the avoidable risk factors that most influences the development of chronic diseases. The aim of this study is to determine the caloric and micronutrients intake among university students from Soria.

Methods: During the academic year 2011–2012 the students (n = 71) filled in a questionnaire on sociodemographic data and a survey on food intake during 7 days. Before the tests, students, were instructed on how to fill in the questionnaire and criteria for measures and amounts were standardized. The conversion of food nutrients was conducted using the specific software Nutriber.

Results: The caloric intake (kcal) is less than 80% of the recommended intake according to age group, gender and physical activity in 73.2% of the students. As for the protein intake, for almost all the participants (98.6%) it exceeds 100% of the recommendations. Only two of the participants had an adequate intake of carbohydrates and only 5 out of 10 students consume the recommended amounts of fats. No differences between genders were appreciated. Of the micronutrients studied, the calcium intake is less than recommended in 38% of the respondents, concerning the iron intake, 100%among the men and 50% among the women are above the established recommendations.

Conclusions: Results suggest college students have an unbalanced diet with a caloric intake deficit, a high proteins intake, which leads to high levels of iron supply and a low intake of carbohydrates and calcium.

P081

Olive Oil Increases Postprandial Absorption of Carotenoids from Tomato Juice in Humans

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Background and Objectives: Tomato-rich diets may produce a potential vascular health benefit that has been related to the high plasma carotenoid level achived after its intake. The matrix in which carotenoids are found in foods appear to be an important determinant of their bioavailability. The aim of the present study was to assess whether the consumption of tomato juice (TJ) with or without refined olive oil affects bioavailability of plasma carotenoids.

Methods: Eleven healthy volunteers were included in an open, controlled, randomized, cross-over feeding clinical trial. After 3 days washout period without tomato products volunteers were included in the study and randomly assigned to one of the following two interventions: 750 g TJ containing 10% refined olive oil/70 Kg body weight or 750 g TJ without oil/70 Kg body weight. Blood samples were collected at baseline and at 3, 6 and 24 h after each intervention.

Results: The presence of refined olive oil in TJ enhances the bioavailability of carotenoids. The most abundant carotenoids identified in plasma were 5-cis and trans-lycopene isomers fol-

lowed by trans-beta-carotene. All lycopene isomers increased significantly when subjects consume TJ with oil reaching the maximum concentration between 3 and 6 h. LDLc decreased significantly (p = 0.036) at 6 h after consumption of TJ with oil that was associated with an increase of total lycopenes. By contrast, plasma triglyceride concentration decreased significantly (p = 0.029) after TJ without oil at 6 h compared to their counterparts.

Conclusions: The addition of refined olive oil in TJ increases postprandial absorption of carotenoids, thay may induce an improvement of lipid metabolism in healthy humans.

P082
Adherence to the Mediterranean Diet in a Group of College Students

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Background: The progressive distancing in recent years from the basics of the Mediterranean Diet (MD) influences the increased prevalence of chronic diseases. The aim of this study was to assess the compliance with the MD in a group of college students.

Methodology: The sample consisted of 77 volunteers (80.8% female and 19.2% male) of the University of Soria, studying degrees in Education (n = 32), Physiotherapy (n = 25), Nursing (n = 12), Business Studies (n = 3), Translation and Interpreting (n = 3) and Agricultural Engineering (n = 2). All of them filled in a questionnaire on sociodemographics and a KIDMED test. This test analyses the degree of compliance with the MD by means of 16 questions. The Test score ranges from 0 to 12 and make it possible to classify the quality of the diet in three different groups: ≤ 3 poor quality, 4-7 average quality and ≥ 8 high-quality.

Results: The average age of the students was 21 ± 5.7 years (mean ± SD). According to their BMI: 3.9% were obese, 15.6% overweight and 3.9% underweight. The evaluation of the KIDMED index showed the following distribution: 40.8% high-quality, 48.7% average quality and 10.5% poor quality; 62 students had home-made food, 12 ate at university residences and three students used to consume ready-made food. The comparison of the KIDMED index between students in Health Sciences and students in other degrees showed a statistical significance, p = 0.017 (chi square for linear trend), with the students in Health Sciences showing a higher compliance with the MD.

Conclusions: The diet of the majority of students surveyed shows an average-high compliance with the MD. The training on nutrition of students in Health Sciences influences the degree of compliance with the MD.

P083
The Influence of Eating Habits and Physical Activity on BMI and WHR of Students from the University of Murcia, Spain

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Background and Objectives: The relationship between lifestyle and chronic diseases has been analyzed by different studies. In this way, physical activity and dietary patterns during the young adulthood age should be considered critical for future chronic diseases development. Under these premises, the lifestyle (eating habits regarding the Mediterranean diet and physical activity) as well as it correlation with the BMI and WHR of students from the University of Murcia have been studied.

Methods: A transverse study in 151 randomly chosen students of different degrees (67 men and 84 women) was carried out. The average age was 25 years old. To determine the eating habits and the Mediterranean Diet Quality Index, KIDMED test together with a physical activity evaluation (active or sedentary) was done. In addition, BMI and WHR were determined in each person. A Pearson's correlation test (p < 0.05) was performed to determine a possible correlation between the BMI-WHR and lifestyle.

Results: BMI-WHR average values (μ ± s.d.) obtained for men (23.56 ± 3.354; 0.83 ± 0.05) and women (21.67 ± 2.703; 0.75 ± 0.06) were in the range established by the WHO as normal (BMI 18.5–24.9; WHR 0.78–0.94 for men and 0.71–0.85 for women). According to the KIDMED test, 44.37% of students were considered to need an improvement on eating habits to adjust intake to Mediterranean patterns. Furthermore, 49.67% of students were considered as sedentary. No significant correlations were found between the BMI-WHR values and the eating habits and physical activity.

Conclusions: Lifestyle of students from the University of Murcia needs an improvement to approach to an adequate Mediterranean diet. No direct correlation between lifestyle and BMI-WHR was found; however it is strongly recommended to change the eating habits of students towards a Mediterranean diet in order to prevent health disorders in the adult age.

P084
Development of Healthier Cookies by Replacement of Fat, Reduction of Sugar and Incorporation of Inulin as Source of Fibre

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Background and Objectives: Bakery products are widely consumed in the mediterranean diet, especially by children and adolescents. However, products such as cookies have also been

associated with high consumption of simple sugars, saturated fat and a higher intake of energy. The aim of this study was to modify the nutritional profile of cookies by replacement of fat, reduction of simple sugars and addition of inulin as source of fibre in order to make them healthier, without decreasing the sensory quality.

Methods: The nutritional composition of cookies elaborated with wheat flour, margarine, sugar, chocolate drops and eggs was analyzed. Margarine was replaced by "high oleic sunflower oil" (HOSO). Simple sugars were reduced in 31%. Chicory inulin, due to its textural properties and partial sweetness, was added in order to increase fiber content and as an alternative to fat and sugar. Proximal analys was determined by AOAC methods, fatty acid profile by GC and simple sugars by HPLC. Sensorial studies were developed with 60 consumers to know the total preference and purchase interest.

Results: Saturated fats were reduced from 8.5% to 2.8%; monounsaturated fats increased from 5.6% to 9.8%; trans fats decreased from 0.26% to 0.01%. Simple sugars were reduced from 24.5% to 5.3%. Fibre increased from 2.1% to 4.2%. Total energy decreased from 462.5 Kcal/100g to 427.5 Kcal/100g. Atherogenic and trombogenic index were also reduced from 1.00 to 0.12 and from 1.95 to 0.49, respectively. Sensorial test showed an increase in the preference (54% vs 42%) and purchase interest (36% vs 19%) in favour of modified cookies.

Conclusion: Replacement of margarine by HOSO, reduction of sugar and addition of inulin are an adequate strategy to develop healthier cookies without affecting sensorial quality being even increasing some positive aspects as preference and purchase interest.

P085

Fruits Consumption and High Blood Pressure in Portuguese Children

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Background and Objectives: Hypertension in childhood has important health implications for children, being related to the development of other cardiovascular disease and diabetes, and may track into adulthood. However, little is known about the risk or protection factors of the elevation of blood pressure in childhood. Thus, this study estimates the prevalence of hypertension and its association with fruit consumption in Portuguese children.

Methods: Cross-sectional study was conducted with nationally representative random sample of Portuguese children. In a sub-sample of 1738 children (50.9% girls) 6–9 years old, weight, height and blood pressure were measured by standard procedures, and parents filled out a questionnaire about family characteristics and eating habits of their children. Body mass index (BMI) was calculated. Fruit consumption was assessed by the question: "In the last week, how many fruits your child ate, on average, by day?". It was considered "irregular consumption" intake of fruits less than two per day. Hypertension was evaluated according the 4th Report on the Diagnosis, Evaluation and Treatment of High Blood Pressure in Children and Adolescents for age, gender and height. Chi-square test and the logistic regression model adjusted for age, gender, child BMI and parental obesity were used for data analysis.

Results: Hypertension prevalence was 4.2%. Irregular consumption of fruits was significantly associated to higher prevalence of hypertension (6.0 vs 3.2%, p = 0.01). In multivariate analysis, children with irregular consumption of fruits were more likely to have hypertension compare to those with regular consumption (OR = 1.95; CI95% = 1.17; 3.24).

Conclusions: Our results support the hypothesis that regular consumption of typical foods from the Mediterranean diet, such as fruits, has protective effect against the development of cardiovascular diseases, such as hypertension. Thus, highlight the need to stimulate the consumption of healthy foods to prevent health issues since childhood.

P086

Vegetables Consumption and Distribution Body Fat in Portuguese Children

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Background and Objectives: The Mediterranean diet is characterized by the consumption of large amounts of vegetables,

providing health benefits to the population and protective effect against chronic diseases. In children, studies have showed that adherence to this diet reduces the risk of increased waist circumference. This study examines the consumption of vegetables and its association with percent body fat (PBF) and waist circumference (WC) in Portuguese children.

Methods: Cross-sectional study included a Portuguese random nationality representative sample of 11004 children (51.2% girls) 6–9 years old. Parents answered a questionnaire about family characteristics and habits of their children. WC and triceps skinfold thickness and subscapular were measured by standard procedures. The percent of body fat was calculated by using skinfold thickness equations. Values greater than the 90th percentile according by age and gender were used to classify WC and PBF as elevated. PBF and WC were used as dependent variables and independent the consumption of raw and cooked vegetables, categorized in (1) occasional consumption (1 or 2–3 times/week) and (2) daily consumption. For data analysis were used the chi-square test and the logistic regression model adjusted for age, gender and parental obesity.

Results: It was verified that children who occasionally eat vegetables presented an higher PBF and WC, in comparison to those who consumed it daily (11.6 vs. 9.6%; p = 0.01, for both). In multivariate analysis, was observed that low consumption of vegetable was associated to higher PBF (OR = 1.207; CI95% = 1.025–1.421) and greater WC (OR = 1.205; CI95% = 1.028–1.413).

Conclusion: This study supports the hypothesis that daily consumption of foods typical of the Mediterranean diet such as vegetables reduces the risk of increased PBF and WC, factors that predispose to the development of chronic diseases.

P087
Behaviours and Family Determinants of Fruits Consumption among Portuguese Children

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Background and Objectives: The importance of regular fruit consumption, characteristic of the Mediterranean diet, is known to have a protective effect against several chronic diseases, and also it's recognized that eating behaviours in childhood tend to track into adulthood. This study aims to analyze the prevalence of irregular fruit consumption and its main determinants in Portuguese children.

Methods: Cross-sectional study includes Portuguese random nationality representative sample of 11112 children (48.7% boys) 6–11 years old. Parents answered a questionnaire about family characteristics and habits of their children. Fruit consumption was assessed by the question: "In the last week, how many fruits your child ate, on average, by day?". It was considered "irregular consumption" intake of fruits less than two per day. For data analysis were used the chi-square test and the logistic regression model with the following variables: sex, physical activity, hours of use television, computer and electronic games, and parent's characteristics (obesity, education and physical activity).

Results: The prevalence of irregular consumption of fruits was 38.5%. In bivariate analysis, the irregular consumption of fruits was associated to lower physical activity; spend more two hours/day with TV, computer and games; lower education of parents; lack of physical activity of parents; and obesity mother, both p ≤ 0.01. In multivariate analysis, the main determinants of the fruits consumption were: higher physical activity (OR = 1.21; CI95% = 1.06; 1.37), less time spends with TV (OR = 1.17; CI95% = 1.04; 1.31) and computer (OR = 1.47; CI95% = 1.06; 2.06), and father's higher education (OR = 1.66; CI95% = 1.42; 1.93).

Conclusion: It's evident the need to stimulate the adoption of healthy lifestyle with more physical activity and less time spent in sedentary activities in programs to stimulate the fruits consumption, and special attention should be given to children of fathers with low education.

P088
Health Promotion Plan in College Students

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Background: Health promotion and protection of the Mediterranean Diet (MD) is a public health objective. On November 17, 2010, the UNESCO recognized this dietary pattern as an Intangible Cultural heritage of Italy, Greece, Spain and Morocco.

Objective: To report the creation and implementation of a plan to promote and improve the quality of health in the University promoting modern nutritional recommendations based on the food patterns of the MD, in addition to regular physical activity.

Methods: In October 2011, we started a pilot study exposing 18–28 year-old college students to a controlled intervention for seven months. The intervention consisted of delivering information on healthy eating and physical education as well as participation in a wellness program. Qualitative and quantitative data were gathered at the visits and interviews conducted throughout

the intervention period. Outcome measures included body mass index, anthropometric data, dietary intakes, nutritional status indicators and parameters of physical activity.

Results: The plan was proposed to approximately 300 college students. The intervention plan was initially adopted by 77 subjects but only 33 completed the study period. Compared with the control condition, the intervention was successful in increasing moderate physical activity in all students (p < 0.05). Those who completed the intervention plan tended to adapt their food habits to the modern nutritional recommendations (p < 0.05) Students reported a high level of satisfaction and receptivity with the intervention. The most common barrier to finishing the program successfully was competition for time/space between the pilot study and the compulsory courses.

Conclusions: An intervention plan that promotes health by delivering nutrition education and physical activity can be an effective way to increase health in young adults. Our results show that this approach is viable. This area of intervention can be extended to other groups in the university community.

P089

Can Lycopene Modulate the Immune System Response? Analysis of Immune System Populations in Sprague-Dawley Rats after Tomato Juice Consumption

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Background and Objectives: Prevalence of obesity has been seriously increasing during last decades. The excess of fat accumulated in fatty tissue produces a status of chronic inflammation and a secondary exacerbate response of the immune system. The tomato carotenoid lycopene has been shown to have immunomodulatory activity. For this reason, we aimed at investigating whether tomato juice intake can have an effect on blood and spleen lymphocyte populations in rats fed a hypercholesterolemic and high-fat diet.

Methods: Sixteen male Sprague-Dawley rats were randomly divided in four groups according to the diet and beverage received: standard diet and water (NA) or tomato juice (NL), and high-fat diet and water (HA) or tomato juice (HL). After seven weeks, rats were sacrificed and blood and spleen samples were collected in order to analyze lymphocyte populations (B, T, NK and NKT cells) by flow cytometry. In addition, lycopene and its isomers were determined in spleen samples by HPLC-MS.

Results: Lycopene was only detected in spleen samples of HL rats, likely due to the excess of fat in this organ increased the apparent absorption of this carotenoid. No significant differences in lymphocyte populations of peripheral blood and spleen were found between the four experimental groups. However, a slight trend towards decreasing spleen NK and NKT cells was observed in NL and HL groups.

Conclusions: Under our experimental conditions, lycopene from tomato juice intake seems to have no effect on the immune system populations analysed. Further studies including other immunological markers are required to understand the role of lycopene on the modulation of the immune system.

P090

Dietary Regulation of VEGFb Gene Expression is Related to its Promoter DNA Methylation Levels

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Background: It has been described the implication of the vascular endothelial growth factor-B (VEGFb) in the tissue lipid uptake, which may open up the possibility for novel strategies to modulate pathological lipid accumulation. DNA methylation is a potent regulator of gene expression. The aim of this study is investigate the effect of dietary fatty acid composition on VEGFb gene and protein expression in rat adipose tissues, and whether this effect is related with DNA methylation.

Methods: A group of rats was assigned to three diets, each one with different composition of saturated, monounsaturated and polyunsaturated fatty acids. Animals were fed during a month. Samples of visceral and subcutaneous adipose tissue were taken for the methylation and expression studies, and for measurements of the tissue fatty acid composition, and total tissue lipid accumulation.

Results: Neither animal nor adipose pad weights varied according to diets, nor even tissues lipid accumulation. Tissue fatty acid composition was significantly different depending on the diet consumed.

VEGFb gene expression level was directly correlated with lipid accumulation of each tissue.

In both tissue, VEGFb gene and protein expression and promoter methylation levels were different regarding to the diet consumed, with the highest values of gene and protein expression, and the lowest of promoter methilation, found in rats fed with the most saturated diet; being VEGFb gene expression directly correlated with the protein levels, and inversely with the promoter methylation levels.

Conclusion: VEGFb gene expression in adipose tissue is associated with the increase in fat accumulation. The presented study shows that VEGFb levels are regulated by dietary fatty acid in adipose tissue, and this regulation is related to the methylation level of VEGFb promoter region.

Abstracts

P091

Protective Potential of Dry Olive Leaf Extract Against Oxidative Stress in Human Lymphocytes Induced by Thyroxin

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Background and Objectives: Thyroid hormones increase oxygen consumption in exposed cells. In hyperthyroidism- dysfunction of the mitochondrial respiratory chain and increase endogenous formation of ROS lead to oxidative stress and DNA damage. Dry olive leaf extract (DOLE), a flavonoid-rich plant product, have been observed to modulate effects of various oxidants in human lymphocytes. The objective was to evaluate the commercial DOLE ability to protect nuclear DNA in peripheral blood lymphocytes from oxidative DNA damage induced by thyroxin.

Methods: In the first group of samples, after initial exposure to thyroxin (50 micromoles) for 15 min on ice, cells were incubated at 37°C for 30 min with three different concentrations of DOLE (1 mg/ml, 0.5 mg/ml and 0.125 mg/ml). The other group of samples was pretreated with DOLE under the same conditions, followed by the administration of thyroxin.

Results: The DOLE extract showed significant protective effect against oxidative damages in all three doses compared to cells exposed only to thyroxin. In relation to the control samples, both pretreatment and post-treatment with DOLE, significantly (p < 0.01) attenuated the DNA strand breaks induced by thyroxin. Treatment with DOLE was most effective at 1 mg/ml in pretreatment and at 0.5 mg/ml in post-treatment, preventing thyroxin induced toxicity.

Conclusion: Cytoprotective and antioxidant properties of dry olive leaf extract were detected in human lymphocytes by using the comet assay methodology. Our results suggest that DOLE may induce genoprotective effects by increasing the antioxidant capacity of lymphocytes through the induction of the antioxidant enzyme system, thus inhibiting oxidative stress.

P092

Impact of Acai Polyphenols Bioactivity in Human Health

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Acai, pulp is a commonly consumed food native to the Amazon basin which has recently found its way to the European market. It is prepared from the fruit of the Amazonian Euterpe oleracea Mart. tree and has traditionally been used in folk medicine by native communities in Brazil (Pacheco-Palencla et al., 2008).

The fruit is reported to be rich in phenolic compounds, which have a potent anti-oxidant capacity and which may have other biological activities. (Heinrich et al., 2011).

The aim of this study is to investigate composition and bioactivity of acai and, hence, to contribute to bridging that gap in scientific evidence required to substantiate any health claims related to its health benefits.

Identification and Quantitative of Anthocyanins and other Flavonoids. Two anthocyanins were identified from freeze-dried
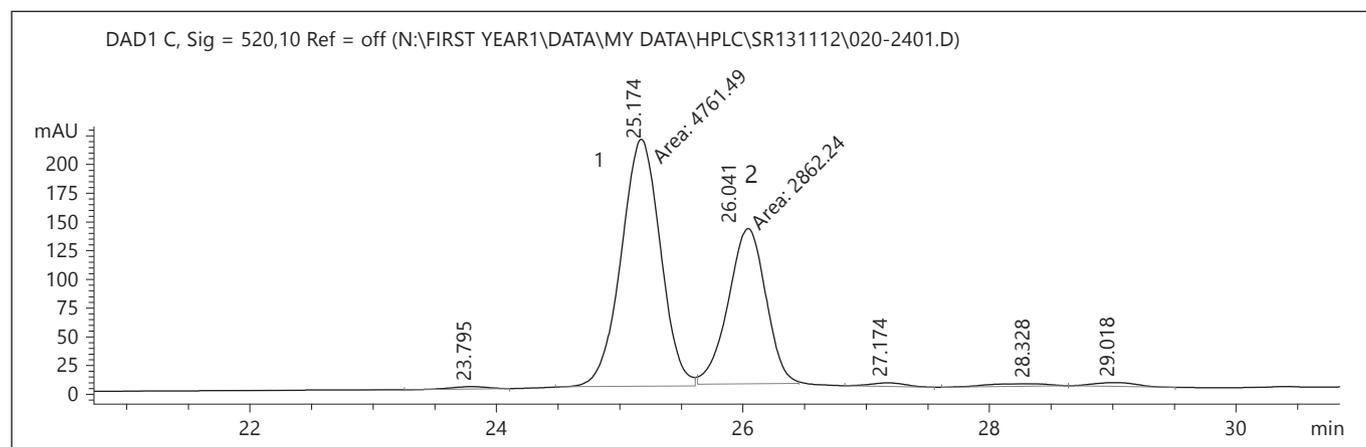
Fig.1. Reverse phase HPLC chromatograms of freeze-dried acai detected at 520nm, peak assignments: 1 cyanidin 3-glucoside and 2, cyanidin 3-rutinoside (for Abstract P092).
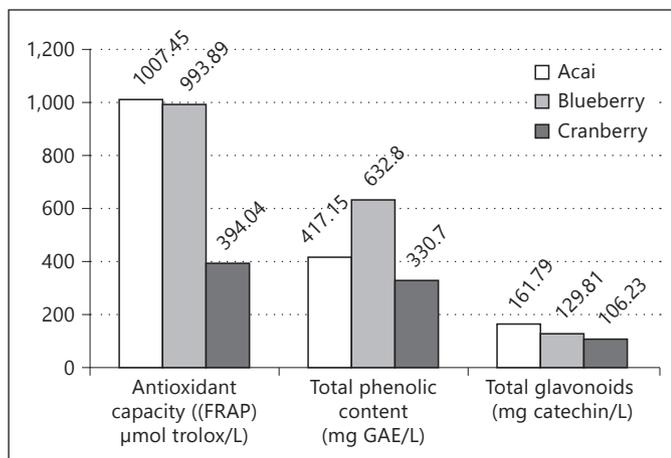
Fig. 2. Comparison of total phenolics, total flavonoids contents and antioxidant capacity in Acai, Blueberry and cranberry (for Abstract P092).

acai (figure1). Of them, cyanidin 3-glucoside and cyanidin 3-rutinoside were found to be the predominant anthocyanins. Two minor anthocyanins, Pelargonidin-3- glucoside and Malvidin-3 -glucoside were also identified from freeze- dried acai extract.

Total Phenolic content (Folin-Ciocalteu assay). Blueberries showed the highest phenolic content (632.8 mg GAE/L) amongst the other fruits tested, followed by acai (417.15 mg GAE/L), followed by cranberries (330.7 mg GAE/L).

Total Flavonoids (AICI3 assay). Acai has shown the highest total flavonoid content (161.79 mg Catechin/L) amongst Blueberries (129.81 mg Catechin/L) and cranberries (106.23 mg Catechin/L)Antioxidant capacity: Acai presented the highest antioxidant activity (1007.45) compared with other samples, which were blueberry (993.89 and cranberry 394.04 µmol Trolox /L).

Anti-genotoxicity in vitro – comet assay. As predicted the acai extract the effects of tested extracts in DNA damage, according to the comet assay. The acai extract had a very significant protective effect on the cells tested. The blueberry extract was found to be significantly protective only when LSD test was applied.

P093

Glycemic Index of Pastas Partially Substituted with Legumes

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Pasta is a foodstuff considered low Glycemic Index (GI) for its content of slowly digested carbohydrates, particularly type 3 resistant starch (RS). If, in addition, Phaseolus vulgaris flours are included in its formulation, this feature is increased due to the contribution of RS of this legume. The aim of this work was to formulate semolina pasta, partially substituted with Phaseolus vulgaris flour and evaluate its cooking quality and glycemic index. For this, long pasta, spaghetti type, was formulated, replacing the wheat semolina by 12% of Phaseolus vulgaris flour. Similarly, a control pasta was prepared with 100% wheat semolina. Moisture, protein, fat, ash (AOAC 1990), dietary fiber (Goñi et al., 2009), total starch (Goñi et al., 1997), resistant starch (Goñi et al., 1996), and cooking quality of the pasta (AACC 200) were quantified. The glycemic index determination was performed according to Goñi and Valentin-Gamazo, (2003). Blood samples were collected in reagent strips and analysed with an equipment to analyse fasting blood glucose at the times of 15, 30, 45, 60, 90 and 120 minutes.

When comparing the cooking quality of the substituted pasta with the semolina one, higher cooking times (12%) and losses by cooking (80%), but lower protein losses in the cooking water (43%) were found. Likewise, this showed a 16%, 86% and 65% more protein, soluble fibre and resistant starch, respectively, in relation to the semolina pasta. The IG of the substituted pasta was 16.7% lower than the semolina pasta. It was concluded that the pastas substituted with Phaseolus vulgaris flours, exhibit an intermediate glycemix response and lower to that for the semolina one, probably for the higher content of soluble fibre and resistant starch present.

P094

Efefct of Consumption of Brewer's Spent Grain in the Content of Short Chain Fatty Acids in Rat Feces

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Background and Objectives: Brewer's spent grain (BSG) is the main residue of brewing industry. Spent grains are by-products produced in the extraction of the wort and its main application is reduced to animal feeding. In addition, BSG could be interesting in human nutrition due to its important content in fiber. Several studies have shown that dietary fiber can help to maintain gastrointestinal health by increasing water retention, enhancing satiety, delaying gastric emptying, decreasing transit time or changing the short chain fatty acids (SCFA) profile in the colon. The aim of the present study was to ascertain whether the consumption of a diet supplemented with BSG could modify the content of SCFA in feces of rats.

Methods: Fourteen female Sprague Dawley rats were randomly divided into 2 groups, 7 rats each, and were housed individually in metabolic cages with a 12-h-light/-dark cycle. The rats were given free access to feed and water during 15 days. Fecal samples were collected at days 1, 8 and 15 and stored at –80ºC until the analysis. SCFA were analyzed in rat feces by GLC-FID at the beginning and after 1 and 2 weeks of the study.

Results: Total SCFA were significantly higher in the group fed BSG diet compared with the group that ingested normal diet. The same trend was observed in acetic and proponic acid with

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significant differences between groups and along the study. The amount of butyric acid also increased but there were not significant differences between both groups at the end of the study. We concluded that a diet supplemented with BSG produced changes in SCFA profile with a significant increase in acetic and propionic acid.

P095
Action of Squalene on Induced Sepsis in Rabbits

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Background and Objectives: Olive oil is the principal source of fat in the Mediterranean diet and accumulating evidence suggests that it may have health benefits. The effect of olive oil on the immune system is sparse, but it may be a potent mediator of the immune response. Squalene is a triterpenic compound present at high proportion in virgin olive oil and it provides a broad spectrum of biological actions. The aim of this work was to examine the squalene effect in sepsis-state. The study was focused on D-galactose and D-fructose intestinal absorption in rabbit treated by lipopolysaccharide (LPS).

Methods: A sepsis condition was induced, in rabbits, for 90 min after intravenous –iv- administration of LPS 2 or 6 microg/kg body weight –bw- (acute treatment). In other group of animals, the administration of LPS was for one week by osmotic pump with 1 mg/kg bw per day (chronic treatment).

Results: The results showed that LPS at 6 microg/kg (90 min) and 1 mg/kg bw per day (7 days) increase the sugar absorption. This effect could be related to modifications in proteins of intestinal epithelial tight junctions (TJ) that are crucial for maintaining intestinal barrier function. After 4 weeks on experimental diet with squalene (0.5%), this triterpene significantly reduced the LPS effect on intestinal absorption. Moreover, the rabbit body temperature increased in sepsis condition was also reduced.

Conclusions: The squalene may be a potent mediator of the immune response that could modify the cytokine actions on the intestinal absorption of nutrients in response to a LPS stimulus. In relation to gut, squalene could have a potential application as a therapeutic agent in bacterial diseases.

P096
Interaction Between Squalene and LPS on Sugar Absorption Across Caco-2 Cells

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Background and Objectives: Olive oil, the main source of the fat in the Mediterranean diet, is a functional food which besides having high amounts of monounsaturated fatty acid contains minor components with biological properties such as squalene. This component is a natural lipid belonging to the terpenoid family and a precursor of cholesterol biosynthesis. Because of its significant dietary benefits, squalene contributes as a protective and preventive agent in cancer treatment (colon, breast, skin), bacterial and fungal infection, coronary heart disease and ageing by inhibiting oxidative stress. The aim of this work was to study the squalene effect on D-fructose and D-galactose absorption in Caco-2 cells (human colon adenocarcinoma) treated with lipopolysaccharide (LPS). This endotoxin is an integral component of the outer membrane of all gram-negative bacteria.

Methods: Caco-2 cells were maintained in a humidified atmosphere of 5% CO_2 at 37ºC. Cells (passages 50–80) were grown in Dulbecco's Modified Eagles medium (DMEM).

Results: The results showed that LPS, at low concentrations (30–50 microg/ml), inhibits the sugar uptake. However at high concentration (75 microg/ml), 0.5 mM D-galactose and 5 mM D-fructose absorption are increased. These effects are reversed when 50 mM squalene was added to cells. On the other hand, LPS and squalene do not cause cell death of Caco-2 either by apoptosis or necrosis (MTT-citotoxicity assay). In addition, the cell cycle and cell proliferation (Flow Cytometry assay) were not modified either.

Conclusions: the results clearly suggest that this natural triterpene has some interaction with the immune system and a further study will be focused in relation to intracellular ways (membrane and cytoplasm proteins) that could be applied to disease management and therapy.

P097
Role of Dietary Fats in Ghrelin and GLP-1 Metabolism

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Background and Objectives: Ghrelin is a orexigenic peptide secreted primarily by the stomach. Its regulation by diet is not sufficiently well known and its relationship with other anorectic péptides. The overall objective of this work is to study human

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ghrelin and GLP-1 response to 3 breakfasts depending on the type of fatty acid consumed in the diet.

Methods: This study was conducted in 10 normal weight patients who have taken three different breakfasts for 3 consecutive weeks, one in a week. The breakfast consisted of 50 g of bread + 25cl of oil, three different types: extra virgin olive oil, refined olive oil and sunflower oil. Blood samples were collected before the intake (time = 0 min) and at 15, 30, 60, 90, 120, 150 and 180 min after intake of food.

Results: Ghrelin secretion inhibition after meal is different depending on the type of fatty acid in the diet and this inhibition is simultaneous to the stimulation of the anorexigenic peptide as GLP-1. At 15 minutes from the intake of food there is a falling ghrelin levels that is els similar to the three types of fat ingested. But breakfast with extra virgin olive oil keeps ghrelin levels lower than any of the other two fats at 180 min of collection. The highest levels of GLP-1 are obtained at 15 min of intake started reaching the highest point when the patient eats extra virgin olive oil.

Conclusions: A diet enriched with olive oil increases the inhibition of ghrelin secretion and the increase of GLP1 secretion.

P098
Brazilian Cardioprotective Diet (Balanced): Development and Nutritional Prescription

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Objective: To develop a cardioprotective diet-based on typical Brazilian foods.

Method: 210 menus were prepared, composed by typical Brazilian foods, from 1,400 to 2,400 kcal/day in accordance with nutritional recommendations given by Brazilian cardiology guidelines. The menus were performed by Nutriquanti diet software, which prioritizes Brazilian food composition tables.

Results: Based on the menus' nutritional characteristics, foods were classified in three color groups according to the following criteria: presence of refined sugar, high energy density, lack of cardioprotective nutrients (fiber, vitamins and minerals), and presence of nutrients that increase cardiovascular risk (cholesterol, sodium, saturated fat). Foods that do not have any of those characteristics were classified as green foods. The energy and nutrient density values of green foods were: 1.11 kcal/g, 0.01 g/g of saturated fat density, 0.04 mg/g of cholesterol density, and 2.01 mg/g of sodium density. Those were considered the cut-off points for classification of the other two food groups: yellow consisted of foods with 1 or 2 values above any cut-off point; and blue consisted of foods with 3 or 4 values above any cut-off point. Dietitians should recommend high consumption of green group foods, moderate consumption of yellow group foods, and low consumption of blue group foods, in analogy to the colors of the Brazilian flag.

Conclusions: The Brazilian Cardioprotective Diet is in accordance with the recommendations of the Brazilian guidelines for the treatment of CVD, and presents a new concept of food classification and diet prescription.

P099
Is the BMI a Good Predictor of Adiposity in Psychiatric Elderly Patients?

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Rationale: People with mental disorders have more body fat (BF) and larger waist circumference (WC) than sedentary men of similar age and body size.

Aim: To examine the relationship between BMI, BF and WC in a group of psychiatric elderly patients institutionalized.

Methods: We conducted a cross-sectional study with 66 institutionalized elderly men with psychiatric illness. BMI, skinfolds and circumferences measurements, and hand-to-food BIA (50kHz) were employed to assess nutritional status and body composition. We compared three different BF predictives formulas: 1.-Deurenbers's formula, based on BIA (reference formula); 2.-Siri's formula, which is only based on skinfolds; 3.-Lean's formula, which is based on triceps skinfold and WC. The results were analyzed by ANOVA or Kruskal-Wallis tests, and the Scheffé's posteriori contrasts. Significance: $p < 0.05$.

Results: The mean age of the patients was 73.03 (95%CI: 71.22–74.84) years. The mean BMI showed healthy weight in our sample (25.74 kg/m^2; 95%CI: 24.80–26.67), although WC suggested abdominal overweight (96.93 cm; 95%CI: 94.54–99.32). According to the new IDF cut-off points values for WC, this reported value (96.93 cm) also reveals risk of cardiovascular disease. Body composition analysis showed higher percentages of BF. Moreover, Siri's formula underestimated BF in comparison with Deurenberg and Lean's formulas (28.14 (95%CI: 26.53–29.75), 36.05; (95%CI: 34.81–37.29), and 36.49 (95%CI: 34.79–38.19), respectively).

Conclusion: BMI underestimates the prevalence of overweight and obesity in our sample. Thus, in the absence of more accuracy methods, the joint use of BMI and waist circumference offers a better prediction of excess of adiposity than the use of BMI alone.

P100

MicroRNAs that Control Lipid Metabolism are Modulated by Mediterranean Diet Polyphenols in Hepatic Cells

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Background and Objectives: Mi(cro)RNAs are small non-coding RNAs of approximately 19–24 nucleotides in length that regulate the expression of target genes at post-transcriptional level. miRNAs are becoming relevant for the epigenetic control of metabolism and there are some evidences that they regulate more than 60% of human genes. Specifically, miR-33 is a critical regulator of cholesterol and fatty acid homeostasis by repressing fatty acid oxidation, hepatic HDL biogenesis and cholesterol efflux to HDL. Furthermore, miR-122 is liver-specific and regulates several genes that control fatty acid and TG biosynthesis. Moreover, we previously described that a grape seed proanthocyanidins extract (GSPE) modulate miR-33 and miR-122 liver expression after 3 hours of an acute dose of GSPE in rats. Thus, the aim of this study was to determine if different polyphenols from Mediterranean diet could modulate miR-33 and miR-122 in HepG2 cells.

Methods: HepG2 cells were cultured and treated for 1 hour with 50μM of gallic acid, quercetin, catechin, epicatechin, resveratrol, epigallocatechin gallate and procyanidin B2. miRNA were isolated and RT-qPCR technique was used to determine miR-33 and miR-122 levels. Significant differences were determined using t-student test between control and treated groups (p < 0.05).

Results: After treatments, miR-33 and miR-122 were down-regulated by epicatechin and epicatechin gallate and up-regulated by resveratrol. However, quercetion just down-regulated miR-33 and gallic acid and procyanidin B2 just down-regulated miR-122.

Conclusions: Different polyphenols from Mediterranean diet can modify miR-33 and miR-122 expression in HepG2 cells. The effect modulating these miRNAs depends on the chemical structure of the polyphenols.

P101

The Central Circadian Clock in Rats is Modified by Proanthocyanidins, the Major Group of Polyphenols in the Mediterranean Diet

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Background and Objective: The circadian system involves interactions between the central nervous system (the suprachiasmatic nuclei of the hypothalamus entrained by light) and peripheral tissues (entrained by food) through the interrelation of clock genes, which form a complex feedback network being Bmal1 the central key gene involved, that allows to rule the temporal organization of many aspects of metabolism. Furthemore, proanthocyanidins, a class of flavonoids common in fruit, chocolate and beverages like red wine, play an important role in the prevention of some pathologies related to metabolism, such as obesity, diabetes and cardiovascular diseases. With all this in mind and taking into account a previous experiment wherein up-regulation of Bmal1 in the liver of rats 1h after the acute ingestion of 250 mg/kg of grape seed proanthocyanidins extract (GSPE), the aim of the current study was to evaluate the capacity of GSPE to modify the central clock.

Methods: Male Wistar rats were fed ad libitum during the night to accomplish a training period of 2 weeks to synchronize their circadian rhythm, and then they were orally administered water containing 250 mg/kg of GSPE or water only (control group) at the precise same time when the light was turned on (9:00 h morning). The sacrifice was performed at 0 (without GSPE administration), 0.5, 1, 3, 6, 12 and 24 hours after the acute administration, then hypothalamus was collected to study the Bmal1 expression by quantitative RT-PCR.

Results: The treatment with GSPE caused an increase after 1 h and a decrease after 6h in the expression of Bmal1 respect to control group in the hypothalamus.

Conclusion: Proanthocyanidins modify the expression pattern of Bmal1 altering the central circadian system.

P102

Do Andalusian Secondary Schools Promote the Mediterranean Diet?

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Background and Objectives: One key aspect in promoting a suitable food model in students is the involvement of schools. To establish criteria for analyzing institutional elements determining the promotion model for the Mediterranean diet in secondary schools in Andalusia, initial performance ANDALIES project, presented in this paper.

Methods: Prevalence study. Population: 1,157 public secondary schools in Andalusia (2010/2011). Sample: 96 centres, stratified random sampling by province and population size (sampling error of + 10% and 95.5% NC). Structured interview to management teams (IES). Category: institutional elements favouring healthy food consumption.

Results: Headmasters interviewed (57.89%), Deputy Head teachers (25.26%), other (16.85%). Lack of specific regulations (68.42%). Non Interventionist attitude on offer. Difficulties: students, family and profitability of the school cafeterias. 38 proposals made by the centres: incentive of fruit, natural juices and fatty snacks restriction, pastries and sweets ... The 31.57% is unaware

of the Food Safety and Nutrition Act, July 6th 2011; the 28.42% find it is diffuse and the 23.15% only know it superficially. Three levels of promoting healthy eating activities are identified. First: a basic information approach, (selected anniversaries, talks ....) and intermediate (meetings, conferences...). Second, a disciplinary, dietician and hygienist approach, curriculum proposals and teaching initiatives. Third, a curricular approach, food education, interdisciplinary and community based.

Conclusions: There is not a general understanding of the law and a lack of internal regulation governing the offer of the cafeteria. Little control of supply and food consumption in the centre. Healthy breakfasts proposals are Mediterranean type (toasts, oil, tomato and sandwich with fresh juice) and cheap. Little relevant food education based on prescriptive approaches and underpowered healthy recommendations to promote substantial changes.

P103
Body Mass Index and Respiratory Function in a Mediterranean Cohort of Asymptomatic Smokers

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Background and Objectives: The body mass index (BMI) is one of the parameters that are used synthetic indices to assess the prognosis of patients with chronic obstructive pulmonary disease (COPD). It is also accepted that subjects diagnosed with obesity may have alterations in lung function. The aim of this study was to investigate the association between BMI and lung function in smokers without respiratory disease from a Mediterranean area.

Methods: Design: Cross-sectional study. Setting: 12 Spanish primary care centers. The period of study was between June 2008 and June 2010. We included smokers of 10 or more cigarette per day, older than 35 years, asymptomatic and without previous lung disease, who consented to undergo spirometry with bronchodilator test. Through structured questionnaire collected sociodemographic data, smoking habit and personal history, physical examination with anthropometric measures and spirometric values. We performed Pearson correlation coefficient, using SPSS for Windows v15.

Results: Sample comprised of 738 patients (52% male) with a mean age of 51 years old (SD: 8.1) and BMI of 27.2 kg/m^2 (SD: 4.8). With regard to smoking, consumption was 19.2 cigarettes/day (SD: 10.9) and 32.1 packs/year (SD: 21.1). Spirometric values were: FVC 93.3% (SD: 16.1) and FEV1 94.7% (SD: 17.7). The correlations between BMI and FVC, FEV1 and lung age were −0.124 (p = 0.05), −0.082 (p = 0.01) and 0.154 (p <0.001) respectively.

Conclusions: This study shows a linear inverse association between BMI and lung function and a positive association between BMI and lung age (assessed by spirometry) in a Spanish Mediterranean cohort of asymptomatic smokers without respiratory disease.

P104
Potential Beneficial Effects of Anthocyanins on Nutritional Status of Obese Human Subjects

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Recently, the prevalence of overweight and obesity is augmented worldwide at an alarming rate and represents an important public health problem in many western countries. These conditions have a large impact on several metabolic and chronic ailments including heart diseases, cancer, arthritis, hypertension, hyperlipidemia, and type 2 diabetes associated with insulin resistance.

There has been an increased interest in natural compounds like anthocyanins because they are considered to be less toxic and have fewer side effects.

Although several beneficial effects of these compounds have been reported to be associated with the prevention of obesity in animal models, there are no evidences in literature regarding their effect on obesity-related disorders in humans.

In this optic, the main objective of the research was to determine whether fresh foods rich in anthocyanins have an effect on body weight and clinical obesity related factors (antioxidant, lipidemic, hormonal status and vitamin A and E).

Based on inclusion criteria, 14 female volunteers suffering from I and II class obesity (BMI between 30 and 40 kg/m^2) were enrolled in a pilot study and 11 subjects completed the supplementation. The intervention period had a duration of 12 weeks and volunteers were supplemented with 2 daily doses of 250 ml each of red orange juice.

The daily consumption of 500 ml of orange juice had no significant effects on body weight and BMI of volunteers. The supplementation significantly (P < 0.05) influenced total cholesterol levels that decreased from 177±46 to 158±44 mg/dl and LDL-cholesterol levels that decreased from 83±41 to 74±42 mg/dl.

This pilot study confirms beneficial effects of a diet rich in anthocyanins on the reduction of total cholesterol and LDL-cholesterol levels, but further researches are needed to elucidate if these natural compounds could ameliorate obesity-related disorders in humans.

Health Claims Perception on Two Functional Foods Related to Calcium among Spanish College Students: Preliminary Study

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Background: The food industry develops new foods which include health claims in labeling and advertising of the product. Due to this, consumers can optimize food choices looking for a health benefit. The aim of this study is to assess health claims perception about calcium based in two functional foods among Spanish university students.

Methods: Cross sectional data was collected from randomly selected sample of 26 students aged 18–24. The average BMI was 22,13 3,12 kg/m^2 (Average ± SD). The data was collected from a 66 item questionnaire that evaluates the general and specific perception on health claims approved by EFSA of Densia and Leche Asturiana. The questions have been taken from previous validated studies; the responders answered them through moodle (moodle?)platform. Results are shown as average ± SD by Likert Scale (1–5) being 1 absolutely in disagreement with the given question and 5 absolutely in agreement.

Results: In general students are "highly in agreement" (4.04 out of 5 points in Likert scale) with the positive association between diet and health status. They clearly understand the health claims evaluated of Densia and La Asturiana (3.25 and 3.61 out of 5 respectively); Students discredit health claims credibility (2.24 and 2.64 respectively). Moreover, health claims do not encourage them to buy the products (1.57 and 1.86 respectively).

Conclusions: Students positively associate diet and health and they maintain a healthy diet. Responders clearly understand health claims given on this study, however they think mentioned health claims are not credible and they would not buy a product encouraged by them.

Healthy Perception and Consumption of Calcium Enrichment Products

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Background: Milk products are 66,8 % of the calcium intake in Spain. Food industry develops milk products rich in calcium to supply daily recommended intake. This study evaluates consumption and healthy perception of two products enriched in calcium in college students.

Methods: Data was collected through moodle platform from a randomly selected sample of 26 students aged 18–24. Data was collected from a 66 item questionnaire which evaluates the consumption and healthy perception of two milk products, "Densia" and "Leche Asturiana". The questions have been taken from pre-vious validated studies. Results are shown as average score by Likert Scale (1 – 5) and percentage.

Results: Students' average score was 2.69 to the question how often do you choose food for health reasons? Being 1 "always" and 5 "never". Daily, they drink one glass of milk (1.36) and 1–3 yoghourts (2.76). 73.43% drink whole milk, 25% non-fat milk, 3.57% soy milk or milk from vegetable sources. None of them drink calcium enriched milk. Rarely they drink "La Asturiana" (1.86 out of 5). 53.85% of them eat regular yoghourts, 34.62% non-fat yoghourts and 11.53 % market's deals. None of them eat calcium enriched yoghourts. Students rarely eat Densia (1.57).

Students expect "La Asturiana" milk compared with regular to be similar (3.42) and healthy (3.52). They think "La Asturiana" can provide them health benefits 3.04. Students similarily perceive Densia; equal to regulars (3.30) and healthy (3.25). They think Densia may not help their bones to be strong scoring 2.55.

Conclusions: Students almost always choose food for health reasons and consume recommended daily intake of milk products. Calcium enrichment milk products and regular are likely equal in health terms to them. They never consume/use enrichment milk products.

Carotid Intima Media Thickness Determinants in Obese Patients

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Background and Objectives: Increased carotid Intima Media Thickness (cIMT) has been proposed as a surogated marker of subclinical atherosclerosis. We evaluated endothelial function and cIMT in obese patients and its association with metabolic disturbances.

Methods: This study included 110 morbid obese (MOP; BMI, d40) and 84 non morbid obese/overweight (OOP; BMI 25–40) patients. Clinical, anthropometric and biochemical data were obtained. cIMT and endothelial function were assessed by carotid ultrasonography and peripheral artery Reactive Hyperemia Index (RHI).

Results: MOP had lower concentrations of total (5.00, b1.05 vs. 5.47, b1.47 mmol/L; P =0.012) and LDL cholesterol (3.10, b0.95 vs. 3.40, b1.04 mmol/L; P = 0.040) and triglycerides (TG; 1.54, b0.89 vs. 2.02, b1.90 mmol/L; P < 0.001); as well as higher levels of high-sensitivity C-reactive protein (hs-PCR; 5.99, b4.80 vs. 1.58, b2.93 mg/L; P < 0.001), FABP4 (68.39, b30.08 vs. 35.51, b20.04 microg/L; P < 0.001), VCAM (786.90, b233.2 vs. 656.90, b213.5 ng/mL; P < 0.001) and E-selectin (46.25, b14.85 vs. 41.54, b12.77 ng/mL; P = 0.020). Systolic blood pressure (SBP) was higher in MOP (137, b24 vs. 130, b20; P < 0.001). No significant differences between groups were observed in either RHI or in me-

dian cIMT. In MOP cIMT was positively correlated with GGT (P = 0.034), Glucose (P < 0.001), Insulin (P = 0.038), HOMA (P = 0.002), TG (P = 0.025) and Age (P = 0.001). The main determinants of cIMT in this population were Age, Glucose levels and male gender. In OOP cIMT was positively correlated with SBP (P = 0.016), total (P = 0.007), LDL (P = 0.022) and non-HDL cholesterol (P = 0.020) and Age (P = 0.029); being the main determinants Age and SBP.

Conclusions: Subclinical atherosclerosis is related to metabolic disturbances as hyperglycemia and hypertriglyceridemia in MOP and to major classical cardiovascular risk factors in OOP patients.

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Interaction of the Flavonoid Quercetin with Zinc Cations Modulates Zinc Homeostasis and Zinc Signalling in Hepatocarcinoma Cells in Vitro

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Zinc, the second most abundant transition metal in humans, is an essential micronutrient with structural, catalytic and signaling function that shows antioxidant action in cells. Consumption of quercetin, one of the most abundant polyphenols found in fruits and vegetables distinctive of the Mediterranean Diet, is beneficial for prevention of chronic diseases such as obesity, hypertension, diabetes, Alzheimer or cancer. Food polyphenols act as antioxidants and as signaling molecules, and are known to form complexes with copper and iron thereby affecting their bioavailability.

In this work, we seek to check whether quercetin interacts with zinc and to evaluate the effect of this interaction on intracellular zinc homeostasis and zinc signaling in an in vitro model of hepatic tumor cells.

Quercetin strongly binds to zinc cations in solution as shown by the quenching of zinc-dependent Zinquin fluorescence. Administration of quercetin together with supplemental zinc to hepatocarcinoma cells results in enhanced expression of the zinc-store protein metallothionein and the zinc-export transporter ZnT1 (as determined by RT-PCR); total intracellular zinc content (assayed by FAAS) and cytoplasmic labile zinc (monitored by Zinquin fluorescence) are increased. Western-blot analyses show that low doses of quercetin greatly enhance zinc-induced phosphorylation of Akt and, vice versa, low doses of zinc enhance the phosphorylation of Akt induced by quercetin. Appropriate combinations of zinc and quercetin result in morphological changes characteristics of apoptotic processes, as revealed by propidium iodide staining.

These results show that combinations of zinc with quercetin are more effective that the single compounds in modulating intracellular zinc homeostasis and signaling. We hypothesize that polyphenols may do that by acting as zinc ionophores. Polyphenol-zinc complexes might be useful for controlling cellular processes such as apoptosis.

P109

Effects of Grape Seed Proanthocyanidins Extract and Oil Rich in Docosahexaenoic Acid on Diet-Induced Obesity Rats

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Obesity, as one of the leading preventable causes of chronic diseases worldwide, is associated with a high incidence of many metabolic disorders. It has been reported that proanthocyanidins exert hypolipidemic effects by improving lipid homeostasis. Additionally, it is well known that a diet rich in omega-3 polyunsaturated fatty acids (PUFAs) EPA and DHA from fish oil has a beneficial effect on lowering cardiovascular and all-cause mortality. In consequence, the aim of this study was to investigate the individual and additive effects of proanthocyanidins and omega-3 PUFAs in a diet-induced obesity model.

Male Wistar rats were fed for 13 weeks with cafeteria diet (CD) in addition to standard diet. The last 3 weeks they received different treatments (n = 7): vehicle (Arabic gum 5% in water), grape seed proanthocyanidins extract (GSPE) (vehicle+25 mg GSPE/kg bw), oil rich inDHA (ORD) (vehicle+500 mg DHA/kg bw) and GSPE+ORD (vehicle+25mg GSPE/kg bw+500 mg DHA/kg bw). BW changes were monitored during all the experiment. The last day of treatments, the energy expenditure was measured in each animal by indirect calorimetry. The day of the sacrifice, the animals were fasted for 3 h and were sacrificed by exsanguination. Plasma was obtained by centrifugation to determine different biochemical parameters.

The animals treated with GSPE significantly decreased the BW gain and the energy expenditure. Moreover, CRP, TG and total cholesterol levels were decreased in plasma at final point, as well as with the GSPE+ORD treatment, although in this case, leptin levels were significantly increased.

Furthermore, ORD increased FFA levels, although there were not significantly differences neither in BW gain nor in leptin levels. Nevertheless, ORD treatment decreased plasma cholesterol levels.

These preliminary results show that the GSPE+ORD treatment tends to improve the lipid homeostasis in diet-induce obesity rats.

P111

Relation of Early Protein Intake, Overweight, Waist Circumference and Cardiovascular Risk Factors in European Children

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Background and Objectives: Early protein intake has been associated with obesity risk in infancy. Abdominal fat is one of the most important cardiovascular risk factors. Waist circumference has been proposed for the screening of metabolic syndrome in obese children. The present work aims to find an association between early protein intake, BMI, waist circumference and cardiovascular risk factors in children from the EU Childhood Obesity Programme.

Methods: 1090 infants (age = 14 days (IQR:3–30d) were randomly assigned to high or low protein formula milk during the first year of life. For comparison, 619 breastfed infants were recruited. Weight, height and waist circumference were measured at 5.5 (n = 637) and 6 years (n = 657); fasted serum insulin, glucose and triglycerides were determined at 5.5 years (n = 454) and blood pressure was assessed at 6 years (n = 425). BMI and HOMA-IR were calculated.

Results: Waist circumference was correlated to HOMA-IR at 5.5y (r = 0.225, p < 0.001) and systolic blood pressure (SBP) at 6 years (r = 0.212, p < 0.01). BMI z score was correlated with HOMA-IR at 5.5y (r = 0.236, p < 0.001) and SBP at 6 years (r = 0.208, p < 0.01). Linear regression models showed that HOMA-IR was increased in children fed higher protein formula (B = 0.174 (95%CI 0.006, 0.342), p = 0.042, r2 = 1.1%). The effect of the formula disappeared when waist circumference was included in the model (p-value for formula = 0.121; effect of waist B = 0.034 (95%CI 0.018, 0.050), p < 0.001, r2 = 6.3%). Waist circumference did not predict SBP when BMI was present in the model. A model including BMI z score, height and triglycerides explained the 15.6% of SBP variability. Being overweight or obese increased up to 6.9 mm Hg the SBP at 6 years of age.

Conclusions: in our sample of 5.5 to 6 years-old children, waist circumference was the main predictor of insulin resistance while overweight/ obesity was the main predictor of SBP.

P112

Dietary Patterns and Mammographic Breast Density in Spanish Women: Cross-Sectional DDM Study

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Background: A high percentage of dense tissue on mammograms is considered a phenotypic risk marker for breast cancer. Some studies point to an association between mammographic density (MD) and dietary factors.

Objective: To evaluate the association between dietary patterns and MD in Spanish women.

Methods: Our study included a total of 3548 Caucasian women aged 45–68 years who were recruited in breast cancer screening centers from 7 Spanish cities. Diet was assessed by a 117-item food-frequency questionnaire. Food intake was aggregated into 27 groups not including alcohol. MD was classified into 5 categories according to Boyd's semi-quantitative scale. Dietary patterns were identified with principal component analysis and the association between dietary patterns and MD was evaluated with mixed models for ordinal logistic regression adjusting for confounders (BMI, age, time from menopause, number of deliveries, history of cancer, center and calories and alcohol consumption).

Results: Two dietary patterns were identified that explained 21% of food variation: a "Western" pattern (high consumption of high-fat dairy products, red meat, fried fish, refined grains, sweets, and caloric drinks, and low consumption of low-fat dairy, non-fried white fish and whole grains) and a "Mediterranean" pattern (non-fried white and blue fish, seafood, vegetables, boiled potatoes, nuts and olives and vegetal oils). Compared to women in the bottom quintile of the Western pattern, those in the upper quintile had a 23% increased odds of being in high MD groups (OR 1.23, 95% IC 1.03–1.46, P linear trend = 0.047). Association between adherence to the "Mediterranean" pattern and MD was suggestive, but not statistically significant, with an odds ratio comparing the upper with the bottom quintile of 0.87 (95% IC 0.71–1.05, P linear trend = 0.217).

Conclusion: The Western dietary pattern is associated with increased MD and therefore may also be associated with a higher risk of breast cancer.

P113

Dietary Patterns and Risk of Breast Cancer in Spanish Women: EPI-Geicam Study

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Background: There is a general agreement about an association between western dietary pattern and high risk of breast cancer but the association with other dietary patterns is still inconclusive.

Objective: To evaluate the association between dietary patterns and risk of breast cancer (BC) in Spanish women.

Methods: In a nation-wide case-control study, 1019 cases from 23 hospitals were matched to 1019 controls by age and municipality of residence. Diet was assessed by a food-frequency questionnaire with 95 food items and food intake was aggregated into 27 groups. Dietary patterns were identified with principal component analysis among controls only and the component loadings obtained were transferred to the cases. The association between dietary patterns and BC was evaluated with conditional logistic regression.

Results: Three dietary patterns were identified: a "Western" pattern (high consumption of high fat dairy products, processed meat, refined grains, sweets, caloric drinks and convenience food and low consumption of low fat dairy products and whole grains); a "Mediterranean" pattern (high consumption of fish, vegetables, legumes, boiled potatoes, fruits, olives and vegetable oil, and low consumption of juices); "prudent" pattern (high consumption of low fat dairy products, vegetables, fruits, whole grain and juices). Adherence to the western pattern was related to a higher odds of BC, with the odds ratio for the top versus the bottom quartile being 1.70 (95% IC 1.17–2.48). An inverse association was seen for adherence to the Mediterranean pattern, with the odds ratio comparing top with bottom quartiles of 0.44 (95% IC 0.30–0.65). No association was found for the prudent pattern.

Conclusion: Our results suggesting an association between diet and risk of breast cancer coincide with results from other studies. While adherence to a prudent low-fat diet fails to prevent risk cancer, mediterranean style diet seems to be negatively associated with breast cancer risk.

P114

Prevalence of the Pathologic States of Iron During Pregnancy: Anaemia and Risk of Haemoconcentration

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Background and Objectives: Anaemia is known to be common during pregnancy even in industrialised countries. There are few data of the prevalence of these deficits among Spanish pregnant women according to the trimester of gestation. This study aimed to estimate the prevalence of anaemia, iron deficiency anaemia (IDA) and risk of haemoconcentration among pregnant women who attend Antenatal Care Centres in the region of Tarragona.

Methods: Data collected from all pregnant women from the clinical histories electronically registered between 2008–2012 (n = 9488). Haemoglobin concentration (Hb), haematocrit and mean corpuscular volume (MCV), were collected routinely for each women at the 1st, 2nd and 3rd trimester. Folic acid supplements (400 mg/d) were prescribed from the first antenatal visit, vitamin supplements with 20 mg of iron from week 15, later around week 26 iron supplementation of around 40 mg/d was prescribed systematically to all women.

Results: The average age of mother was 29.8±5.7 years. The mean values (±SD) of haematological indexes at the 1st, 2nd and 3rd trimester respectively were as follows: Hb: 126.3±9.1, 114.1±8.9, 117.0±10.0 g/L; haematocrit: 36.8±2.7, 33.1±2.6, 34.2±2.9% and MCV: 87.4±5.3, 88.9±5.5, 87.9±6.0 fl. The prevalence of anaemia increased from a 3.8% at the first trimester to a 13.1 at the 2nd trimester and a 21.5% at the 3rd. According to the severity of anaemia at the 3rd trimester a 20.8% was mild, 0.8% moderate and only one severe. The results show that a 9.1% of the subjects had MCV values less than standard value of 80 fl suggesting a microcytic anaemia. A 3.3% and a 9.9% of pregnant were at risk of haemoconcentration during the 2nd and 3rd trimester respectively.

Conclusions: Iron deficiency anaemia and risk of haemoconcentration are a public health problem among Spanish pregnant women. Iron supplementation guides should be revised in order to better prevent this pathology.

P115

Tobacco During Pregnancy and Newborn Health

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Background and Objectives: Tobacco habit and gestational iron-deficiency anemia are related to adverse pregnancy outcomes, but they have not been assessed simultaneously. The aim of the study was to evaluate the effect of different forms of exposure to tobacco during pregnancy on newborn health considering the effect of iron-deficiency anemia and other risk factors associated with the studied relationship.

Methods: Longitudinal study conducted on 269 healthy pregnant women. General clinical and obstetric histories were collected as well as the tobacco habits, including the personal and the environmental tobacco smoke (familiar or at workplace). Blood haemoglobin (Hb), serum ferritin, and transferrin saturation (TS) were measured at each trimester and at delivery. Pregnant women were classified into: active smoker, second-hand smoker, non-smoker and ex-smoker. Birth weight, low birth weight (<2500 g) and preterm delivery (<37 weeks gestation) data were recorded.

Results: 18.2% of pregnant women were active smokers, 8.9% were second-hand smokers, 59.1% were nonsmokers and 13.6% of women were ex-smokers. Women exposed to tobacco had more risk of preterm delivery than non-smokers (6.7 times more the active smokers (95% CI: 1.5-29.9) and 7.3 times more the second-hand ones (95% CI: 1.3-40.6)). Women exposed to tobacco (active and second-hand smokers) had babies weighting less than nonsmokers (125g less the active smokers and 174 g less the second-hand smokers).

Conclusions: Exposure to tobacco, both actively and passively, during pregnancy is associated with adverse effects on the newborn such as increased risk of preterm birth and low birth weight. These findings reaffirm the importance of the recent political guidelines on protection from exposure to tobacco smoke at work.

P116

Breastfeeding and Infant Formula: Effect on Infant Development

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Background: Current World Health Organization guidelines recommend exclusive breastfeeding for the first 6 months of life, and nutrition during the first year of life is crucial for the proper infant development.

Objectives: To show the effect of breastfeeding on the anthropometric, biochemical and cognitive development of infants.

Methods: Longitudinal study on 129 healthy infants followed from birth until the year. Anthropometrical data, iron biochemical parameters and cognitive development (Bayley Scales) were measured at 6 and 12 months.

Results: At 6 months, 16.5% of infant take breastfeeding (BF), 20.3% mix breastfeeding with infant formula (IF) and 63.2% IF. At 6 months, babies fed with IF versus BF infants had higher values of hematocrit (Ht), hemoglobin (Hb), mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH), and lower incidence of depleted iron stores (0% vs 15%) and anemia (6.3% vs 31.6%). At 12 months, babies fed with IF versus BF infants had higher values of Ht, Hb, MCV and MCH. BF babies had high mental development scores at 12 months compared to IF (103.84 ± 9.08 vs 97.36 ± 11.45; p = 0.009).

Conclusions: The breastfeeding improves mental development at 12 months despite the decrease of the biochemical parameters of iron. No differences were observed in anthropometric parameters among breastfed and formula-fed infants.

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Chronic Treatment with Low Doses of Resveratrol Improves Non-Alcoholic Fatty Liver Disease by Modulating Endoplasmic Reticulum Stress Related Factors

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Red wine contributes to the health benefits provided by mediterranean diet. Among the polyphenols of red wine resveratrol (RSV) plays a pivotal role for such beneficial effects. A main RSV target is lipogenesis, which is intimately associated with fatty liver related pathologies such as non-alcoholic fatty liver disease (NAFLD). Interestingly, recent publications pinpoint the implication of endoplasmic reticulum (ER) stress not only on lipogenesis, but also on NAFLD.

ER stress is characterized by accumulation of unfolded proteins in ER lumen. To deal with this situation hepatocytes activate UPR (Unfolded protein response) mechanisms but if not resolved it will lead to apoptotic cell death.

We have developed an in vitro approach of NAFLD using HepG2 cells overloaded with the saturated FFA palmitate in order to investigate: (a) whether a chronic treatment with a low RSV dose can improve NAFLD, and (b) the implication of ER stress mechanisms on such effect.

HepG2 cells were incubated with 5 μM RSV for 14 days. Afterwards, an acute treatment (8 h) with palmitate or oleate (1mM) was done. Several markers of apoptotic (CHOP and PUMA) and ER stress (xbp-1 splicing and GADD34) processes were studied by PCR.

RSV reduced the palmitate deleterious effect on hepatic cells by promoting: (a) a slight decrease on XBP-1 splicing and a concomitant reduction of CHOP and PUMA expression, and (b) a slight increase on GADD34 expression.

Chronic treatment with low amounts of RSV is able to counteract the damage induced by a saturated FFA accumulation on hepatic cells. RSV alleviates the palmitate-related apoptotic signaling as well as induces translational recovery. These effects are hallmarks of an effective UPR process and ER stress resolution; and suggest that chronic consumption of low doses of red wine will be beneficial for NAFLD prevention.

Non-alcoholic fatty liver disease, Resveratrol, ER stress.

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Moderate Beer Consumption Reduces the Cardiovascular Risk

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Background and Objectives: Several epidemiological studies suggest that moderate alcohol consumption reduces the cardiovascular risk. Nevertheless, the cardiovascular effects of different types of alcoholic beverages are still under debate.

The aim of this study is to compare the effects on the lipid profile and circulating adipokines of two different alcoholic beverages, one fermented and one distilled in males at high cardiovascular risk.

Methods: We embarked on a randomized crossover feeding trial with 33 male subjects at high cardiovascular risk. After a run-in period in which alcoholic beverages were avoided (during 15 days), all subjects received either 30 g of alcohol/day in the form of beer or gin for one month. After the run-in period and after each intervention body mass index (BMI), triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol, Apolipoprotein A-I (ApoA-I), ApoA-II, ApoB, ApoC-I, ApoC-III, lipoprotein(a), growth hormone (GH), adiponectin and leptin were measured.

Results: Both, beer and gin interventions increased HDL, ApoA-I and ApoA-II plasma concentrations, as well as the LDL/HDL ratio, while the other parameters remained unaltered throughout the study.

Conclusions: Moderate alcohol consumption independently of the type of alcoholic beverage improves the lipid profile but neither ethanol nor non-alcoholic beer compounds modify the circulating adipokines concentrations.

The School Lunch Program Review (PReME) in Catalonia Improves the Quality of Menu Plannings, 2011–2012

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Background: The School Lunch Program Review (PReME), included in the Integral Plan for Health Promotion through Physical Activity and Healthy Eating (PAAS) of the Public Health Agency of Catalonia (ASPCat) is one of the activities of the Project 2.2 of the Health Plan 2011–2015. The program began in 2006, in collaboration with the Department of Education, and it has been offering to review the menu planning of the schools in Catalonia. After the evaluation of 2100 menu plannings we have started monitoring the implementation and acceptance of the suggested measures of improvement.

Objective: To assess the compliance of the suggested recommendations for improvement.

Methods: After submitting the initial assessment report, a questionnaire for re-assessing and monitoring the evolution of the suggestions for improvement is sent to the school. The answers to the questionnaire and the new menu plannings are evaluated.

Results: (n = 681): 91% consider it a useful tool. 85% believe that the report will lead to the improvement of the menu plannings. The report was sent to different stakeholders. Regarding to the new menu plannings, the following changes are observed in achieving the recommendations (n = 257): specification of ingredients and preparations of starters (23%–65%*), specification of ingredients and preparations of main courses (62%–74%*), presence of deep-fried food (79%–91%*) presence of salad (43%–45%), specification of the salad ingredients (43%–80%*), presence of fresh fruit in the dessert (46%–81%*), presence of fresh food (76%–91%*), daily presence of vegetables (58%–93%*) and recommended frequencies of foods (42%–61%*).

*(P < 0.05)

Conclusions: The assessments have improved key aspects of menu planning. The report with suggestions for improvement is known by different stakeholders and is highly regarded. The mainstreaming of PReME with the involvement of different professionals and local public health teams is essential and bring an added value.

Dietary Fat Modifies Lipid Metabolism in the Adipose Tissue of Patients with Metabolic Syndrome

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Background and Objectives: Obesity plays a central role in the development of adipose tissue (AT) dysfunction in the metabolic syndrome (MetS). In turn, AT dysfunction leads to the alteration on the processes that regulate lipid metabolism in this tissue. Our aim was to investigate the effect of the long-term consumption in fasting state and at the postprandial state of 4 dietary models with different quantity and quality of fat on the expression of genes related to the lipid metabolism (uptake of dietary lipids, lipogenesis, lipolysis) in AT.

Methods: A randomized, controlled trial conducted within the LIPGENE study assigned MetS patients to 1 of 4 diets: a) high-saturated fatty acid (HSFA), b) high-monounsaturated fatty acid (HMUFA), c) low-fat, high-complex carbohydrate diets supplemented with n-3 polyunsaturated fatty acids (PUFA) (LFHCC n-3), and d) low-fat, high-complex carbohydrate diets supplemented with placebo (LFHCC), for 12 weeks each. A fat challenge reflecting the fatty acid composition as the original diets was conducted post-intervention.

Results: The long term consumption of LFHCC n-3 diet decreased SREBP1 (p = 0.007) and SCD-1 fasting mRNA levels (p = 0.043) as compared to LFHCC diet. We found that the fasting mRNA levels of ATGL increased after HSFA diet consumption as compared with HMUFA (p = 0.024), LFHCC (p = 0.011) and LFHCC n-3 (p < 0.001) diets. We also observed that the mRNA levels of ATGL increased in the postprandial state after HSFA meal intake as compared with the intake of the HMUFA (p = 0.02), LFHCC (p < 0.001), and LFHCC n-3 (p < 0.001) meals.

Conclusions: Our results suggest that the intake of omega-3 fatty acid reduce the activation of the lipogenesis observed after low fat high carbohydrates diet consumption. Additionally, the intake of saturated fatty acid increases the lipolysis in fasting and in postprandial state.

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The Gut Microbial Community Changes in Over-Nutrition and According to the Number of Metabolic Syndrome Criteria

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Background and Objectives: Over time, over-nutrition leads to obesity. Increasing evidence suggests that the gut microbiota plays an important role in the harvest energy from food, and thus affect the equation energy intake and expenditure. Obesity is the central and causal component of the metabolic syndrome (MetS), a multi-component disorder identified by the presence of different criteria, including abdominal obesity, low HDL levels, high TGL levels, hypertension and impaired insulin sensitivity. In the last years, the intestinal microbiota has gained special interest in this field, because the possibility of its implication in the development of the complications associated to the obesity. The modifying of gut bacteria community could help to battle obesity, MetS, and its complications. However, studies supporting this hypothesis are still scarce. We aimed to determine the differences in the bacterial community structure of the intestinal microbiota in obese patients with 3, 4 and 5 MetS criteria as compared to obese people without MetS and control individuals.

Methods: We extracted the bacterial DNA from feces of 200 patients (40 patients of each group) and we analyzed the intestinal microbiota by qPCR with specific primers for several relevant phyla, genera and species.

Results: We found a significant decrease in the Bacteriodetes phylum (p = 0.002), several Bacteroides species (B. fragilis, B. vulgates, B. distasonis, and B. thetaiotaomicron, all p < 0.05), Ruminococcus subgroup (p < 0.001), and Bifidobacterium adolescentis (p = 0.001), as the number of MetS criteria increases (p = 0.002). No differences were observed in Firmicutes, Actinobacteria and Proteobacteria phyla and Bacteroides and Clostridium genera. Interestingly, Eubacterium (p = 0.004) and Lactobacillus (p = 0.014) genera increase according to the number of MetS criteria.

Conclusion: Our data suggest that the presence of metabolic syndrome influences the composition of gut microbial community. Its importance in the development of the complications associated to obesity or its causal-effect relationship will have to be investigated.

P122

The Amed Certification Enables to Follow a Healthy Eating Diet Outside the House in Catalonia for more than 38,000 People/Day

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Background: Amed identifies and certifies establishments that promote the Mediterranean diet whilst improving the food offer. It addresses to restaurants, chains of food and labour dinners, especially in labour surroundings. It is a pioneer project in Spain. Nowadays, there are 220 certified establishments, in 76 municipalities, reaching 38,516 people/day.

Objective: To evaluate the improvements in the use of selected typical Mediterranean foods, observed within the applicants, before and after the certification during year 2012.

Material and Methods: Food offer is collected with an online questionnaire through Amed's website. Later, the data is confirmed by telephone or by a personal visit of a certified Dietitian-Nutricionist. A descriptive analysis has been applied to obtain the improvement percentage of the food offer within the applicants (olive oil, vegetables and pulses, whole grain products, fresh fruit and low fat dairy products), following the Amed criteria.

Results: During 2012, 77 establishments have been certified for offering Mediterranean meals to 13,869 people/day. The improvements are an increase of 89.6% in the use of high-oleic-acid sunflower oil to fry, 33.7% in the incorporation of whole grain products, 16.9% of low fat dairy products for dessert, 10.4% in the use of olive oil or high-oleic-acid sunflower oil to cook, 10.4% in the offer of more vegetables and pulses in the first course, 10% in the offer of fresh fruit for dessert and 5% in the offer of lean meats and fishes in the second courses. All of the establishments offered already oil olive as salad dressing.

Conclusions: The Amed certification guaranteed food improvements within the certified establishments, mainly concerning the change of common vegetal oil for high-oleic-acid sunflower oil to cook and/or fry. It also increased the use of whole grain products, mainly bread, and fresh fruit and low fat dairy products for dessert.

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Background: Prospective longitudinal studies evaluating the relevance of the "Metabolically Healthy but Obese" (MHO) phenotype at risk for diabetes and cardiovascular diseases are few and the results are contradictory.

Materials and Methods: 1051 individuals were evaluated in 1997–1998 and re-evaluated after six years (n = 820) and eleven years (n = 554). Subjects without known diabetes mellitus were given an oral glucose tolerance test. Weight, height, blood pressure (BP), serum glucose, triglycerides, HDL-c and serum insulin were measured. BMI and HOMA-IR were calculated.

Four sets of criteria were considered to define MHO subjects: A: BMI≥30 kg/m^2 and HOMA-IR<90th percentile; B: BMI≥30 kg/m^2, HOMA-IR<90th percentile, HDL-c>40 mg/dl in men and HDL-c>50 mg/dl in women, triglycerides <150 mg/dl, fasting glucose <110 mg/dl and BP≤140/90 mmHg; C: BMI≥30 kg/m^2, HOMA-IR<90th percentile, triglycerides <150 mg/dl, fasting glucose <110 mg/dl and BP≤140/90 mmHg; D: BMI≥30 kg/m^2, HOMA-IR<90th percentile, triglycerides <150 mg/dl and fasting glucose <110 mg/dl.

Subjects with diabetes at baseline were excluded from the calculations of the incidence of diabetes.

Results: The baseline prevalence of MHO phenotype varied between 3.0% and 16.9%, depending on the set of criteria chosen. Whatever the set chosen, a significant reassignment of the classification has occurred over the years (p < 0.0001).

Metabolically non-healthy obese subjects (MNHO) were at the highest risk for becoming diabetic after 11 years of follow-up (OR = 8.20; 95% CI = 2.72–24.72; p<0.0001). In MHO subjects the risk for becoming diabetic was lower than in MNHO subjects, but this risk remained significant (OR = 3.13; 95% CI = 1.07–9.17; p = 0.02). In subjects who lost weight during the study, the association between MHO phenotype and diabetes incidence disappeared, even after adjusting for HOMA-IR (OR = 0.67; 95% CI = 0.08–5.44)

Conclusions: The results suggest that MHO is a dynamic concept that should be taken into account over time. As a clinical entity it may be questionable.

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Background: The aim of this study was to examine the prevalence and characteristics of metabolically healthy obese subjects and metabolically abnormal normal-weight subjects in the Spanish population and compare the findings with the US population (NHANES 1999–2004 study).

Methods: Di@bet.es study is a national, cross-sectional population-based survey conducted in 2009–10. Clinical, metabolic, socio-demographic, and anthropometric data were collected as well as information about lifestyle habits. Those subjects without known diabetes mellitus were given an oral glucose tolerance test. The criteria used to define the body size and cardiometabolic abnormalities were the same as in NHANES study (normal weight, <25 kg/m^2; overweight, 25–29.9 kg/m^2; and obese, >30 kg/m^2). Cardiometabolic abnormalities included elevated blood pressure; elevated levels of triglycerides, fasting glucose, and hs-CRP; elevated HOMA-IR value and low HDL-c level.

Results: In the Spanish population, 55.18% of overweight individuals and 28.91% of obese individuals were metabolically healthy, and 28.88% of normal-weight individuals were metabolically abnormal. The prevalence of a metabolically abnormal phenotype in overweight and obese subjects was higher in older age groups, those with a greater waist circumference, a moderate physical activity level and different levels of alcohol intake. In the overall population the probability of having more than one car-

diometabolic abnormality was significantly and negatively associated with physical activity level, education level, alcohol intake and olive oil intake and positively associated with BMI.

Conclusions: The prevalence of cardiometabolic abnormalities related to obesity is similar to that found in US population. Smoking, physical activity level and alcohol intake contribute to the explanation of the prevalence of metabolic non-healthy obee subjects in the Spanish population, as in the US population. However, in Spain olive oil intake, independently of education level, contributes significantly to the explanation of the variance in the prevalence of metabolic abnormalities.

P125
Determination of Colonic Microbiota Metabolites From Grape Seed Flavanols in Rat Plasma

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Background and Objectives: Flavanols are a cass of dietary phenolic compounds abundant in Mediterranean diet, with a well-defined biological activity and health benefits. However, their bioactive compounds responsible of the in vivo activity are still not well defined, and its identification and quantification are becoming important issues for the understanding of how polyphenols exert their beneficial effects. The low molecular weight forms of dietary flavanols are absorbed into the small intestine, and they are posteriorly conjugated in the intestine and liver to give sulphated, glucoronidated and/or methylated derivatives. The non-absorbed flavanols reach the colon where they are subjected to the microbiota metabolism and converted into small phenolic compounds which are efficiently absorbed in situ. The aim of this study was to identify the plasma colonic metabolites after an acute administration of a grape seed extract rich in flavanols.

Methods: 1 g/kg of a grape seed extract rich in flavanols was orally administrated to male Wistar rats (n = 6). Plasma was collected 2 h, 7 h, 24 h and 48 h after the administration. Valerolactones and phenolic acids were quantified in plasma by High Performance Liquid Chromatography tandem Mass Spectrometry (HPLC-MS/MS).

Results: Original flavanols present in the extract showed the highest concentrations 2 h post flavanol extract administration. Valerolactones display their highest concentration at 7 h. Finally, phenolic acids showed maxim concentrations between 7 h and 24 h post-administration.

Conclusions: Products from flavanol microbiota metabolism have been determined in rat plasma at 2 h, 7 h, 24 h and 48 h after an acute oral administration of a grape seed flavanol extract. The higher concentration of first intermediate colonic metabolites, valerolactones, and final colonic products, phenolic acids, were observed at 7 h and 24 h post administration, respectively. This allowed the determination of colonic microbiota metabolites in rat plasma at different times.

P126
Body Iron Stores and Metabolic Syndrome: A Meta-Analysis of Observational Studies

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Background: Alterations in body iron stores may play a role in the development of the metabolic syndrome. However, positive associations between increased serum ferritin levels and the metabolic syndrome and/or its components have been inconsistent.

Objective: To perform a systematic review and meta-analysis of published observational studies to estimate the association between serum ferritin levels and the metabolic syndrome in adult population.

Methods: The MEDLINE and the Cochrane Library databases were searched for studies published before December 2012. Observational studies assessing serum ferritin levels and metabolic syndrome outcome were selected. There were no language restrictions. Two investigators independently selected and reviewed eligible studies. Measures of association were pooled by using an inverse-variance weighted random-effects model. The heterogeneity among studies was examined using the I2 index. Publication bias was evaluated using the funnel plot.

Results: Ten cross sectional studies and two prospective large studies met our inclusion criteria. The meta-analysis included 41,059 people of both genders from America, Asia and Europe.

The metabolic syndrome pooled odds ratio in a comparison of the lowest with the highest serum ferritin levels categories was 1.57 (95% CI: 1.45, 1.70); P for heterogeneity: = 0.126; I2 = 26.9%. This finding was remarkably robust in the sensitivity analysis. We did not find any publication bias.

Conclusions: High plasma ferritin levels were associated positively with metabolic syndrome in observational studies. The effect of iron stores on mechanisms involved in the metabolic syndrome needs to be elucidated. Further prospective studies are needed to confirm the link between iron metabolism and/or iron body stores and metabolic syndrome.

P127

Serum sCD163 Concentrations are Associated with Diabetes and Coffee and Wine Intake: Results of the Di@bet.es Study

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Background: Serum concentrations of soluble forms of TNF-like weak inducer of apoptosis (sTWEAK) and scavenger receptor CD163 (sCD163) have been associated with type-2 diabetes mellitus (T2DM). We test the association of sTWEAK and sCD163 with the intake of coffee and wine in subjects with T2DM and normal OGTT controls.

Methods: Cross-sectional, matched case-control study of 514 T2DM subjects and 517 controls matched by sex, age and BMI, using data from the di@bet.es study. Study variables included a clinical and demographic structured survey, a food frequency questionnaire and a physical examination. Serum concentrations of sTWEAK and sCD163 were measured by ELISA. Linear regression analysis was used to determine what variables were related to sTWEAK and sCD163 serum concentrations. Logistic regression analysis was used to estimate odd ratios of presenting T2DM.

Results: sCD163 and sCD163/sTWEAK ratio were higher (P<0.001) in T2DM than controls. There were no differences in sTWEAK between cases and controls (P = 0.8). Lineal regression analysis adjusted by sex, age, WHR, obesity and T2DM has shown a negative association of sTWEAK with coffee intake (p = 0.04), while sCD163 is negatively related to coffee intake (p = 0.03) and red wine intake (p = 0.002).

The OR of presenting T2DM in subjects in the highest vs the lowest tertile of sCD163 was 2.12 (95%CI, 1.53–2.94); P for trend<0.001 adjusted by sex, age, obesity, abdominal obesity, high blood pressure, sTweak, and coffee and wine intake.

Conclusions: High circulating levels of sCD163, but not sTWEAK, are associated with T2DM. Reduced serum levels of sTWEAK are related to coffee intake while lower levels of serum sCD163 concentrations are related to coffee and red wine consumption.

P128

Children's Preferences for School Meals Consumed in Real Conditions in the Municipality of Murcia, Spain

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Background and Objectives: Hedonic evaluation of the school meals is limited, but necessary to optimize consumption and contribute to improving dining services. This study evaluates user's preferences for foods served at school cafeterias and its association with the actual food consumption (uneaten food quantity).

Methods: Descriptive study of hedonic acceptance of food (7-point scale) individual items by 8–12 years school cafeteria users, analyzed by fixed factors such as structure, scholar cycle and sex. 20 meals were evaluated, which represented 300 trays (5 schools x 4 meals including a week x 15 children). Each meal has four (4-C) or five (5-C) components including appetizer, first course, second-main course, dessert and bread. Statistical differences were fixed at p<0.05.

Results: The overall hedonic grading for 4 and 5 components of meals were 5.83 and 5.44, respectively (p > 0.05). The rate for first courses was 4.75, with significant differences (p = 0.0001) between 4-C (5.43) and 5-C (4.56), while for second courses was 5.14; 5.52 for 4-C and 4.98 for 5-C (p = 0.024). Legumes and cooked vegetables (first courses) were better evaluated by scholars from second (5.08 and 5.60) than third (4.14 and 3.72) scholar cycles (p = 0.04 & 0.006, respectively). The same trend (p < 0.05) was observed for egg and fish as second courses, pears and white bread. Cooked vegetables were better rated by girls than boys (6.1 vs. 4.1; p = 0.010). Foods with the highest proportion of negative evaluations were salads, cooked vegetables, rice and fish first courses, and fish main courses. Differences depend on school cycle rather than gender. Relationship between hedonic ratings and the amount of uneaten food was observed (p < 0.05).

Conclusions: The findings suggest the hedonic perception of the meals in school canteens should be considered to improve the intake of food that is moderately or poorly evaluated.

P129

Metabolic and Hormonal Responses to Oral Glucose in Human Subjects Adhered to High-Fat Diet

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Important component of daily energy expenditure is increase in thermogenesis after food ingestion. The aim of the study was evaluation thermogenic effect of glucose (TEG) in individuals adhered to high fat diet (HF) (80% of fat, 15% of protein and 5% of carbohydrates) for longer than 1 year. 18 healthy individuals (age 30–78 years and BMI 19.78–30.11 kg/m^2) remaining on HF longer than 1 year, volunteered in the study. They were compared with 17 control subjects matched with sex, age and BMI who consumed standard diet (SD) –60% of carbohydrate, 25% of fat and 15% of protein). Blood samples for glucose, insulin, adrenaline and noradrenaline concentration were collected before and every 30 minutes of the Oral Glucose Tolerance Test (OGTT –75 g of glucose in 200 ml of water). TEG was assessed from oxygen consumption and CO_2 production. Magnitude of TEG, glycemia and insulinemia were expressed as areas under the curves of energy expenditure, changes in concentration of glucose (GAUC) and insulin (IRIAUC). Average TEG in HF group 18.6±17.5 kJ/min) was lower than in control group (79.4±28.7 7 kJ/min, p > 0.05). GAUC after glucose ingestion was lower in SD subjects than in HF group (GAUC 258,2 41,7 vs 543,0 78,52, p < 0.001). However IRIAUC was not significantly different (5928.3±1210.5 vs 10627±500; p > 0.05).

Basal adrenaline and noradrenaline concentration was higher in the HF group (1.581 nmol/l; 9.08 nmol/l respectively) as compared to control (0.309 nmol/l; 0.347 nmol/l) as well as maximal adrenaline and noradrenaline plasma concentration during OGTT (Amax 1.581 nmol vs Amax 0.347 nmol/l, NAmax 1.446 nmol/l vs and NAmax 9.018 nmol/l respectively).

Summarizing: long term effect of high fat diet include diminished postprandial thermogenesis and glucose tolerance manifested by higher glycaemia and insulinaemia after glucose load, what may be attributed to lower sensitivity to adrenergic stimuli.

Metabolic and hormonal responses to oral glucose in human subjects adhered to high-fat diet.

P131

Cardiovascular Risk Factors and Alcohol Consumption within an Elderly Spanish Population at High Cardiovascular Risk

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Background and Objectives: Cardiovascular diseases (CVD) are the leading cause of mortality and disability in developed countries. A healthy diet can improve cardiovascular risk factors. Specifically, polyphenols, bioactive compounds mostly found in foods from plant origin, have been associated with low risk of CVD. Wine and beer are polyphenol-rich beverages that are also commonly consumed in the Mediterranean countries. Our aim was to compare the main cardiovascular risk factors between wine and beer consumers and non-consumers from the PREDIMED study.

Methods: The PREDIMED study is a large, parallel-group, multicenter, randomized, controlled 5-year clinical trial aimed at assessing the effects of the Mediterranean diet on the primary prevention of cardiovascular diseases. The 7,447 eligible participants were community-dwelling people aged 55 to 80 years, who were free of cardiovascular disease at baseline. Wine and beer consumers and non-consumers were divided to compare cardiovascular risk factors. Statistical analyses (ANOVAs and Bonferroni tests) were conducted using SAS software, version 9 (SAS Institute, Inc., Cary, North Carolina).

Results: We observed a decrease in triglycerides levels (–16.5 mg/dL, P = 0.03) and glucose levels (–5.6 mg/dL, P = 0.046) comparing moderated wine drinkers with non-drinkers. Heart rate and BMI were significantly lower among wine and beer consumers comparing to non-drinkers (P < 0.001). There were no changes on SBP and DBP among non-drinkers and moderate wine drinkers, although both SBP and DBP were increased among those who drunk >14 drinks/week (SBP: +3.3 mmHg, P = 0.001; DBP: +2.6 mmHg, P < 0.001). No significant differences were observed in cholesterol levels.

Conclusion: Polyphenol-rich beverages improved cardiovascular risk factors. These data will be useful to investigate about polyphenol intake and the incidence of several pathologies.

P132
Clinical and Nutritional Aspects of Children and Teenagers with Celiac Disease in a City of Northeast Brazil

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Celiac disease (CD) affects genetically susceptible individuals and is induced by the exposure to gluten. In CD occurs a flattening and changes in the intestinal villi which can affect the nutritional status of the patients. The only effective treatment is a totally gluten-free diet (GFD).

The aim of this study was to observe clinical and nutritional aspects of children and teenagers with CD in the city of Fortaleza (Ceara), in northeast of Brazil. Were collected clinical and anthropometric data of 30 coeliacs (11 children; 19 teenagers). The nutritional status of the children was assessed using the parameters: weight for height (W/H), height for age (H/A), body mass index for age (BMI/A), weight for age (W/A); and for the adolescents: BMI/A and H/I.

The parameters used were the nutritional classification of System Food and Nutrition Surveillance in Brazil. Most celiacs (63.33%) presented the firsts symptoms with 2 years or less old. 50% took at least one year to diagnose the disease. The main initial symptoms presented were abdominal distension, abdominal pain, diarrhea and poor weight gain (66.7%, 63.3%, 56.7%, 53.3%, respectively). Among the diseases associated current, the allergies were the most reported. The majority (66.27%) reported that they strictly follow a GFD. 31.58% among teens do not always follow GFD. Among children, nearly all were eutrophics and with a normal W/A. Among adolescents, according to BMI/A, 73.68% were eutrophic and 26.32% were overweight. It can be observed that initially, most celiacs showed classic symptoms of CD, but with the follow-up of GFD the symptoms were reversed and currently the patients have adequate weight and are eutrophics, showing the importance of the nutritional monitoring of celiacs to avoid future problems, to reverse situations of nutritional deficit and to avoid the opposite, as overweight.

P133
Optimal Cutoffs of BMI, Percentage Body Fat, and Waist Circumference for Predicting Metabolic Syndrome among Lebanese Adults

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Background: Obesity is a main predictor for metabolic abnormalities. Body mass index (BMI), percentage body fat (%BF) and waist circumference (WC) have been proposed as indices to assess obesity. Various cut-off values were developed, however, ethnic differences have been shown to affect the sensitivity and specificity of these indices.

Objective: To determine population specific cut-off points for BMI, %BF and WC associated with an increased risk of metabolic syndrome (MetS) among Lebanese adults.

Methods: This is a secondary analysis of data drawn from the National Nutrition and Non-Communicable Disease Risk Factor Survey conducted in Lebanon between 2008 and 2009. Survey participants older than 18 years and with no chronic diseases were included in this analysis (n = 314; 146 males and 168 females). MetS was diagnosed using the "Harmonizing criteria of A Joint Interim Statement of IDF/NHLBI/AHA/WHF/IAS/IASO 2009". Receiver Operating Characteristic curves analysis was employed to derive cut-off points for BMI, %BF and WC associated with increased risk of MetS.

Results: Prevalence of MetS in the study sample was 23.9% (33.6% males, 15.5% females). The cut-off points for BMIs for males and females respectively were 27.26 and 28.35 kg m^2 with AUC of 0.743 and 0.830. As for %BF, cut-off values were 25.2 and 35.9% with AUC of 0.713 and 0.820. Regarding WC, cut-offs were 94.7 and 90.1 cm with AUC of 0.74 and 0.85.

Conclusion: The optimal cut-off values to predict MetS of BMI, %BF and WC were derived. Our findings indicated that Lebanese adults are obese at lower BMI values as compared to the internationally recommended (WHO) standards. To prevent development of metabolic syndrome among Lebanese, it might be useful to lower the cut-off for obesity as defined by BMI.

P134
Cannabinoid CB1 Receptor in the Islets of Langerhans could be Involved in Alterations of Intracellular Signalling Pathways during Type 2 Diabetes, Contributing to Beta Cell Dysfunction

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Background and Objectives: The obesity epidemic has been related to an increased consumption of certain types of n-3 and n-6 fatty acids, essential fatty acids being precursors of, among others, arachidonic acid (AA). In turn, AA is involved in the synthesis of lipid signalling molecules called endocannabinoids, whose levels are increased in both obese and diabetic subjects. Currently, it is recognized that these patients have an overactive endocannabinoid signalling, mainly channelled through cannabinoid CB1 receptors, and this alteration has been related to the physiopathology of these diseases. Furthermore, cannabinoid CB1 receptors have been involved in the stimulus-secretion coupling in beta cells as well as in the regulation of beta-cell mass. Type-2 diabetes (T2D) is a common obesity-related pathology, whose development implies both beta-cell failure and insulin resistance. Unfortunately, the mechanisms underlying beta-cell failure are still poorly understood. We are currently exploring the involvement of CB1 downstream intracellular pathways in islet

physiology as well as their eventual role in beta-cell failure during T2D.

Methods: Mice were fed a high-fat-diet until development of T2D. Pharmacological experiments were performed in vivo as well as in isolated islets. Activation of intracellular pathways were analysed by Western Blot.

Results: We have found CB1-dependent alterations in Akt/PKB, cAMP/CREB and mTORC1 pathways in animal models of T2D. The results suggest that CB1 receptors on islets are involved in the physiopathology of T2D, probably by channelling excessive endocannabinoid signalling and thus deregulating beta-cell physiology.

Conclusions: These findings support previously suggested peripheral pharmacological interventions to ameliorate T2D via CB1 receptor inhibition and further strengthen the notion that dietary interventions aimed at controlling AA availability could be useful tools to fight against T2D.

P136
A Low Alcoholic Novel Orange Drink Improve Lipid Profile in an Animal Model of Metabolic Syndrome

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Background and Objectives: The beneficial effects of fruit through its antioxidant compounds have largely been confirmed. Moreover, moderate alcohol consumption confers cardiovascular protection. A low alcoholic beverage (1%) from fermented orange juice (F-OJ) could join both actions. Therefore, our aim is to evaluate the effect of this beverage on plasma antioxidant capacity (PAC) and lipid profile in an animal model of metabolic syndrome.

Methods: OF1 male mice, 8 weeks old (n = 32) were fed with a high-fat diet (HFD) (42% from caloric content) till metabolic syndrome onset (12 weeks). During the next 12 weeks mice were maintained with the same HFD and 4 groups (n = 7) were established: i) control (plain water); ii) orange juice (dilution 1:10) in drinking water; iii) FP-OJ at same dilution in drinking water and iv) alcohol (dilution 1:100) in drinking water. Beverages were provided ad libitum. Blood was obtained by intracardiac puncture and PAC was assayed by ORAC, FRAP and ABTS. Lipid profile (TAG, TC, LDL, HDL) was determined by spectrophotometic assays.

Results: ORAC assay showed a significant (p < 0.01) increase in orange juice group vs control. No significant differences among groups were observed with the rest of PAC assays. FP-OJ group showed a very significant (p < 0.001) decrease vs control, and oranje juice and alcohol group showed a significant decrease (p < 0.01) vs control in TAG levels. FP-OJ group showed a significant (p < 0.05) increase in HDL levels vs control. No significant differences were observed in CT and LDL levels among groups.

Conclusions: Thus, a low alcoholic orange drink improved HDL levels in an animal model of metabolic syndrome.

P137
Nutritional Status of Children from the City of Ba-Pintadas

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Background and Objectives: The nutritional status reflects the health condition of the population, especially among children and adolescents, since their influence on growth and development, in addition to the risks associated morbidity and mortality. Thus, the study aims to diagnose the nutritional status of school children of Bahia-Brazil-Pintadas in order to achieve a mapping with the nutritional status of children and adolescents by analyzing their determinants and proposing intervention measures.

Methodology: The study is a prospective, descriptive, cross-sectional conducted with 662 school students from urban and rural municipality of Pintadas, which were classified in preschoolers, children and adolescents according to age. We applied a structured and pre-coded with demographic, socioeconomic, information on physical activity and nutrition in school. For the anthropometric measurements were measured weight and height, and certain indicators of total body mass (weight/height, BMI/I) and linear growth (height/age).

Results: It was found that most students had adequate growth and development. In the group of preschoolers, showed that 81.6% had appropriate weight for height, while 14.3% had some degree of overweight and 4.1% underweight. In school, 98.3% had linear growth appropriate to the age and 78.4% had adequate total body mass to height and age. 96.7% of adolescents had adequate linear growth and 80.4% had adequate body weight for height and age. While 10.1% had excess risk and 4.6% overweight.

Conclusions: According to the analysis of data obtained in this study, it was concluded that students had growth and development, however, were observed percentages above 10% risk of overweight.

P138

Pas a Pas Program: A Community Randomized Intervention Study of Physical Activity

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Background and Objectives: The regular practice of physical activity is an effective tool for primary and secondary prevention of chronic diseases such as diabetes, hypertension, overweight and obesity. Our aim is to evaluate the effectiveness of a community intervention of regular physical activity on cardiovascular risk factors and improving the quality of life in primary care users.

Methods: Community randomized intervention study was conducted on 119 subjects over 40 years old of three urban primary care centres. 66 participants were included in the intervention group and 53 in the control group. The intervention consisted of walking 1 hour/day, 2 days a week for 9 months straight. At the beginning and at the end of the intervention were collected sociodemographic characteristics, morbidity, anthropometry, daily intake and blood samples for the basic biochemistry.

Results: In the intervention group, we observed a reduction in weight (74.4±14.5 to 73.4±14.9 kg, p < 0.001), BMI (29.8 to 29.3 kg/m^2, p < 0.001) and waist circumference (98.2±11.1 to 94.9±14.9 cm, p = 0.024). In addition, energy intake increased (p = 0.035). In relation to diet, this group augmented fruit consumption (p = 0.022) and milk (p = 0.011).

At the end of the study, the intervention group consumed fewer industrial pastries (24.9±19.6 g/day, p = 0.046), showed lower systolic blood pressure (130.8±14.7 mmHg, p = 0.002) and lower serum cholesterol values (197.8±43.0 mg/dl, p = 0.036) than the control group.

Conclusions: Regular physical activity favoured spontaneous beneficial changes in diet and improved levels of systolic blood pressure and cholesterol levels, reducing cardiovascular risk. Improving health with this kind of intervention programme could decrease the cost of health services.

P139

Effect of the HFE Gene Mutations on the Iron Status of Pregnant Women and their Infant Health

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Background and Objectives: HFE gene regulates dietary iron absorption, increasing it when altered. HFE gene mutations are frequent in our population, but the effects of these mutations have not been previously described in pregnant women supplemented with iron. This study aimed to assess the effect of the HFE gene mutations on the iron status of iron supplemented pregnant women and their child.

Methods: Longitudinal and prospective study on 281 Caucasian healthy pregnant women. Clinical and obstetric history and blood samples were collected at each trimester and at delivery: haemoglobin (Hb), serum ferritin (SF) and, transferrin saturation (TS) were determined. Infant birth weight (IBW) was measured.

C282Y (G845A), H63D (C187G) and S65C (A193T) mutations of the HFE gene were measured. Women were classified as having a mutation in the HFE gene (Altered genotype group) or not (Absence of these three mutations: wild-type genotype group).

Results: A 44.3% of women presented the altered genotype. Both groups had similar socioeconomic and obstetric characteristics, life style, iron supplementation pattern and gestational age. Both groups presented similar iron status at early pregnancy, but at the end of pregnancy the altered genotype group were significantly different than the wild-type genotype group in: Hb, SF and TS levels. Therefore, prevalence of anaemia was higher (16.2% vs 30.2%, p = 0.009), haemoconcentration risk was lower (17.1 vs 7.4, p = 0.021) and the prevalence of low birth weight (LBW) was lower (10.3 vs 4.2%, p = 0.044).

Conclusions: The presence of HFE gene mutations in pregnant women exerts a protective effect on iron deficiency but increases the haemoconcentration risk and LBW. Further studies are needed to determine an iron supplementation pattern adjusted to the individual characteristics of each pregnant in order to prevent both, deficit and iron excess at the end of pregnancy.

P140

A Nutritional Program for Weight Control Based on Measured Resting Metabolic Rate and Preferite Foods Promotes Compliance and Success Rate

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Background and Objectives: Recommendations for daily caloric intake, even by health authorities, are based upon calculated mean values, which can markedly and unpredictably differ from those based on measured Resting Metabolic Rate (RMR).

This discrepancy creates confusion and facilitates undesirable weight gain even with the intake of health foods. Implement an easy-to-use body weight (BW) control program based on any local and personal nutritional lifestyle and centered on measured RMR.

Methods: Participants (n = 364: 312 women, 52 men) were referred by physicians or recruited via media/seminars. According to individual needs/wishes two programs of the duration of 1-month or 6-months with seminars on energy balance and additional consultations were offered. RMR was measured via indirect calorimetry. Daily nutritional schedules were based on individual food preferences, adapted to standard nutritional rules. Daily caloric deficit ranged between zero and 700 kcal.

Results: Initial BW (kg) and BMI (kg/m^2): Lean (64.1±4.7 and 23.9±0.9, n = 669; Overweight (77.5±6.6 and 27.9±1.1, n = 143)

Obese(94.7±11.3 and 35.3±3.5, n=155).

BW-changes in the 1-month groups:

Lean −0.8±1.2

Overweight −1.4±0.6

Obese −2.0±1.1

In the 6-months groups:

Lean −2.7±1.6

Overweight −5.3±1.6

Obese −6.4±3.3

After 6 months, BMI was reduced from 23.6±0.9 to 22.7±1.1 (lean), from 27.9±0.9 to 26.4±0.7 (overweight) and from 35.3±3.5 to 33.0±3.6 (obese). Measured RMR (kcal/24 h) were: 1223±171, 1368±139 and 1486±210 respectively.

Conclusions: The observed consistent reduction in BW indicates that weight management based on measured RMR can contribute to long-term success by maintaining any local and individual nutritional habits. The most relevant subjective statement by all participants was that the familiarity with their own real metabolic capacity gives security, removes confusion and promotes motivation and adherence. All these aspects indicate the importance of this study for long term prevention and reduction of obesity.

P141
Nutrient Adequacy of Foods Consumed by Hiv/Aids Infected Women in Mumias District – Kenya

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Background and Objectives: Proper diets help HIV/AIDS patients to cope with the strong medicines used to treat opportunistic infections associated with the virus such as tuberculosis (TB) and avert malnutrition. In addition, micronutrients improve the body's ability to clear by-products and other toxins from the strong anti-TB drugs, thereby reducing skin inflammation and blisters. Mediterranean diet incorporates the basics of healthy eating which include fruits, vegetables, fish and whole grains, and limit unhealthy fats for prevention of major chronic diseases. The objective of this study therefore was to find out the nutrient adequacy for foods consumed by HIV/AIDS positive women in Mumias district and their impact on HIV progression. This will be used to design and develop a food based intervention strategy using locally available foods rich in micro-nutrients as a tool for management of HIV positive status.

Methods: This study was composed of a cross-sectional and intervention study designsPhase one was composed of a cross-sectional study of 137 women living with HIV/AIDS in Mumias district to determine their nutrient adequacy. The P value for statistical significance test was set at <0.05.

Results: Quantitative analysis was achieved using SPSS software package. Descriptive statistics such as means and standard deviations were used to organize, describe and summarize the data on socio-economic and anthropometric measurements of the respondents. Anthropometry was used to provide valuable information on development in size and body composition of the women More than half of the women were found to consume foods that were inadequate in nutrients.

Conclusions: Given that more than half of the women were malnourished there was need to develop a Food based intervention from foods locally produced and consumed by the women and the product commercialized so as to empower these women and improve their livelihoods and health.

P142
Effect on Colonic Preneoplastic Lesions Induced by 1,2-Dimethylhydrazine in Rats of Maslinic Acid, a Natural Triterpenoid from Olea Europaea L

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Background and Objectives: Maslinic acid is a pentacyclic triterpene found in a variety of foods, including vegetables and fruits. Previous studies have demonstrated its antiproliferative and proapoptotic activities in HT-29 and Caco-2 colon cancer cell lines (Reyes-Zurita et al., 2006, Juan et al., 2008). Therefore, the aim of the present work was to evaluate the effect of maslinic acid on early preneoplastic markers induced by 1,2-dimethylhydrazine (DMH) in rats.

Methods: The triterpene was orally administered to Sprague-Dawley rats at a dose of 10 mg/kg for 49 days. Precancerous lesions were induced by intraperitoneal injections of DMH (20 mg/kg). At the end of the period, colon was divided into proximal, medial and distal segments and fixed with 10% buffered formalin before examination under the light microscope. Aberrant crypt foci (ACF) were counted after staining the tissue with methylene blue, while the high-iron diamine alcian blue staining was used to evaluate mucin depleted foci (MDF), a common feature of severe dysplasia.

Results: DMH-injected rats developed ACF following a regionalized pattern with 4 ± 4, 140 ± 27 and 76 ± 16 in the proximal, medial and distal colon, respectively. In the maslinic acid group, the number of ACF in the same segments were 1 ± 0, 109

± 14 and 88 ± 15. Maslinic acid treatment reduced the total number of ACF in a 9% (P > 0.05). Total aberrant crypts were 429 ± 89 and 355 ± 40 in the DMH and maslinic acid groups, respectively. Moreover, the number of MDF in both groups was 41 ± 8 and 44 ± 13, respectively.

Conclusions: Maslinic acid administered at a dose of 10 mg/kg does not significantly reduce the formation of preneoplastic lesions induced by DMH in rat.

P143

Tomato Intake Modulates the Effect of an Ancestry Informative Marker in the PLCB1 Gene on Blood Pressure

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Background: Genetic admixture has been strongly associated with hypertension. We have selected several ancestry informative markers (AIMs) and investigated gene-diet interactions on blood pressure (BP). We focused on rs6086473, an intronic AIM in the PLCB1 (phospholipase C, beta 1, phosphoinositide-specific) gene. This gene has been involved in cardiac hypertrophy, oxidative stress-induced cell death and mechanisms of vasoactive peptides in vascular smooth muscle. Likewise, tomato extract has been reported to reduce BP. Our aim was to examine if tomato intake may modulate the effects of the rs6086473 AIM on BP.

Methods: Cross-sectional investigation in 963 high cardiovascular risk subjects participating in the PREDIMED-Valencia study. BP (by standard procedures) and tomato intake (by a validated questionnaire) were measured at baseline. Adherence to traditional Mediterranean diet (MedDiet) was also measured, and the rs6086473, determined by allele-specific assays.

Results: PLCB1 genotypes were: 50%CC, 41%CT and 9%TT. We dichotomized tomato intake depending on the mean intake observed in the PREDIMED participants (67 g/d) and found a statistically significant interaction (P = 0.010) between the rs6086473 and raw tomato intake on diastolic blood pressure (DBP). Thus, in a model adjusted by sex, age, medications, diabetes and total energy intake, we observed that when tomato intake was low (<67g/d), the rs6086473 tended to be associated with higher DBP (81.4±0.9 mmHg CC; 83.4±1.0 CT and 84.5±2.1 CC). However, this trend was opposite with tomato intake was high (82.9±0.6 mmHg CC; 80.6±0.7 CT and 80.8±1.3 CC; P < 0.05). When carriers of the variant T allele were grouped, we obtained more significant results (P < 0.01). This interaction remained sta-

tistically significant even after additional adjustment for the adherence to the MedDiet score.

Conclusions: High tomato intake may decrease DBP in carriers of the variant (T) allele of the rs6086473 AIM in the PLCB1 gene.

P144

Does Depression Increase the Risk of Overweight in Adolecents? Longitudinal Study

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Background and Objectives: It has been suggested that depression increases the weight and the waist circumference (WC) in adults. The aim of this study was to assess the effect of depression on anthropometric parameters in adolescents of both genders over the course of three years, adjusting the relation by the quality of diet, physical activity and others emotional disorders.

Methods: A 3-year longitudinal study conducted on 229 schoolchildren (87 boys and 142 girls) followed from 10 years-old (10.2±0.9 years-old) to 13 years-old (13.5±0.9 years-old). Depressive disorders, major depressive episode (MDE) and dysthymia, were diagnosed using the MINI-International Neuropsychiatric Interview for Kids (MINI-Kid). Waist circumference (WC) and body mass index (BMI) were determined.

Results: In adolescence, boys with MDE did not differ BMI from controls, in contrast, boys with dysthymia showed a significantly greater BMI (24.4±7.8 kg/m^2, overweight according to Cole et al., 2000) than boys without MDE (19.5±2.9 kg/m^2). Girls with dysthymia and MDE showed a significantly greater BMI (24.5±3.4 kg/m^2 and 25.9±6.1 kg/m^2 respectively, overweight according to Cole et al., 2000). Based on adjusted multiple regression models, we observed that diagnosis of dysthymia was a highly significant predictor of increased WC (p = 0.001) and BMI (p < 0.001). However, diagnosis of MDE was found to be inversely related to BMI (p = 0.020). For girls, dysthymia influenced significantly on the increase in WC (p = 0.017). In addition, quality of diet and physical activity were found to be significant predictors of WC or BMI in boys (p < 0.05).

Conclusions: Depressive disorders in adolescence influence on anthropometric development with differences according to severity. Dysthymia in preadolescence lead to increased weight gain and abdominal fat during adolescence in both genders. However, MDE led a slight decreased of weight that was not observed in girls. Future research should seek to confirm the possible physiopathology, genetics or environmental mechanisms involved.

P145

Antihypertensive Effect and Hepatic Lipid Improvement of Grape Seed Procyanidins in Cafeteria-Diet Rats

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Background and Objetives: Cardiovascular diseases are a primary crònic disease in industrialized societies and a first cause of death in this population. Most of the patients die because of hypertension. One of the first steps in the treatment of cardiovascular diseases (CVD) is a change in life-style, being the diet one of the main factors. In this regard, polyphenols, which are abundant in Mediterranean diet, have shown several health benefits on CVD. A good model of metabolic syndrome associated to CVD is a cafeteria diet-induced hypertensive rats. The aim of this study was to evaluate the acute effect of a grape seed procyanidin extract (GSPE) on hypertension and lipid metabolism.

Methods: Male cafeteria diet-induced hypertensive rats (n=12 per group) were intragastrically administered with GSPE (375 mg/kg of body weigh) or water as placebo. Blood pressure was recorded at 0 and 6 hours post-administration of the treatment by the tail-cuff method, and then the rats were sacrificed. Plasmatic and hepatic colesterol and triglycerides were measured.

Results: GSPE decreases systolic and diastolic blood pressure at 6 hours post-administration of GSPE compared to the control group reaching values of normal blood pressure. Hepatic triglycerides were decreased by GSPE in cafeteria diet-induced hypertensive rats. Plasmatic and hepatic colesterol were not modified at 6h post-administration of GSPE as well as plasmatic triglycerides.

Conclusions: Grape seed procyanidins have beneficial effects in CVD decreasing blood pressure and hepatic triglycerides levels.

P146

Adequacy of Food Consumption and Nutritional Intake of Dependent Patients in a Home Care Program

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Background and Objectives: Malnutrition in dependent patients has a high prevalence and it can decrease the quality of life and increase morbidity and mortality. The aim of this study is to describe the food consumption of dependent patients in a home care program and to analyze their nutrient intake adequacy.

Methods: Cross-sectional study carried out in 10 Primary Care Centers of the Reus-Tarragona area. The patients of the Home Care Program were included when they had a score between 17–23.5 in the Mini Nutritional Assessment test (MNA), older than 65 and had caregivers. Food consumption was recorded by a food frequency questionnaire. The SPSS/PC program was used for statistical analysis.

Results: 192 patients of the Home Care Program participated with a mean age of 85±7.2 years. The average intake of energy was 1801.5±434.3 kcal/day in men and 1694.86±312.1 kcal/day in women, 75.06% and 90.39% respectively of the Spanish recommended nutrient intake (RNI). The macronutrient distribution is 38.1% carbohydrates, 47.9% lipids and 13% proteins. The protein intake covers 86.4% of the RNI.

The mean intakes of vitamin B3, vitamin B6, vitamin D, Ca and Fe are below two-thirds of the RNI. However, the probability of inadequate intake of vitamin B12 (3.15) and vitamin C (16.98) are low.

Conclusions: Dependent patients had a diet high in fat and low in carbohydrates. The average intake of energy and proteins was adequate, but the main vitamins and minerals were below of the recommendations, except for vitamin B12 and vitamin C.

P147

Relationship Between Dependency and Malnutrition in Home Care Patients with Caregivers

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Background and Objectives: Dependent patients have difficulties to feed themselves and need a caregiver. The degree of dependency may influence in the nutritional status of these patients.

The aim of this study was to analyze the relationship between degree of dependency and malnutrition in patients with caregivers of a Home Care Program.

Methods: Cross-sectional study carried out in 10 Primary Care Centers of the Reus-Tarragona area. The patients of the Home Care Program were included when they had a score between 17–23.5 in the Mini Nutritional Assessment test (MNA), older than 65 and had caregivers. Dependency was assessed by the Barthel Index and malnutrition trough MNA test, anthropometry parameters as weight and calf circumference and biochemistry parameters (albumin and prealbumin).

The SPSS/PC program was used for statistical analysis.

Results: 192 patients (130 women and 62 men) of the Home Care Program participated with a mean age of 85±7.2 years. The mean score of Barthel Index was 61.57±26.35 and the mean of MNA was 20.04±2.65 points. The score of Barthel Index was positively related to MNA score (r = 0.434, p < 0.001), albumin (r = 0.166, p < 0.05), weight (r = 0.194, p < 0.01), BMI (r = 0.214, p = 0.03) and to CC (p = 0.163; P = 0.025). The score of Barthel was not related to prealbumin. The MNA score was positively related to weight (r = 0.228, p < 0.01), BMI (r = 0.239, p < 0.001) and CP (p = 0.219; P = 0.003), however, it was not related to albumin and prealbumin.

Conclusions: Dependent patients are a higher risk of malnutrition than patients without dependency and have worst protein status and anthropometry parameters. Dependency is an aggravating factor of the nutritional status.

P148

Effect of a Nutrition Education Intervention for Dependent Patients at Risk of Malnutrition of a Home Care Program

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Background and Objectives: Dependent patients are vulnerable to suffer malnutrition. Caregivers are an important part of the care and feeding of these patients. The aim of the study is to assess the effect of an educational intervention for caregivers on the nutritional status of dependent patients at risk of malnutrition.

Methods: Intervention study with control group, randomly allocated, of 192 patients of the Home Care Program carried out in 10 Primary Care Centers. These patients were dependent and at risk of malnutrition according to Mini Nutritional Assessment (MNA) score, older than 65 and had caregivers. The socioeconomic and educational characteristics of the patient and the caregiver were recorded. On a schedule of 0–6–12 months, patients were evaluated as follows: MNA, food intake, degree of dependency (Barthel Index), cognitive state (Pfeiffer test), mood status (Yesavage test), and anthropometric and serum parameters of nutritional status: albumin and prealbumin.

Prior to the intervention, the educational procedure and the design of educational material were standardized among nurses. The nurses conduct an initial session for caregivers and then monitor the education impact at home every month (4 visits) up to 6 months. Bivariate normal test statistics and multivariate models were created to adjust the effect of the intervention.

The SPSS/PC program was used for statistical analysis.

Results: The mean age was 85±7.2 years. 55,2% of the participants were at social risk, 64.4% had hypertension and the average score of the Barthel Index was 61.57±26.35 points. MNA score decreased in the control group (19.25±3.15 a 18.12±4.06; p = 0.040) but in the intervention group remained stable. Intervention group increased consumption of eggs (p = 0.011), fish (p = 0.018) and legums (p < 0.001).

Conclusions: Nutrition education intervention in patients at risk of malnutrition improved 2,6 point the MNA score in relation to the non intervention group.

P149

The Mediterranean Diet: A Example of Mediterranean Diet: Syiria

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Background and Objectives: Many of the factors related to certain diseases are linked to the food. On the 50s many researches studied the relationship between the consumption of certain foods and coronary heart diseases. The objectives of this study are to conduct a literature review about the origins, components and benefits of the Mediterranean diet and about the characteristics of this diet in Syria.

Methods: For the realization of this work it has been revised a total of 92 scientific papers: books, articles, dissertations, websites …

Results: Homo Sapiens-Sapiens, the Pharaonic era, ancient Greece, the Roman Empire, the Arabs and the discovery of America, all contributed to the formation of the Mediterranean diet that is composed by fruits, vegetables, cereals, dairy products, olive oil, nuts, spices and condiments, fish, seafood, poultry, eggs, legumes and small amounts of red meat and sausages. And wine in moderation respecting the social and religious aspects. The culinary tecnichs to get a dish is a basic Mediterranean element plus complements and a kind of cooking according to the traditions of each country. The benefits are over cardiovascular diseases, type II diabetes mellitus, overweight and obesity. Syria is a country in the Middle East, which was influenced by the Greeks and Romans, and the foods that are considered basic in the Syrian population are: cereals, fruits, vegetables, olives, and grapes. Some examples of Syrian-Mediterranean dishes are Kubbeh, Makdus.

Conclusions: The Mediterranean diet results from the interaction of diverse people and cultures, plus geographical and climatic conditions. Numerous studies have been conducted, and the benefits are already established. Despite the current decline in consumption of some Mediterranean elements in Syria, it has been kept typical Mediterranean habits. The result of the sum of the basic Mediterranean foods plus elements from this country creates the distinguished Syrian cuisine.

P150
Global DNA Methylation and SCD Promoter Methylation in an Intervention Study: Egabro-Pizarra Project

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Background and Objectives: In the last years, several studies are emerging showing the role that epigenetic modifications could have in the etiology of complex human diseases. These epigenetic processes may also be affected by environmental factors (diet and exercise). DNA methylation is one of the most common epigenetic marks studied. The aim of this study was to analyze wether the patterns of global (LINE-1 elements) and specific DNA methylation (SCD promoter methylation) are involved in the different response to dietary intervention program in a population-based cohort study.

Material and Methods: Design: Cohort study (prospective) and intervention with control group. Subjects: After an OGTT, those subjects with a carbohydrate metabolism disorder were selected (160 control subjects and 160 intervention group). Intervention program consisted of intensive program with regular controls to achieve goals for dietary habits, exercise and weight within the Mediterranean dietary pattern. After a year of nutritional intervention, a blood sample was taken at baseline and after an OGTT in both cohorts.

Methods: We collected phenotypic, anthropometric, biochemical and nutritional information of all subjects. DNA methylation was quantified by pyrosequencing technology.

Results: DNA methylation patterns (LINE-1 and SCD promoter) were similar at the beginning of the study in both populations. One year after nutritional intervention, methylation profiles were significantly greater in control group than in intervention group ($p < 0.001$). We observed intra-individual change in global DNA methylation in both groups (Control: 64.2% vs 66.8%, $p < 0.001$; Intervention group: 64.1% vs 63.6%, $p = 0.001$) whereas SCD promoter methylation only changed in control group (1.5% vs 2.44%, $p < 0.001$). Regarding to weight gain, subjects from intervention group lost more weight than control group (-2.5 ± 4.8 kg vs -0.7 ± 3.5 kg; $p = 0.001$). We found a significant association between weigh loss and SCD promoter methylation levels in the intervention group ($p = 0.013$).

P151
Effects of Apples Consumption on Selenium in Patients with Asthma – A Pilot Study

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Background and Objectives: It is already known that regular consumption of apples reduces risk of asthma. Since selenium, trace element abundant in apple peel has protective role in patients with asthma, the aim of our pilot study was to test the hypothesis that beneficial effect of apples consumption might be also due to increment of selenium in blood and tissues.

Methods: In eight male patients with chronic, stable asthma on inhaled corticosteroids and eight healthy, age matched men selenium was measured in blood in basal condition in the morning. All participants then ate two apples at once. Selenium was measured once again four hours thereafter. Patients and controls then started regular diet enriched daily with three apples (400 g) and basal selenium was measured thereafter. Apples of cultivars Jonagold were unpeeled and from high quality Slovenian integrated production.

Results: We found significantly lower selenium in patients compared to controls (84.5, 74–105.5 vs. 109.0, 100.0–118.5 mcg/L, $p < 0.05$). Four hours after consumption of two apples selenium was significantly increased in both patients (94.0, 81.5–113.5 mcg/L) and controls (129.5, 118.5–135.5 mcg/L) compared to basal selenium (both $p < 0.05$). After four weeks of diet basal selenium did not change in controls (103.5, 102–114.5 mcg/L) but was slightly higher in patients (89.0, 73.5–108.0 mcg/L) (both $p = $ NS).

Conclusion: In addition to expected result that patients with asthma have lower selenium, results of our pilot study to our knowledge for the first time showed that consumption of only two apples in the morning significantly increases selenium a few hours thereafter, what is probably associated also with improvement of antioxidant status in the body. However, it seems that this is only short term effect since no significant changes were noticed in basal selenium after four weeks of regular diet enriched with even larger amount of apples a day.

P152

The Association Between rs2880411 in the NPY2R Gene and BMI is Modulated by Consumption of Read Meat and Meat Products

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Background: Neuropeptide Y (NPY) is an appetite hormone that controls feeding behaviour, NPY2R is a NPY receptor. Targeted ablation of the NPY2R in mice yields obesity. In humans, a genome-wide association study identified the rs2880411 (T>G) in the NPY2R as significantly associated with several obesity-related parameters. However, this study was carried out in a population with a high read meat intake. The traditional Mediterranean Diet (MedDiet) is characterized by a low red meat consumption. Our objective was to analyze the association between the rs2880411 (T>G) and body mass index (BMI) as well as the modulation by meat intake in a high cardiovascular risk (HCR) Mediterranean population.

Methods: We studied 779 subjects with HCR participating in the PREDIMED-Valencia study at baseline. Anthropometric data were assessed by standard methods. Food consumption was obtained through a validated questionnaire. Individuals were classified according to high (100–150 g, 1 or more servings/day) or low (less than 1 serving/day) consumption of read meat and meat products.

Results: Individuals with high consumption of read meat and meat product had higher BMI than their counterparts (P = 0.002). Minor allele frequency was G: 0.151. A recessive model was considered. Although we did not detect a significant association between the rs2880411 and BMI in the whole population (p = 0.254), we observed that consumption of read meat and meat products modulated the effect of rs2880411 in determining of BMI (P for interaction = 0.020). So, carriers of G allele with a high consumption of read meat and meat products showed higher BMI compared with TT homozygotes (GG+TG:32.5 ± 4.5 kg/m^2 vs TT:30.2 ± 4.3 kg/m^2; P = 0.012), but no significant differences in BMI were found in subjects with a low meat consumption (p = 0.894).

Conclusion: High meat consumption seems to modulate the association of the rs2880411 with BMI in this Mediterranean population.

P153

Capacity Analysis of Healthy Food Choice by Reference to Consumers in Two Models of Nutritional Labeling: Crossover Study

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Background and Objectives: Consumers are interested in the nutritional quality of the food products and need transparent nutritional information on their purchases. The aim of this study was to compare two models of nutrition labeling front-of-pack, in reference to the ability of consumers to choose a diet closer to nutritional recommendations.

Methods: Randomized crossover design in 32 adults (18–65 years) of both sexes. Participants were randomly exposed to two experimental conditions using nutritional traffic light system (S-SN) or monochrome system (SM).

Participants had to choose options from a closed menu for five days on the basis of the experimental front-of-pack labelling. For each meal, three food options with different nutritional compositions were given to the participants. The total energy and fat, saturated fat, sugar and salt of the chosen options were calculated.

Results: No significant differences in baseline socio-demographic and anthropometric characteristics were shown between individuals regardless of the experimental condition in which they started. The subjects tended to choose a diet with a lower, but not significant energy content of 23.0 ± 67.5 (P = 0.063) and a significantly lower sugar content of 3.5 ± 9.2 g, P < 0.001 and 0.6 ± 1 g, P < 0.003 for salt.

Conclusions: Compared to the to the monochrome system, the multiple traffic-light system probably can help make food choices with less sugar and salt in a situation similar to the usual purchase in which there is a time limitation

P154

Nut Consumption Modified the Effect of a Functional Polymorphism (Arg72Thr) in the PYY Gene on Obesity Risk in Elderly Subjects

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Background and Objective: Several studies have reported that moderate nut consumption may be inversely associated with obesity-related traits. One of the multiple mechanisms suggested is that nuts may promote satiety, which can help reduce the consumption of other foods. Peptide tyrosine-tyrosine (PYY) is a satiety hormone implicated in eating control. Some polymorphisms in the PYY gene have been associated with obesity with controversial results. One of the most relevant is the G>C rs1058046 polymorphism consisting of an amino acid change (Arg72Thr) in preproPYY. Our aim was to investigate if nut consumption may modify the effect of the Arg72Thr polymorphism on obesity-related traits in a high cardiovascular risk (HCR) population.

Material and Methods: We analyzed 1004 subjects with HCR participating in the PREDIMED-Valencia study at baseline. Anthropometric and genetic data were obtained. Total nut consumption was assessed using a validated questionnaire and categorized as low (less than 3 servings/wk) or high (>3 servings/wk). Statistical interaction models with multivariate control for confounders were fitted.

Results: Allele frequency was Arg = 0.629 and Thr = 0.361. In the whole population, no significant association was found between this PYY polymorphism and body mass index (BMI) (p = 0.319) or obesity (p = 0.594). However, in subjects with a high consumption of nuts, we observed a favourable effect of the Thr allele compared with ArgArg homozygous in determining BMI (ThrThr: 29.4±3.3 kg/m^2, ThrArg: 29.2±4.2 kg/m^2, ArgArg: 30.4±5.0 kg/m^2, p = 0.048) in the multivariate analysis. A similar trend was observed for obesity. No genotype-related differences in BMI or obesity risk were detected in individuals with a low consumption of nuts. The interaction term between the Arg72Thr polymorphism and nuts on BMI was statistically significant (P-interaction: 0.038) in the multivariate model.

Conclusion: Nut consumption interacts with the Arg72Thr polymorphism (PYY gene) in determining BMI in elderly subjects.

P156

Walnuts and Apples as a Rich Source of Phenolic Compounds

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Background and Objectives: Walnut and apple fruits contain many nutrients and bioactive compounds. Among them, polyphenols are proved as phytochemicals with important health promoting effects, based on their antioxidative capacity. Our hypothesis was that the phenolic content in walnut and apple depends on the cultivar. A higher intake of phenolics would be achieved upon the production and consuming polyphenol-rich cultivars.

Methods: Kernels of nine walnut cultivars and fruits of nine apple cultivars from integrated production were analysed for their phenolic profile and individual phenolic compounds using HPLC-PDA-MS system. A total phenolic content (TPC) was spectrofotometrically determined, too.

Results: There were cultivar-related contents of individual phenolics, but no intercultivar variability in phenolic profile for both walnut and apple. Ten phenolics belonging to hydroxybenzoic acids, flavan-3-ols, elagitannins and gallotannins were quantified in walnut kernels. Sum of 10 phenolics was 2347.73 mg/kg DW, ranging from 1674.25 mg/kg in Hartley to 3122.98 mg/kg in Franquette. The same cultivars had the lowest and the highest TPC (6909.92 and 11495.87 mg GAE/kg), respectively. 11 phenolics from the groups of phenolic acids, flavan-3-ols, flavonols and dihydrochalcones were determined in apple cultivars. Sum of phenolics showed a mean value of 1756.87mg/kg. Significantly the lowest content was found in Golden Delicious (1194.79 mg/kg) and the highest in Goldrush (2264.26 mg/kg). The last cultivar expressed the highest TPC (4111.2 mg GAE/kg).

Conclusions: dried walnut kernels and fresh apple fruits of different cultivars producing in Slovene orchards are a good source of phenolics. Considering frequently reported role of walnuts and apples in the prevention of several diseases, their production, as well as dairy intake should be increased. Walnut cultivars Franquette and Seifersdorfer and apple cultivars Goldrush and Red Elstar are recommended for this purpose owing to their high phenolic contents.

P157

Influence of Apple Consumption on Seasonal Variation of Erythrocyte Catalse in Middle Aged Men

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Background and Objectives: Oxidative stress is one of the most important non-classical risk factors of atherosclerosis. It seems to be influenced by seasonal variation, probably also due to consumption of seasonal food which is rich on antioxidants in summer and autumn but not in winter and spring. Since apples are traditional, natural source of antioxidants available throughout the year, the aim of our study was to explore possible influence of regular apple consumption on antioxidant enzyme erythrocyte catalase (ECAT) activity during autumn and spring period.

Methods: Ten middle age males with risk factors of atherosclerosis were included in the study and ate regular diet enriched with three unpeeled apples daily for four weeks in autumn immediately after apple picking and in spring after cold storage during winter period. Basal ECAT activity was measured by spectrophotometric assay (BIOXYTECH R Catalase-520TM, OxisResearchTM, USA) before and after four week diet in autumn and spring period.

Results: We found significantly higher basal ECAT activity in autumn compared to spring ($p < 0.05$). After four weeks of diet enriched with three apples we found significantly higher ECAT activity in spring period ($p < 0.01$). No similar increments of ECAT activity were found in autumn period.

Conclusions: The results of our study indicate to our knowledge for the first time seasonal variation of antioxidant activity of ECAT with lower activity in spring time, when a body is depleted from antioxidants probably also due to antioxidant poorer nutrition during winter period. And what is really important, probably applicative result is that particularly in this season we can improve this with regular consumption of apples from cold storage, what is relatively cheap and natural source of antioxidants available to all population.

P159

Evaluation of Consumption of Fruits and Vegetables and Practice of Physical Activity of College Students in Southern Brazil

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Background and Objectives: The consumption of fruits and vegetables (FV) and physical activity (PA) are indispensable for the proper functioning of the body. In contrast, poor diet and physical inactivity are important risk factors for chronic diseases. College students have greater difficulty of maintaining a healthy lifestyle because of poor eating habits common among young people.

Methods: The aim of this study was to evaluate the consumption of FV and practice of PA of college students according to the Food Guide for the Brazilian Population (2008) and World Health Organization (2010), respectively. Cross-sectional study with 1314 students aged 18 or more years, both sexes, from Florianópolis, Brazil. Data collected in 2012 using a self reported questionnaire about daily consumption of FV and duration in min/day of PA. According to the Food Guide, the daily recommendation of FV intake is 400 grams or five servings and according to WHO the recommendation minimum of PA among adults is 150 min/week.

Results: Results indicate that in both sexes there was no difference between the proper consumption of FV ($p = 0.619$). Regarding age, the college students who consumed FV appropriately were those under 20 and over 25 years old. Among men, 28% practiced regular PA, whereas in women was 43% ($p < 0.001$). The college students aged between 20 and 24 years were the greatest practitioners of PA (40.3%).

Conclusions: The results show that regular consumption of FV in both sexes is low, as the practice of PA, pointing a warning for the development of chronic diseases. It is concluded that the adoption of educational strategies about food intake and PA on universities is essential for the prevention of diseases.

P160

What does Food Security Mean for the Students of First Course of the Bachelor of Science in Dietetics and Nutrition?

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Background and Objectives: The perception of the food risk may vary owing to the social, economic and cultural context. Speaking of alimentary risk make us to believe about the uncertainties and possible dangers caused by the consumption of spoiled food.

To assess the knowledge on food security of the students of first course of the Bachelor of Science in Dietetics and Nutrition.

Methods: Analysis of quantitative data obtained from individual surveys. A total of 82 students were given a survey and 78 of them answered. The survey featured of 16 open questions.

Results: Out of the 78 students that answered the survey 70 were women. The average of age was 21 years. Sixty-three percent of the students were high school graduates, 15% were university graduates, and 12% were coming from professional training (technicians). Sixty percent of the students defined food security as a balanced diet, whereas 36% thought that the term food security was related to pollution, manipulation and addition of additives. Seventy-six percent considered that food security and food risk are not synonymous, while 17% considered that both terms were complementary. Eighty-four percent considered that the meaning of food security varies depending on the social, economical, and historical context. This variation is accounted for by the scientific advances, cultural reasons and people needs. With respect to the alimentary crisis, 78% thought that the governments hide information during periods of alimentary crisis and only 35% thought that the information given was true and sufficient. Likewise, 64% thought that information given by newspapers was insufficient and inappropriate to avoid social alarm. Finally, 53% students considered that the sanitaryfood controls were insufficient.

Conclusions: The term food security brought to mind different definitions in bachelor degree students. In a significant percentage the alimentary risk was associated to deficient sanitary controls. Food security, food risk.

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Antioxidant Role of Meat and Fish in the Diet

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The antioxidant capacity (AC) of meat, meat products and fish and a balance diet was determined using the oxygen radical absorbance capacity (ORACFL) assay. In addition, the effect of thermal treatment in the antioxidant capacity of meat and fish was evaluated. The hydrophilic ORACFL (H-ORACFL) of raw meat and fish ranged from 600 to 1873 µmol Trolox Equivalents (TE)/100 g. In general, heating decreased the H-ORACFL of meat and fish, being fish the most affected with losses of 40% ($p < 0.001$). A comparison between the AC of meat and juices was made and the results showed that Iberian cured ham provided 4890 µmol TE/100 g compared with 764.1 µmol TE/100 g showed in orange juices. The estimated total antioxidant capacity (TAC) of a balanced diet was 29006 µmol TE/whole diet/day, representing meat and fish a 10.51% of the TAC. Therefore, the intake of meat and fish contribute significantly to the TAC of the diet.

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Effect of Oregano Essential Oil on the Quality of Pork Patties

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The aim of this study was to determine the effect of oregano essential oil (EO) on the quality of patties manufactured without synthetic additives and stored under retail display conditions. For that 3 batches of pork patties (minced to 5 mm and 2% salt) were prepared: the control group C, O1 (0.05% EO), and O2 (0.4% EO). The patties were packed with modified atmosphere (70% O_2: 20% CO_2: 10% N_2) and stored for a maximum of 9 days at 4ºC. Meat spoilage was determined by measuring colour, microbiological analysis (total viable and total psycrophiles, log u.f.c/g), and sensory analysis was carried out evaluating visual and odour attributes (Rancid Odour and Meat Colour), through descriptive analysis with 10 trained panellists. Analysis was performed at 0, 3, 6 and 9 days. L, a*, b* values showed that EO (O1 and O2) increased colour stability. From day 3 of storage had higher a* values ($p < 0.05$), which implies less pigment oxidation and a better appearance. This was contrasted with the sensory analysis.

Independently of the dosage used, a positive effect of oregano was found on meat colour and rancid odour. Regarding the antimicrobial effect of EO, significant differences from C group and

O1–O2, was observed in mesophiles and psycrophiles during all the storage. The use of EO of oregano improves the quality of pork patties due to the fact that this delays the oxidation of fat and colour and microbiological spoilage, improving the appearance of the meat.

Is it Time to Revise Energy Values of Some Foods – Especially Nuts?

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Background and Objective: In the USA Atwater determined energy values for various foods over 100 years ago with studies on a small number of human subjects. Atwater factors are still applied to individual foods and food ingredients to determine their caloric content by using compositional data – protein, fat, carbohydrate and correcting for digestibility. The belief that for most applications the Atwater factors "are good enough" has hindered major revisions of energy values. While health experts are recommending greater consumption of plant-based foods, many of these foods may have overestimated caloric values. Improved knowledge on the effect of food structure on digestibility and compositional analyses, especially for carbohydrates, indicate that some energy values should be revised. This poster will demonstrate that there is enough new scientific data to support the revision of energy values for certain tree nuts and other plant foods.

Methods: The accuracy of values for the digestibility of certain higher fiber cereals, nuts and legumes may be impacted by advances in composition analyses and human clinical trial design. Microscopy analysis reveals that not all plant cell walls are broken during mastication, and not all lipid in the cells is available during digestion. Recent USDA clinical trial on metabolizable energy showed that the traditional digestibility value may be overestimated. Advanced fiber analyses of a variety of plant foods, such as oats and pulses, indicate that the energy contribution previously reported as total carbohydrate also needs to be revised.

Conclusion: It may be time to officially revise the energy values of some foods using new composition and digestibility data.

Association Between Classic Cardiovascular Risk Factors and Mortality in the Predimed Trial

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Background and Objective: In Mediterranean countries, non-cardiovascular deaths, mainly due to cancer, are more frequent than cardiovascular ones even among participants with a high cardiovascular risk. Therefore, we aimed to assess if classic cardiovascular risk factors were able to predict total mortality in a Mediterranean population at high cardiovascular risk.

Methods: In the PREDIMED trial (ISRCTN35739639), 7447 participants (men aged 55–80y, women aged 60–80y) at high cardiovascular risk were recruited. We collected general and lifestyle characteristics, measured anthropometric values and blood pressure, and reviewed medical charts to address cardiovascular risk factors at study inception. Deaths were identified reviewing medical records and consulting the National Death Index yearly.

We assessed if being diabetic or a former or current smoker, having hypertension or hypercholesterolemia, or having a family history of premature coronary heart disease or a higher waist to height ratio were independently associated to a higher mortality with Cox regression models.

Results: We identified 348 deaths after a median follow-up of 4.8 years. Former smoking [HR = 1.57; 95%CI, 1.18–2.08] and current smoking (2.06; 1.49–2.85) were associated with a higher risk of mortality. In addition, being diabetic increased the risk of dying by a 51% (1.18–1.92). Also, having a waist to height ratio greater or equal than 0.7 was independently associated with mortality (1.44; 1.01–2.05).

Conclusion: Classic cardiovascular risk factors such as diabetes, smoking and a larger waist to height ratio were independently associated with total mortality in the PREDIMED trial.

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Biochemical Analysis in Almond and Hazelnut European Cultivars

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During the period 2007–2010, the European Project SAFENUT: "Safeguard of almond and hazelnut genetic resources from traditional uses to modern agro-industrial opportunities", has been carried out in Europe, by researchers from six European countries (France, Greece, Italy, Portugal, Slovenia and Spain), and the participation of 11 different partners. The main cultivars of almond (Prunus dulcis Mill.) and hazelnut (Corylus avellana L.) of each country were evaluated, among other studies, according to their nutritional and nutraceutical aspects: fatty acids, oil content; tocopherols, phenolic compounds, mineral content (K, Ca, Mg, P) and total protein content. More than 70 accessions of each species were analyzed for these parameters.A great range of variation was found in the germplasmanalysed. Eleven phenolic compounds were found in the almond kernel, 6 were well identified. Referring to mineral content, the potassium content varied 2.7 times, the calcium content varied 4.1 times, the phosphorous content varied 2.4 times, the magnesium content varied 2.1 times, and finally, the protein content varied 3.0 times, ranging from 11.6 to 34.3 mg/kg DW. Almond samples from France had high P, Mg and Ca content and from Greece had high Ca content. In hazelnut cultivars the oil content with mean value of 57% varied widely and ranged from 46.95% to 65.20%. The ?-tocopherol content varied from 108.25 to 360.69 mg/kg. Five cultivars presented the highest total (13) phenolic compounds (between 200 and 225 mg/kg) and six cultivars had less than 60 mg/kg phenolic compounds in their kernels. Potassium content varied 1.9 times, calcium content varied 2.3 times; phosphorous content varied 2.7 times, magnesium content varied 1.7 times, and protein content varied 4.1 times. The variation found among accessions, almond and hazelnut, indicates the possibility of selecting genotypes for different uses and with different technological and nutritional properties.

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Beverage Consumption Patterns are Associated with Diet Quality and Abdominal Adiposity in Spanish Youth

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Beverages are an important part of dietary patterns. This study assessed the impact of beverage pattern on diet quality and anthropometric proxy measures for central adiposity in young Spaniards. Data were obtained from a representative national sample of 2513 young Spaniards aged 10 to 24 years. Height, weight, and circumferences at the waist and hip were measured. Dietary assessment was performed with a 24 h recall. Beverage patterns were identified by cluster analysis. Adherence to the Mediterranean diet was measured by the KIDMED index. Four beverage clusters were identified – low milk (53.4%), high milk (20.4%), juice/milk (12.4%), and soft drink (13.8%) consumption – and accounted for 5.3%, 13.9%, 14.6%, and 15.8% of total energy intake, respectively. Each unit of increase in the KIDMED index was associated with an 8% lower (p = 0.019) and 11% higher (p < 0.001) probability of membership in the "juice/milk" and "soft drink" cluster, respectively, compared with the "low milk" cluster. Members of the "soft drink" cluster had a 2% and 14.0% higher risk of 1 cm increase in

waist circumferences regressed on height and age (p = 0.043) and of 0.1 unit increase in waist to height ratio (p = 0.035) compared with the "low milk" cluster. These findings suggest that a beverage pattern dominated by soft drink intake has an impact on abdominal adiposity and diet quality in Spanish youth.

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Fruit and Vegetable Consumption is Inversely Associated with Blood Pressure in Moroccan Women

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Fruits and vegetables are among components of Moroccan population diet. Epidemiologic studies have reported inconsistent findings on the association of fruit and vegetable intake with the risk of cardiovascular disease.

Objective: The objective here was to examine the association of fruit and vegetable intakes with blood pressure in Moroccan women.

Design: Among 181 women aged 18–55 years, fruit and vegetable intake (seving/day) was assessed using a food-frequency questionnaire including 23 different types of fruit and vegetables for each participant. Hypertension was defined as diastolic (DBP) =90 mmHg, or systolic blood pressure (SBP) = 140 mmHg or current use of antihypertensive medication for management of hypertension.

Results: The mean age of women participating in this study was 39.8 ± 8.9 years, the mean of body mass index (BMI) was 26.6 ± 4.8 kg/m^2, the SBP and DBP means were 122.4 ± 14.1 mmHg and 73.4 ± 8.4 mmHg respectively. The overall prevalence of hypertension was 18.8%. Both age and BMI were significantly lower in normotensive group. Whereas the mean intake of fruit ($\pm$SD) was 2.18 ± 1.1 serv/d and that of vegetable was 2.85 ± 1.4 serv/d.

Intake of fruit was inversely and significantly associated with hypertension (p < 0.01). The intake of vegetable was positively associated with fruit intake (r = 0.35) and negatively with age.

Conclusion: Our results reinforce the need for a diet rich in fruits and vegetables that can substantially lower blood pressure. The study results offer an additional nutritional approach to preventing hypertension.

P168
Association Between Weight Loss and Fatty Acids Profile in Overweight Elderly Subjects: a Metabolomic Analysis

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Background and Objectives: Obesity is defined as an excessive fat accumulation which prevalence is increasing worldwide. The application of metabolomics to nutritional research is growing due to its capacity to quantify and identify small molecules present in the biological system. The aim of the present study was to examine changes produced in the fatty acids profile, non-esterified fatty acids (NEFA) and fatty acid methyl esters (FAME), after a weight loss intervention in overweight elderly subjects.

Methods: A total of nineteen overweight elderly volunteers participated in a controlled clinical trial (Age: 60 ± 1 y; BMI: 29.7 ± 0.47 kg/m^2) for 8 weeks. Subjects followed a personalized and hypocaloric diet (–15% energy of the studied requirements) with a macronutrient distribution of 45% total caloric value from carbohydrates, 30% lipids and 25% proteins. Anthropometric and biochemical variables were analysed at the beginning and at the end of the intervention. Levels of FAME in serum were determined by gas chromatography-mass spectrometry (GC-MS).

Results: After 8 weeks of weight loss intervention subjects mean weight loss was 5.4 ± 0.6 kg. Levels of NEFA in serum decreased during the weight loss intervention without reaching significance (p = 0.071). Analysis of FAME in serum revealed a significant decrease (p < 0.05) in myristic acid (14:0), palmitic acid (16:0), linoleic acid (18:2n-6), oleic acid (18:1), stearic acid (18:0), arachidonic acid (20:4n-6), cis-8, 11, 14, 17-eicosatrienoic acid (20:3n-6), cis-11, 14-eicosadienoic acid (20:2), cis-11-eicosenoic acid (20:1), cis-4, 7, 10, 13, 16, 19-docosahexaenoic acid (22:6n-3) and lignoceric acid (24:0).

Conclusions: The weight loss treatment based on a hypocaloric diet reduced body weight and fatty acids levels in overweight elderly subjects. Indeed, GC-MS seems to be a potential technique to effectively detect concentrations of specific fatty acids in serum.

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Development of a Computer Game to Encourage Healthy Food Practices in Children

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Introduction: The games used as a tool for nutrition education are currently considered appealing a teaching modality, which facilitates the child acquires knowledge about the subject, as it connect visual and hearing senses, as well as text messages.

Objective: To describe the development of the computational game Hortalândia, whose future prospects, being a tool for nutrition education program to be used in studies to promote healthy eating habits among schoolchildren.

Methodology: The main objective of the game was to approach Hortalândia nutritional and sensory aspects of fruits, vegetables and foods high in sugar, fat and salt. This computational game was developed in the Java language and Processing platform. The work team was composed by students and teachers of courses in Nutrition (development the script and game content), Computer Science/Information System (development and codification of the game), Educational (teaching aid in the area) and Music (development the soundtrack). The game was developed for children with cognitive capacity between eight and nine years old.

Results: The Hortalândia was developed in one and a half year. It was structured in three phases connected in a previous history and the avatar was a child. The player's mission was to rebuild a garden completely devastated, being necessary for it to complete the phases to achieve this goal. Regarding the nutritional content, in the first phase of the game, the player learns to separate fruits and vegetables (concept of what is fruit and vegetable), their physical and sensory characteristics and the foods with high percentage of sugar, fat and salt. In the second phase, the player learns to differentiate mainly vegetables. And finally, in the third stage, the player learns about the nutrients in fruits and vegetables. To finish the phase, the player fights with the villains represented by goodies (French fries, wafer, soda, ice cream, chips), emphasizing that they should be eaten in smaller quantities and frequency. After the end of the game development, tests were carried out among team members and some flaws in the execution of command were found, but corrected.

Conclusion: The final version of the game Hortalândia was an attractive strategy to use in school children, but it is necessary to apply the game on target population in order to evaluate the acceptance of it and find errors and failures were not intentional.

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Dietary Patterns and Risk of Breast Cancer in Spanish Women: EPI-Geicam Study

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Background: There is a general agreement about an association between western dietary pattern and high risk of breast cancer but the association with other dietary patterns is still inconclusive.

Objective: To evaluate the association between dietary patterns and risk of breast cancer (BC) in Spanish women.

Methods: In a nation-wide case-control study, 1019 cases from 23 hospitals were matched to 1019 controls by age and municipality of residence. Diet was assessed by a food-frequency questionnaire with 95 food items and food intake was aggregated into 27 groups. Dietary patterns were identified with principal component analysis among controls only and the component loadings obtained were transferred to the cases. The association between dietary patterns and BC was evaluated with conditional logistic regression.

Results: Three dietary patterns were identified: a "Western" pattern (high consumption of high fat dairy products, processed meat, refined grains, sweets, caloric drinks and convenience food and low consumption of low fat dairy products and whole grains); a "Mediterranean" pattern (high consumption of fish, vegetables, legumes, boiled potatoes, fruits, olives and vegetable oil, and low consumption of juices); "prudent" pattern (high consumption of low fat dairy products, vegetables, fruits, whole grain and juices). Adherence to the western pattern was related to a higher odds of BC, with the odds ratio for the top versus the bottom quartile being 1.70 (95% IC 1.17–2.48). An inverse association was seen for adherence to the Mediterranean pattern, with the odds ratio comparing top with bottom quartiles of 0.44 (95% IC 0.30–0.65). No association was found for the prudent pattern.

Conclusion: Our results suggesting an association between diet and risk of breast cancer coincides with results from other studies. While adherence to a prudent low-fat diet fails to prevent risk cancer, mediterranean style diet seems to be negatively associated with breast cancer risk.

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The Novel Antimicrobial Agents Produced by Lactococcus Lactis as Biopreservatives

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Background and Objectives: Lactococcus lactis belongs to lactic acid bacteria which have been used by mankind throughout the history. Lactococcus lactis have antagonistic properties against some microorganisms. This property serves to extend shelf-life of the foodstuffs. Antagonistic activity of lactococci is provided by synthesis of lactic acid, diacetyl and bacteriocins. Nisin is allowed to be used as a food preservative by European Parliament and Council (code E234). But the search for new antimicrobial metabolites and bacteriocins is a promising area of research. The aim of our study was to investigate properties of antimicrobial substances produced by Lactococcus lactis.

Methods: Lactococcus lactis subsp. lactis strain 194-K was isolated from fresh Buryatian milk (Russia). Microorganism demonstrated inhibitory activity against gram-positive, gram-negative bacteria, Aspergillus and Penicillium. The strain produced antibiotic complex, consisting of five components (A, B, C, D, E). Components 194-?, 194-B and D were purified by solid-phase extraction methods and RF-HPLC. Their physicochemical and biological properties were studied.

Results: The antibiotic substances differ from each other by molecular mass, Rf values and biological properties. Component A was a hydrophobic substance which contained aromatic groups, keto-, aldehydic and alkyl residues and was responsible for antifungal activity. Component B was also an aromatic substance with alkyl groups, 879 Da, that inhibited growth of gram-positive and gram-negative bacteria. Antimicrobial substances A and B, in concordance with UV-spectrum, molecular mass and spectrum of antimicrobial activity were identified as novel antibiotics, that were absent in BNPD database. Strain 194-K produced two bacteriocins. One was identified as nisin A. Bacteriocin, 194-D, wasn't previously described in literature. It's properties: 20 amino acids, molecular mass of 2589 Da and activity against gram-positive and gram-negative bacteria.

Conclusions: L. lactis 194-K can be considered as a potential producer of biopreservatives with wide activity spectrum.

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Promoting the Mediterranean Diet in School Cafeterias: A Necessary Change

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Background and Objectives: Schools are basic agents for promotion of healthy eating habits. The ANDALIES Project, which develops a participatory action research has among other objectives to analyze the food supply of secondary schools cafeterias in Andalusia taking as a frame of reference the Mediterranean Diet (MD).

Methods: Cross-sectional. Stratified random sample by province and population size of 72 cafeterias. The Healthy Eating Promotion scale (HEP) was used organized into three categories: food supply (variety, quality, availability of products outside the Mediterranean Diet ...), location of food products and healthy eating advertising. Techniques of data collection: direct observation, interview to the person responsible for the cafeteria and image registration. Analysis using SPSS 18, index HEP calculated: values between –10 points (no promotion) to 30 points (best promotion).

Results: The 84.9% of the cafeterias get a low HEP rate promoting healthy eating (> 0–10). The variability is higher in nutritional quality (DT = 2.098) and the supply of not recommended products (DT = 1.73). The 80% of the cafeterias have a varied food supply. Absent foods are fruits (71.2%), semi-skimmed milk and healthy sandwiches. The most common products (between 89% and 97.3%) in cafeterias are: fried snacks, sweets, meat, fatty cold meat and sugary fizzy drinks, respectively, with a preferential location (80.8%). Messages promoting healthy eating are not transmitted in the cafeterias (66.7%).

Conclusion: The level of promotion of the Mediterranean Died in Andalusian secondary schools cafeterias is low. Indicators for these differences are: nutritional quality and supply of non recommended products. The supply of products away from the Mediterranean Diet is more frequent than those considered healthy. The location and advertising of healthy products are valued by the HEP index as insufficient.

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Impaired Folate Transport During Embryonic Development and Post Weaning Leads to Learning and Cognitive Deficits in Rats

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Background and Objectives: Exposure to folate receptor antibodies (FR-Ab) in utero and during early development impairs folate supply to the developing nervous system and brain and has been associated with pregnancy complications and early neurodevelopmental disorders. However, the long-term effects in adult life are unknown. We investigated the effect of FR-Ab exposure in utero and just after weaning on cognition, learning and memory in adult rats.

Methods: A 50% resorption dose of FR-Ab was administered to pregnant dams and then to their offspring post-weaning. Behaviour was assessed using "open field" [anxiety-locomotor activity and exploratory behaviour, (control / exposed rats: N = 13/6], "novel object" [recognition memory, (N = 6/6)] and "place avoidance" [spatial memory formation), (N = 8/6)] tests at 40–70 post-natal days (adulthood) Both groups were fed a folate replete diet throughout the study. Behaviour parameters between both groups were compared using the one-tailed Mann-Whitney U test.

Results: In the open field test the exposed group covered a shorter distance in the test arena (Median: 102 cm; p < 0.05), spent more time in the corner (163 s; p < 0.05) and groomed themselves more (4 times; p<0.001) compared to the control group (252 cm, 149 s and 1 self-grooming). They took longer to start exploring novel object (35.5 s) than the control group (8.0 s; p < 0.05). In contrast to the control group, only 50% of the antibody exposed group of rats were able to complete the passive place avoidance task and none of them mastered the active place avoidance task.

Conclusions: FR-Ab exposure during fetal development and post-weaning leads to increased anxiety and severe learning impairment that persists in adult rats.

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